IM
An Imaging Toolkit
Version 3.15

IM is a toolkit for image representation, storage, capture and processing. The main goal of the library is to provide a simple API and abstraction of imaging for scientific applications.

The most popular file formats are supported: TIFF, BMP, PNG, JPEG, GIF and AVI. Image representation includes scientific data types, and about a hundred Image Processing operations are available.

This work was developed at Tecgraf/PUC-Rio by means of the partnership with PETROBRAS/CENPES.

Project Management:

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http://www.tecgraf.puc-rio.br/im
Also available at http://imtoolkit.sourceforge.net/

SOURCEFORGE

Veja esta página em Português.

Product

Overview

IM is a toolkit for Digital Imaging. IM is based on 4 concepts: Image Representation, Storage, Processing and Capture. Image Visualization is a task that it is left for a graphics library.

It provides support for image capture, several image file formats and many image processing operations. The most popular file formats are supported: TIFF, BMP, PNG, JPEG, GIF and AVI.

Image representation includes scientific data types (like IEEE floating point data) and attributes (or metadata like GeoTIFF and Exif tags). Animation, video and volumes are supported as image sequences, but there is no digital audio support.

The main goal of the library is to provide a simple API and abstraction of images for scientific applications.

The toolkit API is written in C. The core library source code is implemented in C++ and it is very portable, it can be compiled in Windows and UNIX with no modifications. New image processing operations can be implemented in C or in C++.

IM is free software, can be used for public and commercial applications.

IM has been used in Tecgraf for many theses and dissertations. Check the Publications in Tecgraf's web site http://www.tecgraf.puc-rio.br/.

Availability

The library is available for several **compilers**:

- GCC and CC, in the UNIX environment
- Visual C++, Borland C++, Watcom C++ and GCC (Cygwin and MingW), in the Windows environment

The library is available for several **operating systems**:

- UNIX (SunOS, IRIX, AIX, FreeBSD and Linux)
- Microsoft Windows NT/2K/XP

Support

The official support mechanism is by e-mail, using **im@tecgraf.puc-rio.br**. Before sending your message:

- Check if the reported behavior is not described in the user guide.
- Check if the reported behavior is not described in the specific format characteristics.
- Check the History to see if your version is updated.
- Check the To Do list to see if your problem has already been reported.

After all of the above have been checked, report the problem, including in your message: **function, element, format, platform, and compiler.**

We host the **IM** support features at **SourceForge**: http://sourceforge.net/projects/imtoolkit/. It provides us Mailing List, SVN Repository and Downloads.

The discussion list is available at: http://lists.sourceforge.net/lists/listinfo/imtoolkit-users.
Source code, pre-compiled binaries and documentation can be downloaded at: http://sourceforge.net/projects/imtoolkit/files/.
The SVN can be browsed at: https://sourceforge.net/p/imtoolkit/im/.

If you want us to develop a specific feature for the toolkit, Tecgraf is available for partnerships and cooperation.

Lua documentation and resources can be found at http://www.lua.org/.

Credits

This work was developed at Tecgraf by means of the partnership with PETROBRAS/CENPES.

Library Author:

- Antonio Scuri

Thanks to the people that worked and contributed to the library:

- Antonio Nabuco Tartarini
- Carolina Alfaro
- Diego Fernandes Nehab
- Erick de Moura Ferreira
- Luiz Henrique Figueiredo
- Marcelo Gattass

We also thank the developers of the third party libraries:

- Sam Leffler (libTIFF author)
- Frank Warmerdam, Andrey Kiselev, Mike Welles and Dwight Kelly (libTIFF actual maintainers)
- Thomas Lane (libJPEG)
- Lutz Müller (libExif)

- Glenn Randers-Pehrson (libPNG)
- Jean-loup Gailly and Mark Adler (zlib)
- Gershon Elber (GIFLib)
- Michael Adams (libJasper)
- Svein Bøe, Tor Lønnestad and Otto Milvang (XITE)
- Jason Perkins (Premake)
- Marc Alexander Lehmann (libLZF)
- (to many others that contribute to these library, keeping them free and updated)

The IM toolkit distribution includes the some third party libraries that are not developed by Tecgraf. Their license are also free and have the same freedom as the Tecgraf Library License. You can read the respective licenses in the files: zlib.txt, libpng.txt, libjpeg.txt, libtiff.txt, libjasper.txt, liblzf.txt, libexif.txt.

Thanks for the SourceForge for hosting the support features. Thanks for the LuaForge team for previously hosting the support features for many years.

IM is registered at the National Institute of Intellectual Property in Brazil (INPI) under the number 07570-6, and so it is protected against illegal use. The registration is valid internationally. See the Tecgraf Library License for further usage information and Copyright.

Documentation

This documentation is available at http://www.tecgraf.puc-rio.br/im and http://imtoolkit.sourceforge.net/

The full documentation can be downloaded from the Download Files. The documentation is also available in Adobe Acrobat and Windows HTML Help formats.

The HTML navigation uses the WebBook tool, available at http://www.tecgraf.puc-rio.br/webbook.

The library Reference documentation is generated by Doxygen (http://www.stack.nl/~dimitri/doxygen/).

Publications

- Scuri, A. "IM - Imaging Toolkit". Software Developer's Journal. Jan/2006. [im_sdj2005.pdf]
- Scuri, A., "IM – An Imaging Tool", Poster, SIBGRAPI 2004 [poster.pdf, poster_text.pdf]

Tecgraf Library License

The Tecgraf products under this license are: IUP, CD and IM.

All the products under this license are free software: they can be used for both academic and commercial purposes at absolutely no cost without affecting the license of the application. There are no paperwork, no royalties, no GNU-like "copyleft" restrictions, either. Just download and use it. They are licensed under the terms of the MIT license reproduced below, and so are compatible with GPL and also qualifies as Open Source software. They are not in the public domain, PUC-Rio keeps their copyright. The legal details are below.

The spirit of this license is that you are free to use the libraries for any purpose at no cost without having to ask us. The only requirement is that if you do use them, then you should give us credit by including the copyright notice below somewhere in your product or its documentation. A nice, but optional, way to give us further credit is to include a Tecgraf logo and a link to our site in a web page for your product.

The libraries are designed, implemented and maintained by a team at Tecgraf/PUC-Rio in Brazil. The implementation is not derived from licensed software. The library was developed by request of Petrobras. Petrobras permits Tecgraf to distribute the library under the conditions here presented.

Some of the secondary libraries in IUP, CD and IM use third party libraries that have different license terms. Almost all third party libraries although different their licenses are compatible with this license and can be used for both academic and commercial purposes without affecting the license of the application. BUT some of these third party libraries are GPL based or not free for commercial applications. The respective IUP, CD and IM secondary libraries that use these restricted libraries follow their license terms, so are also restricted. These libraries are:

```
cdpdf + PDFLib (not free for commercial applications)
im_fftw + FFTW (GPL)
```

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Download

The download site for pre-compiled binaries, documentation and sources is at **SourceForge**:

> http://sourceforge.net/projects/imtoolkit/files/
>
> Use this link for the latest version: http://sourceforge.net/projects/imtoolkit/files/3.15/

Before downloading any precompiled binaries, you should read before the Tecgraf Library Download Tips.

Some other files are available directly at the **IM** download folder:

> http://www.tecgraf.puc-rio.br/im/download/

Tecgraf/PUC-Rio Library Download Tips

All the libraries were build using **Tecmake**. Please use it if you intend to recompile the sources. **Tecmake** can be found at http://www.tecgraf.puc-rio.br/tecmake.

> The **IM** files can be downloaded at http://sourceforge.net/projects/imtoolkit/files/.
> The **CD** files can be downloaded at http://sourceforge.net/projects/canvasdraw/files/.
> The **IUP** files can be downloaded at http://sourceforge.net/projects/iup/files/.
> The **Lua** files can be downloaded at http://sourceforge.net/projects/luabinaries/files/.

Build Configuration

Libraries and executables were built using speed optimization. In UNIX the dynamic libraries are built with the -fPIC parameter when in 64 bits. In MacOS X the dynamic libraries are in bundle format, except for the Lua bindings.

The DLLs were built using the **cdecl** calling convention. This should be a problem for Visual Basic users.

In Visual C++ we use the static multithread C Run Time Library for static libraries (-MT) and the dynamic multi thread C RTL for DLLs (-MD).

Packaging

Some pre-compiled **Binaries** are available for download. They are named according to the platform where they were build.

In **UNIX** all strings are based in the result of the command "uname -a". The package name is a concatenation of the platform **uname**, the system **major** version number and the system **minor** version number. Some times a suffix must be added to complement the name. The compiler used is always gcc. Binaries for 64-bits receive the suffix: "_64". In Linux when there are different versions of gcc for the same uname, the platform name is created adding the major version number of the compiler added as a suffix: "g3" for gcc 3 and "g4" for gcc 4.

In **Windows** the platform name is the **compiler** and its **major** version number.

All library packages **(*_lib*)** contains pre-compiled binaries for the specified platform and includes. Packages with **"_bin"** suffix contains executables only.

The **Lua** bindings are in a separate folder identified by the Lua version (Lua51, Lua52, ...). The packages follows the same naming convention. But notice that you will have to download the main package and the Lua package in order to use the Lua bindings.

The package name is a general reference for the platform. If you have the same platform it will work fine, but it may also work in similar platforms.

Here are some examples of packages:

iup2_4_Linux26_lib.tar.gz = IUP 2.4 32-bits Libraries and Includes for Linux with Kernel version 2.6 built with gcc 3.
iup2_4_Linux26g4_64_bin.tar.gz = IUP 2.4 64-bits Executables for Linux with Kernel version 2.6 built with gcc 4.
iup2_4_Win32_vc8_lib.tar.gz = IUP 2.4 32-bits Static Libraries and Includes for Windows to use with Visual C++ 8 (2005).
iup2_4_Win32_dll9_lib.tar.gz = IUP 2.4 32-bits Dynamic Libraries (DLLs), import libraries and Includes for Windows to use with Visual C++ 9 (2008).
iup2_4_Win32_bin.tar.gz = IUP 2.4 32-bits Executables for Windows.

The **Documentation** files are in HTML format. Its package contains all the documentation files available on the website. The same documentation is also available in CHM and PDF formats. These two files are provided as a separate download, but they all have the same documentation.

The **Source** files are available in zip and tar.gz formats, but they have the same contents.

Installation

For any platform we recommend you to create a folder to contain the third party libraries you download. Then just unpack the packages you download in that folder. The packages already contains a directory structure that separates each library or toolkit. For example:

```
\mylibs\
        iup\
            bin\
            html\
            include\
            lib\Linux26
            lib\Linux26g4_64
            lib\vc8
            src
        cd\
        im\
        lua5.1\
        lua52\
        lua53\
```

This structure will also made the process of building from sources more simple, since the projects and makefiles will assume this structure .

Usage

For makefiles use:

```
1) "-I/mylibs/iup/include" to find include files
2) "-L/mylibs/iup/lib/Linux26" to find library files
3) "-liup" to specify the library files
```

For IDEs the configuration involves the same 3 steps above, but each IDE has a different dialog. The IUP toolkit has a Guide for some IDEs:

Borland C++ BuilderX - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/cppbx.html
Code Blocks - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/codeblocks.html
CodeLite - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/codelite.html
Dev-C++ - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/dev-cpp.html
Eclipse for C++ - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/eclipse.html
Microsoft Visual C++ (Visual Studio 2003) - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/msvc.html
Microsoft Visual C++ (Visual Studio 2005) - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/msvc8.html
NetBeans - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/netbeans.html
Open Watcom - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/owc.html

Available Platforms

The following platforms can be available:

Package Name	Description
AIX43	IBM AIX 4.3 (ppc) / gcc 2.95 (Motif 2.1)
IRIX65	SGI IRIX 6.5 (mips) / gcc 3.0 (Motif 2.1)
IRIX6465	SGI IRIX 6.5 (mips) / gcc 3.3 (Motif 1.2)
Linux26g4	Ubuntu 10.4 (x86) / Kernel 2.6 / gcc 4.4 (GTK 2.20)
Linux26g4_64	Ubuntu 10.4 (x64) / Kernel 2.6 / gcc 4.4 (GTK 2.20)
Linux30	Ubuntu 11.10 (x86) / Kernel 3.0 / gcc 4.6 (GTK 2.24)
Linux30_64	Ubuntu 11.10 (x64) / Kernel 3.0 / gcc 4.6 (GTK 2.24)
Linux32	Ubuntu 12.04 (x86) / Kernel 3.2 / gcc 4.6 (GTK 2.24)
Linux32_64	Ubuntu 12.04 (x64) / Kernel 3.2 / gcc 4.6 (GTK 2.24)
Linux35_64	Ubuntu 12.10 (x64) / Kernel 3.5 / gcc 4.7 (GTK 2.24)
Linux313_64	Ubuntu 14.04 (x64) / Kernel 3.13 / gcc 4.8 (GTK 3.10)
Linux319_64	Ubuntu 15.04 (x64) / Kernel 3.19 / gcc 4.9 (GTK 3.14)
Linux44_64	Ubuntu 16.04 (x64) / Kernel 4.4 / gcc 5.3 (GTK 3.18)
Linux415_64	Ubuntu 18.04 (x64) / Kernel 4.15 / gcc 7.3 (GTK 3.22)
Linux50_64	Ubuntu 19.04 (x64) / Kernel 5.0 / gcc 8.3 (GTK 3.24)
Linux54_64	Ubuntu 20.04 (x64) / Kernel 5.4 / gcc 9.3 (GTK 3.24)

SunOS510	Sun Solaris 10 (sparc) / gcc 3.4 (Motif 2.1)
SunOS510x86	Sun Solaris 10 (x86) / gcc 3.4 (Motif 2.1)
SunOS511x86	Sun Solaris 11 (x86) / gcc 4.5 (GTK 2.20)
FreeBSD54	Free BSD 5.4 (x86) / gcc 3.4
MacOS104	Mac OS X 10.4 (ppc) [Tiger] / Darwin Kernel 8 / gcc 4.0
MacOS104x86	Mac OS X 10.4 (x86) [Tiger] / Darwin Kernel 8 / gcc 4.0
MacOS105x86	Mac OS X 10.5 (x86) [Leopard] / Darwin Kernel 9 / gcc 4.0
MacOS106	Mac OS X 10.6 (x64) [Snow Leopard] / Darwin Kernel 10 / gcc 4.2
MacOS107	Mac OS X 10.7 (x64) [Lion] / Darwin Kernel 11 / clang 4.x
MacOS109	Mac OS X 10.9 (x64) [Mavericks] / Darwin Kernel 13 / clang 5.x
MacOS1010	Mac OS X 10.10 (x64) [Yosemite] / Darwin Kernel 14 / clang 6.x
MacOS1011	Mac OS X 10.11 (x64) [El Capitan] / Darwin Kernel 15 / clang 7.0
Win32_vc8	Static library built with Microsoft Visual C++ 8.0 (2005) (static RTL/multithread) Also compatible with Microsoft Visual C++ 2005 Express Edition
Win32_vc9	Static library built with Microsoft Visual C++ 9.0 (2008) (static RTL/multithread) Also compatible with Microsoft Visual C++ 2008 Express Edition
Win32_vc10	Static library built with Microsoft Visual C++ 10.0 (2010) (static RTL/multithread) Also compatible with Microsoft Visual C++ 2010 Express Edition
Win32_vc11	Static library built with Microsoft Visual C++ 11.0 (2012) (static RTL/multithread) Also compatible with Microsoft Visual C++ 2012 Express Edition
Win32_vc12	Static library built with Microsoft Visual C++ 12.0 (2013) (static RTL/multithread) Also compatible with Microsoft Visual C++ 2013 Express Edition - https://www.visualstudio.com/vs/express/ Â^1
Win32_vc14	Static library built with Microsoft Visual C++ 14.0 (2015) (static RTL/multithread) Also compatible with Microsoft Visual Studio Community 2015 - https://www.visualstudio.com/vs/older-downloads/ Â^1
Win32_vc15	Static library built with Microsoft Visual C++ 15.0 (2017) (static RTL/multithread) Also compatible with Microsoft Visual Studio Community 2017 - https://www.visualstudio.com/downloads/ Â^1
Win32_vc16	Static library built with Microsoft Visual C++ 16.0 (2019) (static RTL/multithread) Also compatible with Microsoft Visual Studio Community 2019 - https://www.visualstudio.com/downloads/ Â^1
Win32_dll8	DLL and import library built with vc8, creates dependency with MSVCR80.DLL
Win32_dll9	DLL and import library built with vc9, creates dependency with MSVCR90.DLL
Win32_dll10	DLL and import library built with vc10, creates dependency with MSVCR100.DLL
Win32_dll11	DLL and import library built with vc11, creates dependency with MSVCR110.DLL
Win32_dll12	DLL and import library built with vc12, creates dependency with MSVCR120.DLL
Win32_dll14	DLL and import library built with vc14, creates dependency with VCRUNTIME140.DLL
Win32_dll15	DLL and import library built with vc15, creates dependency with VCRUNTIME140.DLL (what changes is the version of the ucrtbase.dll installed on the system)
Win32_dll16	DLL and import library built with vc16, creates dependency with VCRUNTIME140.DLL (what changes is the version of the ucrtbase.dll installed on the system)
Win64_vc8	Same as **Win32_vc8** but for 64-bits systems using the x64 standard.
Win64_vc9	Same as **Win32_vc9** but for 64-bits systems using the x64 standard.
Win64_vc10	Same as **Win32_vc10** but for 64-bits systems using the x64 standard.
Win64_vc11	Same as **Win32_vc11** but for 64-bits systems using the x64 standard.
Win64_vc12	Same as **Win32_vc12** but for 64-bits systems using the x64 standard.
Win64_vc14	Same as **Win32_vc14** but for 64-bits systems using the x64 standard.
Win64_dll8	Same as **Win32_dll8** but for 64-bits systems using the x64 standard.
Win64_dll9	Same as **Win32_dll9** but for 64-bits systems using the x64 standard.
Win64_dll10	Same as **Win32_dll10** but for 64-bits systems using the x64 standard.
Win64_dll11	Same as **Win32_dll11** but for 64-bits systems using the x64 standard.
Win64_dll12	Same as **Win32_dll12** but for 64-bits systems using the x64 standard.
Win64_dll14	Same as **Win32_dll14** but for 64-bits systems using the x64 standard.
Win64_dll15	Same as **Win32_dll15** but for 64-bits systems using the x64 standard.
Win64_dll16	Same as **Win32_dll16** but for 64-bits systems using the x64 standard.
Win32_gcc4	Static library built with Cygwin gcc 4.3 (Depends on Cygwin DLL 1.7) - http://www.cygwin.com/ Â^1
Win32_cygw17	Same as **Win32_gcc4**, but using the Cygwin Posix system and also with a DLL and import library
Win32_dllg4	DLL and import library built with Cygwin gcc 4.3 (See **Win32_gcc4**)
Win32_mingw4	Static library built with MingW gcc 4.6 - http://www.mingw.org/ Â^1 Also compatible with Dev-C++ - http://www.bloodshed.net/devcpp.html and with Code Blocks - http://www.codeblocks.org/ Â^1
Win32_dllw4	DLL and import library built with MingW gcc 4.6 (See **Win32_mingw4**)
Win32_mingw6	Static library built with MingW-w64 gcc 6.4 - http://mingw-w64.org/ Â^1 Also compatible with Dev-C++ - http://www.bloodshed.net/devcpp.html and with Code Blocks - http://www.codeblocks.org/ Â^1
Win32_dllw6	DLL and import library built with MingW-w64 gcc 6.4 (See **Win32_mingw6**)
Win64_mingw4	Static library built with MingW-w64 gcc 4.5 - http://mingw-w64.org/ Â^1 Tool chains targeting Win64 / Personal Builds / "sezero" for 64-bits systems using the x64 standard.
Win64_dllw4	DLL and import library built with MingW gcc 4.5, for 64-bits systems using the x64 standard. creates dependency with MSVCRT.DLL
Win64_dllw6	DLL and import library built with MingW-w64 gcc 6.4 - http://mingw-w64.org/ Â^1 for 64-bits systems using the x64 standard. creates dependency with MSVCRT.DLL

Win32_owc1	Static library built with Open Watcom 1.5 - http://www.openwatcom.org/
Win32_bc55	Static library built with Borland C++ 5.5 Compiler - https://downloads.embarcadero.com/free/c_builder Â¹
Win32_bc6	Static library built with Embarcadero C++ Builder 2010 / Embarcadero C++ 6 Compiler - https://downloads.embarcadero.com/free/c_builder (trial)
Win32_bin	Executables only for Windows NT/2000/XP/Vista/7 (can be generated by any of the above compilers)
Win64_bin	Same as **Win32_bin** but for 64-bits systems using the x64 standard
Win32_cygw17_bin	Executables only for Windows NT/2000/XP, but using the Cygwin Posix system (See **Win32_cygw17**)

Â¹ - Notice that all the Windows compilers with links here are free to download and use.
Â² - Recently Borland removed the C++ Builder X from download. But if you bought a book that has the CD of the compiler, then it is still free to use.
[3] - Open Motif 2.2 is classified as 'experimental' by the Open Group.

SVN

The SVN repository is at **SourceForge**. It can also be interactively browsed at:

https://sourceforge.net/p/imtoolkit/im/

To checkout using the command line use:

```
svn checkout svn://svn.code.sf.net/p/imtoolkit/im/trunk/im im
svn checkout svn://svn.code.sf.net/p/imtoolkit/im/trunk/fftw3 fftw3 (to compile IM_FFTW3 in Windows)
svn checkout svn://svn.code.sf.net/p/imtoolkit/im/trunk/zlib zlib (to compile IM in Windows)
```

History of Changes

Version 3.15 (30/Jul/2020)

- New: functions **imCompressDataLZ4** and **imCompressDataUnLZ4**.
- Changed: Removed im_lzo library and LZO replaced by LZ4.
- Changed: FFTW is now an external library.

Version 3.14 (18/May/2020)

- New: functions **imProcessRenderOpAlpha** and **imProcessRenderCondOpAlpha**.
- New: function **imProcessBinThinZhangSuen**.
- New: function **imProcessThresholdSaturation**.
- Changed: **imProcessRenderConstant** and **imProcessRenderFloodFill** now supports alpha channel.
- Changed: **imProcessBinMorphThin** renamed to **imProcessBinThinNhMaps**.
- Changed: libjasper updated to version 2.0.14. But we lost support for GeoJasper. It is still possible to compile using older version.
- Changed: libjpeg updated to version 9d. Changes in libjpeg are not necessary anymore. Any libjpeg distribution can also be used.
- Changed: libexif updated to version 0.6.21.
- Changed: libtiff updated to version 4.1.0. Changes in libTIFF can be ignored and another libtiff distribution can be used.
- Changed: libpng updated to version 1.6.37.
- Fixed: kernel check for im.**ProcessGrayMorphConvolve** and im.**ProcessBinMorphConvolve** in Lua.
- Fixed: IM_ALPHA support in **imImageCreate**

Version 3.13 (07/Jan/2019)

- New: functions **imProcessBinaryMask, imProcessSelectHue, imProcessSelectHSI, imProcessLensDistort, imProcessQuantizeGrayMedianCut**, **imProcessQuantizeRGBMedianCut**, **imProcessThresholdColor**, **imProcessShiftComponent**, **imProcessFixBGR**, **imProcessPseudoColor**, **imProcessBackSub**.
- Changed: added counter support for processing functions imProcessInterlaceSplit, imProcessFlip, imProcessMirror, imProcessRotate180, imProcessRotate90, imProcessReduceBy4, imProcessCrop, imProcessInsert, imProcessAddMargins, imProcessZeroCrossing, imProcessBinMorphThin, imProcessCanny, imAnalyzeFindRegions, imAnalyzeFindRegions, imAnalyzeMeasureArea, imAnalyzeMeasureCentroid, imAnalyzeMeasurePrincipalAxis, imAnalyzeMeasureHoles, imAnalyzeMeasurePerimeter, imAnalyzeMeasurePerimArea, imProcessPerimeterLine, imProcessRemoveByArea, imProcessFillHoles, imCalcRMSError, imCalcSNR, imCalcPercentMinMax, imCalcHistoImageStatistics, imCalcHistogramStatistics, imCalcImageStatistics, imCalcCountColors, imCalcGrayHistogram, imCalcHistogram
- Changed: **imAnalyzeFindRegions** function changed to return the counter state and region_count is now a parameter.
- Changed: from float to double in the API of functions imColorRGB2HSI, imColorHSI2RGB, imVideoCaptureGetAttribute, imVideoCaptureSetAttribute, imImageSetAlpha, imConvertDataType, imConvertToBitmap, and all imProcess* functions that have a float parameter.
- Changed: im_ffft3 that uses FFTW3 is now also included in the distribution and uses float and double support.
- Changed: hue palette last color to be also red.
- Changed: imPaletteCian renamed to imPaletteCyan.
- Changed: added suppot for IM_GRAY in **imProcessRenderFloodFill**.
- Fixed: palette copy in **imImageCopyAttributes**.
- Fixed: support for multiple counters nested or not.
- Fixed: counter in **imConvertDataType** and **imConvertColorSpace**.
- Fixed: **imCalcHistogram** for IM_SHORT and IM_USHORT data types.
- Fixed: **imPaletteLinear** some invalid colors.
- Fixed: added support for IM_DOUBLE in **imProcessMergeHSI** and **imProcessSplitHSI**. And fixed conversion.
- Fixed: maximum number of formats in **imVideoCapture**.
- Fixed: invalid memory access in **imProcessBlend**.

Version 3.12 (30/Sep/2016)

- New: **imDibSectionFromImage** utility.
- Fixed: **imDibCreateSection** and support for alpha channel in **imDibToImage** and **imDibFromImage**.

Version 3.11 (20/Jun/2016)

- New: USE_LUA_VERSION variable for the Lua binding Makefiles to simplify the build for different Lua versions.
- Changed: libTIFF updated to version 4.0.6
- **Changed:** libPNG updated to version 1.6.23. libPNG code is now used only in Windows. In Linux it uses the libpng installed on the system.
- **Changed:** zlib updated to version 1.2.8. zlib source code is now separated from the main svn. Is still inside IM svn but in a separate folder. In Linux it uses the zlib installed on the system.

Version 3.10 (15/Sep/2015)

- New: header "im_plus.h" with the first version of the C++ API.
- New: ifile:**GetAttributeRaw** in Lua to retrieve an attribute as an userdata.
- New: function **imProcessRenderFloodFill**.
- **Changed:** removed include "im_old.h" from "im.h", must be manually included by old applications. Notice that the old API will be removed in future versions.
- **Changed:** Lua pre-compiled binaries are now separated by folders Lua51/Lua52/Lua53.
- **Changed: imAnalyzeMeasurePerimArea** and **imAnalyzeMeasureHoles** to include region_count parameter.
- Fixed: checking of real and complex image data types in some im.Processing functions in Lua.
- Fixed: **imImageRemoveAlpha** memory allocation.

- Fixed: removed luaL_register dependency from Lua >= 5.2 bindings.
- Fixed: **imProcessNormalizeComponents**

Version 3.9.1 (27/Apr/2015)

- New: support for Lua 5.3.
- New: im.Close() function available from Lua to avoid memory leaks.
- Fixed: invalid TIFF file when saving bitmap images.

Version 3.9 (30/Sep/2014)

- New: function **imImageLoadFromResource** only in Windows.
- New: **imCompressDataLZO** and **imCompressDataUnLZO** for data compression/decompression using libLZO in an external library called im_lzo because libLZO is GPL.
- New: "image:**SetPixels**(table)" and "table = image:**GetPixels**()" member functions in Lua.
- New: "PFM" internal file format (Portable FloatMap Image Format).
- New: utility functions **imImageSetAttribInteger**, **imImageSetAttribReal**, **imImageSetAttribString**, **imImageGetAttribInteger**, **imImageGetAttribReal**, **imImageGetAttribString**, **imFileSetAttribInteger**, **imFileSetAttribReal**, **imFileSetAttribString**, **imFileGetAttribInteger**, **imFileGetAttribReal**, **imFileGetAttribString**.
- New: data types IM_DOUBLE and IM_CDOUBLE. All functions that process IM_FLOAT will also process IM_DOUBLE.
- New: function **imProcessMultipleMedian.**
- Changed: **IMPORTANT** - the following attributes changed from IM_FLOAT to IM_DOUBLE in TIFF format (StoNits, GeoTiePoints, GeoTransformationMatrix, "Intergraph TransformationMatrix", GeoPixelScale, GeoDoubleParams).
- Changed: TIFF format when saving IM_BINARY images in one of the CCITT are now saved as WhiteIsZero (image data is inverted before saving as well). This was necessary because some applications were ignoring the PhotometricInterpretation tag in favor of the CCITT compression.
- Changed: libTIFF updated to version 4.0.3.
- Changed: interpolation order is now optional in Lua. Defaults to 0 for IM_MAP and IM_BINARY, or 1 for other color spaces.
- Changed: definitions of **imMultiPointColorOpFunc** and **imMultiPointOpFunc** to include image count and depth.
- Changed: repository migrated from CVS to SVN.
- Fixed: added compatibility code for libPNG 1.2.
- Fixed: alpha processing in some operations to check for alpha on both source and target.

Version 3.8.2 (21/Nov/2013)

- New: support for 16 bits packed RGB import in RAW format using new attribute "RGB16".
- Changed: **imProcessQuantizeGrayUniform** can now accept an IM_MAP as target to keep the range in 0-(grays-1) interval.
- Fixed: support for BMP files with newer header information. Improved support for 16 and 32 bpp.
- Fixed: support for CMYK in JPEG format.

Version 3.8.1 (26/Nov/2012)

- Fixed: image:**SetAttribute** and file:**SetAttribute** when data is a Lua string.
- Fixed: loading frames from large video files in the WMV format.

Version 3.8 (15/May/2012)

- New: function **imProcessAbnormalHyperionCorrection.**
- New: function im.**ErrorStr** in Lua.
- New: function **imImageRemoveAlpha**.
- New: support for IM_SHORT data type.
- New: IM_UN_POSITIVES and IM_UN_NEGATIVES operations for **imProcessUnArithmeticOp**.
- New: IM_GAMUT_MINMAX flag for **imProcessToneGamut**.
- New: IM_CAST_USER option for **imConvertDataType**.
- Changed: im.**ImageCreate** in Lua will now issue an error when the image failed to be created.
- Changed: **imCalcHistogram** renamed to **imCalcByteHistogram**, and created a New function **imCalcHistogram** that compute the histogram for a given image plane.
- Changed: libexif updated to version 0.6.20.
- Fixed: some invalid .lh files with size 0 that affected the IMLua binding.
- Fixed: invalid memory access in **imVideoCaptureConnect** when the camera has support for many resolutions.
- Fixed: parameter checking in im.**ProcessRangeContrastThreshold** and im.**ProcessLocalMaxThreshold** in Lua.
- Fixed: **imConvertDataType** when promoting a small integer type to a bigger integer type. Improved demoting bigger integer type to small integer type, and promoting an integer to real.
- Fixed: im.**CalcImageStatistics** and im.**CalcHistogramStatistics** in Lua when depth > 1.
- Fixed: support for GPS Exif tags in JPEG format.
- Fixed: invalid ymin processing in **imProcessInsert**.

Version 3.7 (02/Jan/2012)

- New: function **imImageMergeAttributes.**
- New: function **imProcessNormDiffRatio.**
- New: function **imProcessSetAlphaColor.**
- New: function **imCalcPercentMinMax.**
- New: function **imProcessShiftHSI**.
- New: function **imProcessCalcAutoGamma**.
- **New:** functions **imProcessUnaryPointColorOp**, **imProcessUnaryPointOp**, **imProcessMultiPointOp** and **imProcessMultiPointColorOp**.
- **New:** functions **imImageSetMap** and **imImageSetGray**.
- **New:** support for OpenMP in the im_process library. Almost all image processing functions now have support for multi-thread using OpenMP. Since multi-threading can be slower than single thread depending on the conditions, there are two libraries one called "im_process" and one called "im_process_omp". New function **imOpenMPSetMinCount** to be used to control the OpenMP loop. New functions **imProcessConvertDataType**, **imProcessConvertColorSpace imProcessConvertToBitmap** equivalent to **imConvertDataType**, **imConvertColorSpace imConvertToBitmap** but with support for OpenMP.
- **New:** image enhance utilities for in-place operation in Lua, including image:**AutoLevel**(), image:**Equalize**(), image:**Negative**(), image:**Level**(), image:**BrightnessContrast**(), and image:**Gamma**().
- New: function **imFormatInfoExtra**.
- **New:** support for Lua 5.2.
- Changed: **imImageInit** now accepts also the IM_ALPHA flag.
- Changed: **imProcessThreshold, imProcessSliceThreshold, imProcessMinMaxThreshold** and **imProcessThresholdByDiff** now supports also IM_FLOAT images.
- Changed: **imProcessEqualizeHistogram, imProcessExpandHistogram, imCalcGrayHistogram, imCalcCountColors, imCalcHistogramStatistics** and **imCalcHistoImageStatistics** now also supports data type IM_USHORT.
- Changed: removed Lua bytecode usage in pre-compiled binaries. Now IM pre-compiled binaries are compatible with LuaJIT.
- Changed: third party libraries updated to newest versions zlib 1.2.5, libpng 1.5.7, libjpeg 8c and libtiff 4.0.
- Changed: **IMPORTANT** - zlib library separated from the main IM library. Now the application that statically link with IM must also link to zlib. If Tecmake is used, and USE_IM=Yes, then no changes are necessary.
- Fixed: support for alpha with gray images in SGI format.
- Fixed: **imProcessMultipleMean** when source images were data type byte.
- Fixed: im.**ProcessAddMargins** in Lua to accept sizes greater or equal than the source size.
- Fixed: im.**ProcessUniformErrThreshold**, im.**ProcessMinMaxThreshold** and im.**ProcessPercentThreshold** return value in Lua.
- Fixed: invalid memory access when loading TIFF files with custom tags using double precision values.
- Fixed: internal precision of **imCalcImageStatistics**.
- Fixed: computation order of IM_BIN_SUB in **imProcessArithmeticOp** and in **imProcessArithmeticConstOp**, was computing b-a instead of a-b.
- Fixed: im.**CalcHistogram** in Lua when data type is IM_USHORT.
- Fixed: loading RGB images with non byte data type, when data planes in file are packed.
- Fixed: memory leaks when parameter test fails in functions that receive an array in Lua.
- Fixed: loading of DNG (TIFF) files.

Version 3.6.3 (09/Nov/2010)

- New: function **imImageCreateFromOpenGLData**.
- Changed: the function **imConvertPacking** now has one more parameter so src_depth can be different from dst_depth.
- Fixed: **imImageGetOpenGLData** for some configurations.
- Fixed: write support for alpha in TGA format. (Thanks to Nicolas Noble)

Version 3.6.2 (22/Jun/2010)

- New: function **imVideoCaptureReleaseDevices**.
- Changed: ICON format now supports writing up to 10 images.
- Changed: replaced old "arg" usage for "..." to improve better compatibility with LuaJIT.
- Changed: control of LOHs inclusion moved from the source code to the makefile.
- Changed: removed compatibility with require"imlua51", now LuaBinaries must be used or LUA_CPATH must be set.
- Changed: added compatibility with Lua 5.2.
- Fixed: image:**HasAlpha**() method in Lua was returning a number instead of a boolean, so **im**.**ImageCreateBased** was adding an alpha channel to all new images.

Version 3.6.1 (23/Apr/2010)

- Fixed: invalid memory access in **imProcessResize** when one dimension is equal to the original.
- Fixed: **imProcessCompose** parameter parsing in Lua.
- Fixed: invalid memory access when saving an image with the JPEG 2000 format.

Version 3.6 (26/Jan/2010)

- New: function **imImageCopyPlane**.
- New: function **imProcessCompose**.
- New: function **imImageSetAlpha**.
- Changed: libTIFF downgraded to version 3.8.2 because of the JPEG support in TIFF not working on the newer versions.
- Changed: included alpha support in **imProcessSplitComponents** and **imProcessMergeComponents**. Included alpha support in all geometric and size operations.
- Fixed: invalid memory access in **imAnalyzeFindRegions** when more than 16k regions where found.
- Fixed: memory leak in **imFileOpen**.
- Fixed: alpha support in image:**CopyPlane**() and in channel indexing in Lua.
- Fixed: incomplete initialization of the array in **imAnalyzeMeasureArea**.
- Fixed: **imProcessRemoveByArea** inside/outside logic.

Version 3.5 (02/Oct/2009)

- New: functions **imProcessUnsharp** and **imProcessSharp**.
- New: function **imImageGetOpenGLData**.
- New: functions **im.ConvertDataTypeNew**, **im.ConvertColorSpaceNew** and **im.ConvertToBitmapNew** in Lua.
- New: file attributes "FileFormat", "FileCompression" and "FileImageCount" when reading from file. Available for all formats.
- New: ASCII compression for RAW format to access text data instead of binary.
- Changed: libPNG updated to version 1.2.39. Removed changes to the library that made it incompatible with other libPNG distributions.
- Changed: libLZF updated to version 3.5.
- Changed: libJPEG updated to version 7.
- Changed: libEXIF updated to version 0.6.17.
- Changed: libTIFF updated to version 3.9.1.
- Changed: library im_fftw3 to use an external library.
- Changed: **imImageCreateBased** and **imConvertColorSpace** now also consider the alpha plane.
- Changed: **imProcessPrune** renamed to **imProcessRemoveByArea**, and added a new parameter to select inside or outside the interval.
- Changed: removed IM_UN_INC operation from **imProcessUnArithmeticOp**. It was not an unary operation. Can simply be done in place by **imProcessArithmeticOp** and IM_BIN_ADD.
- Changed: now **imProcessUnArithmeticOp**, **imProcessArithmeticConstOp** and **imProcessArithmeticOp** willl crop the result to 0-255 if target has data type byte.
- Fixed: PNG attribute TransparencyIndex. new PNG attribute TransparencyMap. TransparentColor renamed to TransparencyColor.
- Fixed: invalid convertion from MAP to GRAY when loading **imImages**.
- Fixed: new image size computation of **im.ProcessCropNew** in Lua.
- Fixed: loading of RAW data.
- Fixed: **imImageClear** to initialize data just like **imImageCreate** does.
- Fixed: **imImageReshape** when the image has an alpha plane. Image is not cleared anymore.
- Fixed: boolean parameters in **file:ReadImageData, im.ConvertDataType, im.ConvertToBitmap, im.ProcessSplitComplex, im.ProcessQuantizeRGBUniform, im.ProcessBitPlane, im.ProcessRotateRef, im.ProcessRotate90, im.ProcessBinMorphConvolve, im.ProcessMergeComplex, im.CalcHistogram, im.CalcGrayHistogram** and **im.AnalyzeFindRegions** in Lua. Changed **im.Capture*** functions to use boolean values in Lua.
- Fixed: RAW format initialization.

Version 3.4.2 (26/Jun/2009)

- Changed: removed "lua5.1.so" dependency in UNIX.
- Fixed: AVI format when reading 32 and 16 bpp frames.
- Fixed: xmin and ymin check in im.ProcessCrop and in im.ProcessInsert in Lua.

Version 3.4.1 (15/Dec/2008)

- Changed: function **imColorHSI_Smax** removed from public, now it is used only internally. HSI space now uses S already normalized between 0-Smax.
- Fixed: **imColorHSI2RGB** conversion.
- Fixed: **imConvertDataType** when converting a floating point to integer, there were rounding problems.
- Fixed: loading and saving two or more files of the same format at the same time.

Version 3.4 (14/Oct/2008)

- New: imlua_avi, imlua_wmv and imlua_jp2 libraries so the respective formats can be dynamically loaded using require.
- Changed: **IMPORTANT** - the "imlua_cd" library moved from IM to CD under the name "cdluaim".
- Changed: **IMPORTANT** - the support services (Downloads, Mailing List and CVS) moved from LuaForge to SourceForge.
- Changed: All dll8 and dll9 DLLs now have a Manifest file that specifies the correct MSVCR*.DLL.
- Changed: Makefiles for UNIX now uses a compact version of Tecmake that does not need any installation, just type "make".
- Changed: premake files are used now only internally and were removed from the distribution.
- Changed: Copyright notice modified to reflect the registration at INPI (National Institute of Intellectual Property in Brazil). License continues under the same terms.
- Fixed: reviewed and fixed the parameter checking of all IMLua processing functions. Also reviewed all IMLua parameter checking. Thanks to Lucas Lorensi.
- Fixed: loading of TIFF format with old JPEG compression.
- Fixed: loading and saving of PNM format when data in textual format and gray values are greatter than 255.
- Fixed: Bicubic and Zero order interpolation for all geometric operations for pixels near the image border when increasing image size.
- Fixed: Lua samples.
- Fixed: ICON format in 64 bits Linux.

Version 3.3 (26/Nov/2007)

- New: read support for ECW using the ERMapper ECW JPEG 2000 SDK.
- Changed: libTIFF updated to version 3.8.2.
- Changed: libPNG updated to version 1.2.22.
- Changed: libJasper updated to libGeoJasper 1.4.0 (using Jasper version 1.900.1). Better support for counter progress, Geo tags and several speed improvements. New GeoTIFFBox and XMLPacket attributes.

- Changed: renamed macro **imPutImage** to **imcdCanvasPutImage**, and added canvas as the first parameter.
- Changed: renamed the **imImage** Lua methods to ***image*:cdCanvasPutImageRect**, ***image*:wdCanvasPutImageRect** and ***image*:cdCanvasGetImage**, and added canvas as the first parameter. Now *imlua_cd* depends on *cdlua* from CD version 5.0.
- Changed: metatable names in Lua are now the same as the C struct names.
- Changed: new read EXIF tags support in TIFF format (no write support yet). Renamed attributes "GeoTransMatrix" and "IntergraphMatrix", to "GeoTransformationMatrix" and "Intergraph TransformationMatrix" for libGeoTIFF compatibility. Better support for known TIFF tags. New support for reading one band of a multiband gray image in TIFF format. New support for DNG files.
- Fixed: **imConvertDataType** gamma function when converting real to/from integer.
- Fixed: small error at the image border when resampling, rotating or other geometric operations.
- Fixed: **imProcessCanny** invalid division by zero when input image is all zero.
- Fixed: **imFileReadImageInfo** when loading MAP images with a scrambled gray palette. They were incorrectly converted to GREY.
- Fixed: support for IM_ALPHA and 32 bpp in ICO format.
- Fixed: number of lines returned in **imProcessHoughLinesDraw**.

Version 3.2 (24/Nov/2006)

- New: **imProcessRotateRef** to rotate relative to a reference point.
- New: geometric distortion **imProcessSwirl**.
- New: **imProcessInterlaceSplit**.
- New: function **imGaussianKernelSize2StdDev**.
- New: convolutions **imProcessBarlettConvolve**, **imProcessPrewittConvolve**, **imProcessSplineEdgeConvolve**, **imProcessConvolveDual** and **imProcessConvolveSep**.
- New: "im_kernel.h" module with simple functions to create know pre-defined kernels like sobel, laplacian, gaussian, etc.
- New: **imVideoCaptureSetInOut** to control input and output in capture devices.
- New: function **imBinMemoryRelease** to release internal memory allocated by the BinMemory file when saving.
- New: functions for capture device information: **imVideoCaptureDeviceExDesc**, **imVideoCaptureDevicePath** and **imVideoCaptureDeviceVendorInfo**.
- New: function **imFileOpenAs** to open a file of a specific format.
- New: functions **imFormatRegisterInternal** and **imFormatRemoveAll** to control format registration.
- Changed: **imProcessGaussianConvolve** to used separable convolution and now is stddev is negative will use its magnitude as the kernel size. Removed Rep functions **imProcessGaussianConvolveRep**, **imProcessDiffOfGaussianConvolveRep** and **imGaussianStdDev2Repetitions**.
- Changed: **imProcessBlend** to use an image instead of a constant. Old function renamed to **imProcessBlendConst**.
- Changed: **imFileHandle** prototype. Now the function has an index parameter to specify which handle it should return. index=0 is always an imBinFile* handle. Use index=1 or greater to return other internal handles that are format dependent.
- Changed: the Removed the include "im.h" to not include "im_lib.h". "im_lib.h" must be included when necessary.
- Changed: **imAnalyzeMeasureArea** and **imAnalyzeMeasurePerimeter** prototypes to include the number of regions as a parameter. Fixed: these functions to internally initialize the results array to zero (this was necessary and not documented).
- Changed: **imProcessFlip** and **imProcessMirror** so they can be done in-place.
- Fixed: missing implementation of **imVideoCaptureOneFrame** in Lua 5.
- Fixed: **imAnalyzeFindRegions** when pixel is at the width-1 column.
- Fixed: file format identification when **TIFF** identification failed was not closing the file.
- Fixed: **imAnalyzeMeasurePerimeter** when perimeter line is at the first or last lines. Thanks to Takeshi Mitsunaga.
- Fixed: invalid return value in **imVideoCaptureConnect** in Lua 5.
- Fixed: **imProcessRotate** for IM_MAP images.
- Fixed: **Lua** binding of **imFileImageSave**, wrong parameters order. New: image:Save(filename, format) alias for imImage objects.
- Fixed: **BMP** format implementation when reading and writing RGBA 32 bits images.
- Fixed: **imFileLoadImageFrame** and **imFileLoadBitmapFrame** index parameter in Lua.
- Fixed: alpha channel allocation in imImage.

Version 3.1 (12/Dez/2005)

- New: Download, Discussion List, Submission of Bugs, Support Requests and Feature Requests, are now available thanks to the LuaForge site.
- New: Binding for Lua 5
- New: support for alpha in imImage.
- New: organization of the documentation.
- New: in ICON format the TransparencyIndex is used to for IM_MAP images without an alpha channel.
- New: video capture functions: **imVideoCaptureFormatCount**, **imVideoCaptureGetFormat** and **imVideoCaptureSetFormat**, to access the available capture video formats.
- New: functions **imFileLoadImageFrame** and **imFileLoadBitmapFrame** to reuse the image data when loading.
- New: function **imFileImageSave**.
- New: function **imImageCreateBased**.
- New: **imProcessInsert**.
- New: compression functions **imCompressDataLZF** and **imCompressDataUnLZF**, using libLZF.
- New: module for imBinFile, **IM_FILEHANDLE** that allows to access an already opened file using the system file handle as file name. Thanks to Frederico Abraham.
- Changed: in JPEG file format YcbCr are now automatically converted to RGB when loaded. RGB images were already automatically converted to YCbCr when saved. Now this behavior can be controlled by the AutoYCbCr attribute.
- Changed: the **imAnalyzeFindRegions** to include an additional parameter that control if regions touching the border are computed or not. The function **imProcessPrune** now will only eliminate the regions in the selected size range.
- Changed: third party libraries updated to newest versions: libExif, libTIFF, libPNG and zlib. Added OLD JPEG support in libTIFF.
- Changed: optimization flags to ON when building the library in all platforms.
- Changed: **imProcessPerimeterLine**, **imAnalyzeMeasurePerimeter**, **imAnalyzeMeasurePerimArea**, **imAnalyzeMeasureCentroid** and **imAnalyzeMeasurePrincipalAxis** to consider pixels that touch the borders.
- Changed: macro name **cdPutBitmap** to **imPutBitmap**.
- Changed: function names imImageLoad and **imImageLoadBitmap**, to **imFileImageLoad** and **imFileImageLoadBitmap**.
- Fixed: overflow in **imCalcImageStatistics** fo IM_INT and IM_USHORT images.
- Fixed: error management in system file I/O in **UNIX**.
- Fixed: some small defines for 64-bits compatibility in libExif, libPNG and libJPEG.
- Fixed: incorrect interpretation of 16 bit data from **PNG** files.
- Fixed: **imFileReadImageInfo** can be called many times with the same index that will return the correct result without accessing the file again.
- Fixed: small bug in sample **iupglcap**.
- Fixed: **TIFF** format read for images with multiple bands in ExtraSamples.
- Fixed: **ICON** format can_sequence was 0.
- Fixed: **imProcessMergeHSI** and **imProcessSplitHSI** documentation, and implementation for **IM_BYTE** images.
- Fixed: **imProcessRangeContrastThreshold**, **imProcessLocalMaxThreshold** and **imProcessRankClosestConvolve** when processing near the border.
- Fixed: invalid file permissions in UNIX when saving a new file.
- Fixed: name for **imProcessLocalMaxThresEstimate**.
- Fixed: **imProcessReduceBy4** for images with odd width and/or height.
- Fixed: **imAttribTableSet** when replacing an attribute (thanks to Takeshi Mitsunaga).
- Fixed: memory leaks in **imConvertToBitmap** and **imConvertDataType** (thanks to Takeshi Mitsunaga).
- Fixed: **imProcessZeroCrossing** for the last pixel column (thanks to Takeshi Mitsunaga). Also fixed for some crossings that were lost.
- Fixed: **imProcessGrayMorphConvolve** for **IM_FLOAT** images with **IM_FLOAT** kernel (thanks to Takeshi Mitsunaga).

Version 3.0.3 (14/Oct/2004)

- New: Image Transform **imProcessDistanceTransform**.
- New: group of functions Image Analysis: **imAnalyzeFindRegions**, **imAnalyzeMeasureArea**, **imAnalyzeMeasurePerimArea**, **imAnalyzeMeasureCentroid**, **imAnalyzeMeasurePrincipalAxis**, **imAnalyzeMeasureHoles**, imProcessPerimeterLine, **imAnalyzeMeasurePerimeter**, **imProcessPrune**, **imProcessFillHoles**.
- New: **imConvertMapToRGB** to help loading data as RGB.
- New: sample iupglcap.
- New: **imProcessRenderChessboard** and **imProcessRenderGrid**.
- Changed: **imProcessThreshold**, **imProcessRangeContrastThreshold** and **imProcessLocalMaxThreshold** now also supports **IM_USHORT** and **IM_INT** data types.
- Changed: the default color conversion to binary so it can be done for all color spaces.
- Changed: im_process.h to split into 4 files: im_process_pont.h, im_process_loc.h, im_process_glo.h, im_process_ana.h. But it still exists and includes the new files for compatibility.
- Changed: the border extensions in several types of convolution. Rank convolution do not extend the borders. Binary morphology use zero extension. Gray morphology do not extend the borders.
- Fixed: file read with bitmap conversion when original data changes only data type.
- Fixed: rank convolution operations that did not accept even kernel sizes.

- Fixed: **imProcessHoughLinesDraw** that was ignoring some lines.

Version 3.0.2 (25/Aug/2004)

- New: utility functions **imPaletteHighContrast**, **imImageLoadImage** and **imImageLoadBitmap**.
- New: operation **imProcessNormalizeComponents**.
- Changed: name **imProcessGaussianConvolve** to **imProcessGaussianConvolveRep**. New: operation **imProcessGaussianConvolve** that uses a float kernel. New: utility functions **imGaussianStdDev2Repetitions** and **imGaussianStdDev2KernelSize**.
- Changed: name **imProcessDiffOfGaussianConvolve** to **imProcessDiffOfGaussianConvolveRep**. New: operation **imProcessDiffOfGaussianConvolve** that uses a float kernel.
- Changed: **IM_GAMUT_BRIGHTCONT** parameters to the interval [-100,100]. Fixed: **IM_GAMUT_EXPAND** and **IM_GAMUT_BRIGHTCONT** normalization.
- Changed: logical operations, flag **IM_BIT_NOT** replaced by operation **imProcessBitwiseNot**.
- Changed: **imImageSetAttribute** count can be -1 for zero terminated data.
- Fixed: operations **imProcessBitwiseNot** and **imProcessNegative** for **IM_BINARY** images.
- Fixed: the **color_mode_flags** parameter interpretation by **imFileReadImageData**.
- Fixed: **imProcessEqualizeHistogram** and **imProcessExpandHistogram** for color images.
- Fixed: **imProcessMultipleStdDev**.
- Fixed: **imProcessDifusionErrThreshold** for **IM_GRAY** images.
- Fixed: "**KRN**" format, internal format is topdown.
- Fixed: initialization of TGA image_count.

Version 3.0.1 (22/Apr/2004)

- Improved compatibility with the old version, it was missing the load of Map images with **imLoadRGB**.
- The FFTW code was from version 2.1.3, not from 2.1.5 as suposed, it was updated. The FFT functions were condensed in only one file with an "#ifdef" for FFTW version 2 and 3. The FFT functions also were renamed to remove the "W" that belongs only to the FFTW library.
- The **SetAttribute** functions now accept NULL in data to remove the attribute.
- New: **imProcessCrossCorrelation** and **imProcessAutoCorrelation** functions.
- The **imCalcGrayHistogram** function now can calculate the histogram of **IM_MAP** and **IM_BINARY** images.

Version 3.0 (April 2004)

A major rewrite of the library. Everything changed, check the manual, but backward compatibility is kept for old applications. A new API more flexible, new formats, support for attributes and video, image capture and image processing. New: color spaces and data types. The library now got a professional look for scientific applications.

Version 2.6 (May 2002)

Correction of bug in resolution reading and writing for format JPEG.

Version 2.5 (August 2001)

Correction of bug in the default GIF compression. Two new callbacks: transparency color index for GIF files and image description for TIFF files.

Version 2.4 (February 2000)

Change in the treatment of LZW compression in formats TIFF and GIF. Now compression is no longer the default.

Version 2.3 (June 1998)

Close function of the access driver for files in memory corrected. JPEG library updated to 6b. Correction of a problem with the reading of some JPEG files.

Version 2.2 (November 1997)

The definition of the counter callback was changed to inform, in a parameter, the type of access being performed, either reading or writing. Type **imCallback** defined to make type casting easier when using function **imRegisterCallback**. Correction of a problem with the makefile in UNIX, which was generating link errors in some platforms.

Version 2.1 (October 1997)

Correction of a problem with internal memory liberation when reading Map images in TIFF files. Conversion **RGB to Map** is now made using the algorithm implemented by LibJPEG. The algorithm of **imResize** was improved for cases in which the size is being reduced instead of increased. Correction of a problem with functions **imImageInfo** and **imFileFormat**: when the provided file was not in a format recognized by IM, there was an error in format TGA which caused these functions to access an invalid memory area.

Version 2.0 (September 1997)

The library was virtually rewritten to implement a new structure which allowed greater flexibility, simplifying the addition of new formats. Formats **TGA**, **PCL**, **JPEG** and **LED** were added to the list of supported formats, and new functions were added: **imMap2RGB**, **imRGB2Gray**, **imMap2Gray**, **imResize**, **imStretch**.

Version 1.1 (June 1996)

Small corrections to increase portability. Changes in return codes. Identifiers were created to return codes and predefined parameters. Online manual concluded.

Version 1.0 (October 1995)

To Do

General

- Test libjpeg-turbo
- Partial image loading for TIFF format
- Imaging Tutorial in the documentation
- DICOM
- MOV (using QuickTime SDK and QT4Linux)
- Linux Capture (using Video4Linux)
- Use libavcodec and libavformat in Linux. AVI using libavifile in Linux (UNIX ?)

For the Processing library:

- Support for the Intel® Integrated Performance Primitives
- Dithering Techniques
- Adaptative Thresholds
- Warping
- Rolling Ball Filter
- Butterworth, Deconvolution
- Inverse Filter, Homomorphic Restoration
- Watershed, Convex Hull

- Other Measures

Our plans for the future may include:

- WebM
- JPEG-XR
- MPEG-2 (using MSSG?)
- VC-1 Coded using Microsoft VC-1 Encoder SDK
- JPEG and TIFF Thumbnails
- Other Formats: FLI, DV, FPX (Flash Pix), MNG, Microsoft HD Photo
- EXR (Industrial Light & Magic High Dynamic Range Format)
- ECW write
- OpenML?
- WIA and TWAIN?

Suggestions? im@tecgraf.puc-rio.br

Comparing IM with Other Imaging Toolkits

Still today there is a need for something easier to code and understand in Imaging. The available free libraries are sometimes close, sometimes very far from "easier". IM is an unexplored solution and proposed as a simple and clean one. It is another Imaging tool with a different approach to the many possibilities in the area. Its organization was designed so it can be used for teaching Imaging concepts. We invite you to try it.

First we list some libraries mainly target for storage, then some scientific libraries, and then a small comparsion of IM and those libraries.

Here are some free storage libraries:

Imlib2

Last Update 2003-09 / Version 1.1.0
http://docs.enlightenment.org/api/imlib2/html/
Language C
Documentation is terrible. Depends on the X-Windows System libraries.
It is designed for display/rendering performance.

Corona

Last Update 2003-09 / Version 1.0.2
http://corona.sourceforge.net/
Language C++
Very simple library. Only a few formats. Only bitmap images, no video.

PaintLib

Last Update 2004-04 / Version 2.61
http://www.paintlib.de/paintlib/
Language C++
A very simple library.
Has an interesting ActiveX component. Only bitmap images, no video.

NetPBM

Last Update 2004-07 / Version 10.23
http://netpbm.sourceforge.net/
Language C
A traditional library that starts at the Pbmplus package more than 10 years ago.
Very stable, it has support for the PNM format family and many processing operations.
Only bitmap images, no video.

DevIL ***

Last Update 2004-06 / Version 1.6.7
http://openil.sourceforge.net/
Language C (Has also a C++ Wrapper)
Called initially OpenIL. Supports many formats and have a very interesting API, that works very similar the OpenGL API (that's why the original name). Also supports the display in several graphics systems. Has several data types as OpenGL has.

FreeImage ***

Last Update 2004-07 / Version 3.4.0
http://freeimage.sourceforge.net/
Language C (Has also a C++ Wrapper)
Supports many formats. Many data types, but only RGB and subclasses (gray, map, etc).
Very well written, stable and simple to use.

ImageMagick and GraphicsMagick ***

Last Update 2004-07 / Version 6.0.3 || Last Update 2004-04 / Version 1.0.6
http://www.imagemagick.org/ || http://www.graphicsmagick.org/
Language C (Has also a C++ Wrapper)
The two libraries are listed together because GraphicsMagick is totally and explicitly based on ImageMagick version 5.5.2.
They have very similar or identical APIs but the development process is completely different. GraphicsMagick propose a more organized development process (a more precise comparison requires detailed knowledge about the two libraries).
These are very complete libraries. They support lots of file formats, several color spaces, but use only the byte data type.
They use a big image structure with everything inside. Image creation may involve about 40 parameters.

And here are some free scientific libraries:

TINA

Last Update 2002-03 / Version 4.0.2
http://www.niac.man.ac.uk/Tina
Language C
Very UNIX oriented. Lots of functions for Computer Vision. Developed by a researcher of the University of Manchester.

XITE

Last Update 2002-09 / Version 3.44
http://www.ifi.uio.no/forskning/grupper/dsb/Software/Xite/

Language C
Very UNIX oriented, but compiles fine in Windows. Several separated command line routines, it is a package not a library. But inspired several aspects of the IM library. Seems to be not updated anymore. Developed by a researcher of the University of Oslo.

VIGRA

Last Update 2004-09 / Version 1.3.0
http://kogs-www.informatik.uni-hamburg.de/~koethe/vigra/
Language C++
STL based. Many operators. Developed by a researcher of the University of Hamburg.

Wild Magic

Last Update 2004-09 / Version 2.4
http://www.magic-software.com/
Language C++
Game development oriented, very rich in mathematics. Developed by Magic Software, Inc.

VIPS

Last Update 2004-09 / Version 7.10.2
http://www.vips.ecs.soton.ac.uk/
Language C/C++
Support for very large images. Powerful macro laguage. Good implementation. Many functions. Developed by researchers at the University of Southampton and The National Gallery in the UK.

MegaWave2

Last Update 2004-06 / Version 2.3
http://www.cmla.ens-cachan.fr/Cmla/Megawave/
Language C
Very UNIX oriented. Good implementation. Many functions. C preprocessor. Developed by French researchers at l'École Normale Supérieure de Cachan.

JAI

Last Update 2003-07 / Version 1.1.2
http://java.sun.com/products/java-media/jai/index.jsp
Language Java
It is becoming more and more popular. Java is slow than C/C++ but the performance of the image processing operations is very acceptable. Also it has several C optimized functions. Developed by the Sun Corporation.

OpenCV ***

Last Update 2004-08 / Version 4.0
http://sourceforge.net/projects/opencvlibrary/
Language C/C++
Only a few formats but lots of image processing operations. One of the most interesting libraries available. It is more than an Imaging library, it is designed for Computer Vision. Developed by Intel Russian researchers.

VTK ***

Last Update 2004-03 / Version 4.2
http://www.vtk.org/
Language C++
Another very important library. Very huge. Much more than Imaging, includes also 3D Computer Graphics and Visualization. Has a book about the library. Developed by Kitware Inc.

IM

Last Update 2004-08 / Version 3.0.2
http://www.tecgraf.puc-rio.br/im
Language C/C++
Support for several data types, i.e. scientific images and different color spaces. Support for input and output of image sequences. Support for generic image attributes (metadata), which includes several standard TIFF tags, GeoTIFF tags and Exif tags. Image storage and capture data can be accessed using an image structure or with raw data. Internal implementation in C++ but with a simple C API. Code is portable for Windows and UNIX. Many image processing operations.

Comparsion

The idea behind IM was to create a toolkit that was not so complex as OpenCV, neither so big as VTK, but that can be used as a solid base to the development of thesis and dissertations, as for commercial applications.

As the academic environment is very heterogeneous the IM project choose some directives:

- Portability (Windows and UNIX)
- C API
- Totally Free, Open Source
- Focus in Scientific Applications
- Easy to Learn
- Easy to Reuse

Considering these directives there are only a few similar toolkits. Making some exceptions the following should be mentioned:

- JAI - Java, Sun.com
- VIGRA - C++ / STL Based, University
- VIPS - Large Images / Macros, University
- VTK - C++ / Huge / Visualization, Kitware.com
- OpenCV – "best" similar choice, Intel.com

Today OpenCV and VTK are the most professional and complete choices of free libraries that are similar to IM. But they are more complicated than IM. For instance VTK it is very large, it has about 700 C++ classes.

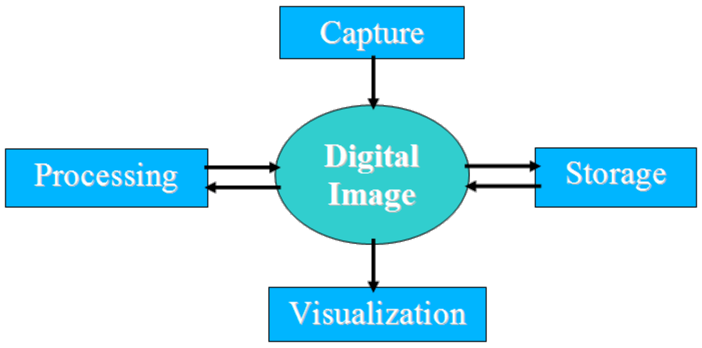
Although OpenCV has many resources, its code is very hard to reuse. The simplicity of the IM code, mainly the image processing routines, make it a good reference to be reused by other applications extracting only the code needed with little changes. And can be used as an complement to learn image processing algorithms and techniques.

This page was last updated in Sep 2004.

Guide

Getting Started

It is important to understand that IM is based in 4 concepts: **Image Representation**, **Image Storage**, **Image Processing** and **Image Capture**. The following picture illustrates the relation between theses concepts.



IM does not have support for **Image Visualization**, because we think this is a task for a graphics library like OpenGL, Windows GDI or CD - Canvas Draw.

Image Representation describes the image model and its details. Which color systems are going to be used, which data types, how the data is organized in memory, and how other image characteristics are accessed.

Image Storage describers the file format model and how images are obtained or saved. **Image Capture** describes the access to a capture device and obtaining an image from it. **Image Processing** describes the image processing operations.

There are infinite ways to implement these concepts. There is no common definition in the literature, but there is a standard called Programmer's Imaging Kernel System (PIKS) published at the ISO/IEC 12087. PIKS is a very complete and also complex standard, very hard to implement. There are only a few implementations available, and the one that I know is commercial software, Pixel Soft of William Pratt http://www.pixelsoft.com/, also author of several books on the subject.

But we want something easier to implement and understand. The free available libraries that we found where sometimes close to what we want, sometimes very far. So we developed our own.

The documentation contains **Overview, Guide, Samples** and **Reference** sections for each one of the IM concepts.

The **Guide** is where you are going to find the explanation about the concepts and decisions made during the library design. It is the best place to understand how things works.

The **Reference** contains pure essential information for function and structure usage. But there is no information on how to put the functions to work together. It is generated automatically from the source code using Doxygen, this means also that the include files (*.h) are very well commented.

Building Applications

Inside you code you should at least include the <im.h> header and link with the "im.lib/libim.a/libim.so" library. This library contains all the **Image Representation** functions and all the **Image Storage** functions (with the exception of the external formats: AVI, JP2 and WMV).

Each external format or processing usually needs a <im_xx.h> file and a "im_xx.lib/libim_xx.a/libim_xx.so" file.

Even if your application is only in C, you must link with a C++ capable linker. Using Tecmake set "LINKER := g++" in your "config.mak" when compiling with gcc (UNIX and Windows).

The download files list includes the Tecgraf/PUC-Rio Library Download Tips document, with a description of all the available binaries.

Building the Library

In the Downloads you will be able to find pre-compiled binaries for many platforms, all those binaries were built using Tecmake. Tecmake is a command line multi compiler build tool based on GNU make, available at http://www.tecgraf.puc-rio.br/tecmake. Tecmake is used by all the Tecgraf libraries and many applications.

You do not need to install Tecmake, scripts for Posix and Windows systems are already included in the source code package. Just type "make" in the command line on the main folder and all libraries and executables will be build.

In Linux, check the "Building Lua, IM, CD and IUP in Linux" guide.

In Windows, check the "Building Lua, IM, CD and IUP in Window" guide.

If you decide to install Tecmake, the Tecmake configuration files (*.mak) are available at the "src" folder, and are very easy to understand. In the main folder, and in each source folder, there are files named *make_uname.bat* that build the libraries using **Tecmake**. To build for Windows using Visual C 9.0 (2008) for example, just execute *"make_uname vc9"* in the iup main folder, or for the DLLs type *"make_uname dll9"*. The Visual Studio workspaces with the respective projects available in the source package is for debugging purposes only.

Make sure you have all the dependencies for the library you want installed, see the documentation bellow.

If you are going to build all the libraries, the makefiles and projects expect the following directory tree:

```
\mylibs\
        im\
        lua5.1\
```

To control that location set the TECTOOLS_HOME environment variable to the folder were the Lua libraries are installed.

Libraries Dependencies

```
im -> libjpeg (included)
   -> libpng
   -> libtiff (included)
   -> zlib
   -> liblzf  (included)
   -> libexif (included)
im_jp2 -> im
       -> libJasper (included)
im_avi -> im
       -> vfw32 (system - Windows)
im_wmv -> im
       -> wmvcore (system - Windows)
im_ecw -> im
       -> NCSEcw (system)
im_capture -> strmiids (system - Windows)
im_process -> im
im_fftw3 -> im_process
         -> fftw3
imlua51 -> im
        -> lua5.1
imlua_capture51 -> imlua51
                -> im_capture
imlua_fftw351 -> imlua51
              -> im_fftw3
imlua_process51 -> imlua51
                -> im_process
```

As a general rule (excluding system dependencies and included third party libraries): IM has NO external dependencies, and IMLua depends on Lua.

The Lua bindings for IUP, CD and IM (Makefiles and Pre-compiled binaries) depend on the LuaBinaries distribution. So if you are going to build from source, then use the **LuaBinaries** source package also, not the **Lua.org** original source package. If you like to use another location for the Lua files define LUA_SUFFIX, LUA_INC, LUA_LIB and LUA_BIN before using Tecmake.

CD Compatibility

IM version 2 was designed to perfectly work with the CD - Canvas Draw toolkit. Version 3 has many more options and only for a subset of the images called Bitmaps can be used with the CD functions. Theses images have data type **IM_BYTE**, and color mode **IM_RGB, IM_GRAY, IM_MAP** or **IM_BINARY**. They can not have the flags **IM_TOPDOWN** and **IM_PACKED**. But it can have the flag **IM_ALPHA** for **IM_RGB** images.

You can convert an image to a bitmap version of it using the function **imConvertToBitmap**, see Image Representation / Conversion.

Function **cdCanvasGetImageRGB** captures an image from the active canvas. Functions **cdCanvasPutImageRect*** draw a client image on the active canvas. These functions allow reducing or increasing the image when drawing.

For applications in systems with only 256 colors available, we recommend the use of function **cdCanvasPalette** before drawing the image, to improve its quality.

When using the imImage structure the macro **imcdCanvasPutImage** can be used. It is defined as:

```
#define imcdCanvasPutImage(_canvas, _image, _x, _y, _w, _h, _xmin, _xmax, _ymin, _ymax)     \
  {                                                                             \
    if (_image->color_space == IM_RGB)                                          \
    {                                                                           \
      if (image->has_alpha)                                                     \
        cdCanvasPutImageRectRGBA(_canvas, _image->width, _image->height,        \
                          (unsigned char*)_image->data[0],                      \
                          (unsigned char*)_image->data[1],                      \
                          (unsigned char*)_image->data[2],                      \
                          (unsigned char*)_image->data[3],                      \
                          _x, _y, _w, _h, _xmin, _xmax, _ymin, _ymax);          \
      else                                                                      \
        cdCanvasPutImageRectRGB(_canvas, _image->width, _image->height,         \
                          (unsigned char*)_image->data[0],                      \
                          (unsigned char*)_image->data[1],                      \
                          (unsigned char*)_image->data[2],                      \
                          _x, _y, _w, _h, _xmin, _xmax, _ymin, _ymax);          \
    }                                                                           \
    else                                                                        \
      cdCanvasPutImageRectMap(_canvas, _image->width, _image->height,           \
                        (unsigned char*)_image->data[0], _image->palette,       \
                        _x, _y, _w, _h, _xmin, _xmax, _ymin, _ymax);            \
  }
```

CD Library is the Tecgraf 2D graphics library available at http://www.tecgraf.puc-rio.br/cd.

OpenGL Compatibility

The function **glDrawPixels** accepts several data types and color modes. Here are the **format** and **type** mapping for OpenGL usage:

```
          IM           <->  OpenGL
```

```
        color_mode             format
IM_RGB|IM_ALPHA|IM_PACKED  = GL_RGBA
IM_RGB|IM_PACKED           = GL_RGB
IM_GRAY                    = GL_LUMINANCE
IM_GRAY|IM_ALPHA|IM_PACKED = GL_LUMINANCE_ALPHA
```

```
        data_type              type
IM_BYTE                    = GL_UNSIGNED_BYTE
IM_BINARY                  = GL_BITMAP
IM_USHORT                  = GL_UNSIGNED_SHORT
IM_INT                     = GL_INT
IM_FLOAT                   = GL_FLOAT
```

There is no mapping for non **IM_PACKED** images so if you use unpacked planes (ex: you use the **imImage** structure) then you have to convert one data into another, the function **imConvertPacking** does this, so you just have to keep an extra buffer for the display image and call this function only when your original image has changed. See Image Representation / Conversion. For example:

```
imConvertPacking(image->data[0], gl_data, image->width, image->height, image->depth, image->data_type, 0);
glPixelStorei(GL_UNPACK_ALIGNMENT, 1); /* data alignment must be 1 */

glDrawPixels(image->width, image->height, GL_RGB, GL_UNSIGNED_BYTE, gl_data);
```

When loading color image data you can use the function imConvertMapToRGB to convert in-place IM_MAP image data into IM_RGB after loading it from file. For example:

```
if (imColorSpace(color_mode) == IM_MAP)
{
  long palette[256];
  int palette_count, packed = 1; /* OpenGL uses packed RGB */
  imFileGetPalette(ifile, palette, &palette_count);
  imConvertMapToRGB(gl_data, width*height, depth, packed, palette, palette_count);
}
```

If you are using the **imImage** structure then you can instead use the function **imImageGetOpenGLData**.

If you just want to save your OpenGL buffer then you can use:

```
glPixelStorei(GL_PACK_ALIGNMENT, 1); /* data alignment must be 1 */
glReadPixels(x, y, width, height, GL_RGB, GL_UNSIGNED_BYTE, gl_data);

ifile = imFileNew(filename, format, &error);
error = imFileWriteImageInfo(ifile, width, height, IM_RGB|IM_PACKED, IM_BYTE);
error = imFileWriteImageData(ifile, gl_data);
imFileClose(ifile);
```

And when using the **imImage** structure then you can instead use the function **imImageCreateFromOpenGLData**. For instance:

```
glPixelStorei(GL_PACK_ALIGNMENT, 1); /* data alignment must be 1 */
glReadPixels(x, y, width, height, GL_RGB, GL_UNSIGNED_BYTE, gl_data);

imImage* image = imImageCreateFromOpenGLData(width, height, GL_RGB, gl_data);
error = imFileImageSave(filename, format, image);
```

You can also do this inside a loop to create an animation.

IM 2.x Compatibility

In version 3.0 the library was completely rewritten. And we changed the main API to allow more powerful features. But the old API is still available for backward compatibility. Version 3 is also binary compatible with version 2.

The only change that must be updated in old applications if they where recompiled is some error code definitions. If you use them in a case there will cause a compiler error because **IM_ERR_READ** and **IM_ERR_WRITE** are now defined as **IM_ERR_ACCESS** both.

Migrating OLD Code

The old API is very inefficient because the file is opened and close three times, for: **imFileInfo**, **imImageInfo** and **imLoadRGB**/**imLoadMap**. There is no room for attributes, so we use the callbacks. And we can not load sequences of images. For these reasons we change the API.

If you would like to migrate your code using the old API the most important thing to change is the memory allocation. For RGB images instead of allocating 3 separate pointers you should allocate only one pointer with room for all three planes. If you still want to keep the three pointers, just do **green = red + width*height** and **blue = red + 2*width*height**.

Also you should change your callbacks usage for attributes access using **imFileGetAttribute** and **imFileSetAttribute**. **IM_RESOLUTION_CB** is replaced by the attributes "**XResolution**", "**YResolution**", "**ResolutionUnit**". **IM_GIF_TRANSPARENT_COLOR_CB** is replaced by "**TransparencyIndex**" and **IM_TIF_IMAGE_DESCRIPTION_CB** by "**Description**".

Except **IM_COUNTER_CB** that is not an attribute, still works with a callback, but now we implement a counter system for all the library including loading, saving and processing. The user just use the **imCounterSetCallback** (like before) to register it counter callback, now there are a few more parameters and a user data pointer. See Utilities / Counter.

The function calls to **imImageInfo** and **imLoadRGB**/**imLoadMap** will be replaced by a sequence of function calls to **imFileOpen**/**imFileNew**, **imFileReadImageInfo**/**imFileWriteImageInfo**, **imFileReadImageData**/**imFileWriteImageData** and **imFileClose**. See Image Storage.

Names Convention

To improve the readability of the code we use a very simple naming convention:

- Global Functions and Types - "im[Object][Action]" using first capitals (imFileOpen)
- Local Functions and Types - "i[Object][Action]" using first capitals (iTIFFGetCompIndex)
- Local Static Variables - same as local functions and types (iFormatCount)
- Local Static Tables - same as local functions and types with "Table" suffix (iTIFFCompTable)
- Variables and Members - no prefix, all lower case (width)
- Defines and Enumerations - all capitals (IM_ERR_NONE)

C x C++ Usage

The library main API is in C. We adopt this because of the many C programmers out there. Some of the API is also available in C++ for those addicted to classes.

Internally C++ is used to implement the format driver base architecture. A virtual base class that every drivers inherits from. This made a lot of things easier to the driver development. But we keep it simple, no multiple inheritance, no exception handling, no complicated classes.

But because we need several data types C++ templates were inevitable used (since we do not like long macros everywhere). But they are used only for processing functions, not classes.

Building Lua, IM, CD and IUP in Linux

This is a guide to build all the Lua, IM, CD and IUP libraries in Linux. Notice that you may not use all the libraries, although this guide will show you how to build all of them. You may then choose to build specific libraries.

The Linux used as reference is the Ubuntu distribution (considering Ubuntu >= 14 and GTK 3).

System Configuration

To build the libraries you will have to download the development version of some packages installed on your system. Although the run time version of some of these packages are already installed, the development versions are usually not. The packages described here are for Ubuntu, but you will be able to identify them for other systems as well.

To build Lua you will need:

```
libreadline-dev
```

To build IM you will need:

```
g++
libfftw3-dev
```

To build CD you will need:

```
libfreetype6-dev (already installed if libgtk-3-dev is installed)
libgl1-mesa-dev and libglu1-mesa-dev (for the ftgl library used by CD_GL)
libgtk-3-dev (for the GTK driver)
```

To build IUP you will need:

```
libgtk-3-dev (for the GTK driver)
libgl1-mesa-dev and libglu1-mesa-dev (for the IupGLCanvas)
libwebkit2gtk-3.0-dev or libwebkit2gtk-4.0-dev depending what's available on the system (for the IupWebBrowser)
```

To install them you can use the Synaptic Package Manager and select the packages, or can use the command line and type:

```
sudo apt-get install package_name
```

Source Download

Download the "xxx-X.X_Sources.tar.gz" package from the "**Docs and Sources**" directory for the version you want to build. Here are links for the **Files** section in **Source Forge**:

Lua - http://sourceforge.net/projects/luabinaries/files/
IM - http://sourceforge.net/projects/imtoolkit/files/
CD - http://sourceforge.net/projects/canvasdraw/files/
IUP - http://sourceforge.net/projects/iup/files/

Unpacking

To extract the files use the tar command at a common directory, for example:

```
mkdir -p xxxx
cd xxxx

[copy the downloaded files, to the xxxx directory]

tar -xpvzf lua-5.3.3_Sources.tar.gz    [optional, see note below]
tar -xpvzf ftgl-2.1.4_Sources.tar.gz
tar -xpvzf im-3.11_Sources.tar.gz
tar -xpvzf cd-5.10_Sources.tar.gz
tar -xpvzf iup-3.19_Sources.tar.gz
```

If you are going to build all the libraries, the makefiles and projects expect the following directory tree:

```
/xxxx/
      cd/
      ftgl/      (included in CD)
      im/
      iup/
      lua53/     [optional, see note below]
```

If you unpack all the source packages in the same directory, that structure will be automatically created.

After the build, if you want to use some of these libraries that are installed on the system (see Installation section below) you will have to define some environment variables before building them. For example:

```
export IM_INC=/usr/include/im
export IM_LIB=/usr/lib           [not necessary, already included by gcc]

export CD_INC=/usr/include/cd
export CD_LIB=/usr/lib           [not necessary, already included by gcc]

export IUP_INC=/usr/include/iup
export IUP_LIB=/usr/lib          [not necessary, already included by gcc]
```

Lua (from the system)

Although we use Lua from LuaBinaries, any Lua installation can also be used. In Ubuntu, the Lua run time package is:

```
lua5.1
```

And the Lua development package is:

```
liblua5.1-0-dev
```

To use them, instead of using the directory "/xxxx/lua5.1" described above, you will have to define some environment variables before building IM, CD and IUP:

```
export LUA_SUFFIX=
export LUA_INC=/usr/include/lua5.1
export LUA_LIB==/usr/lib          [not necessary, already included by gcc]
```

By default the Makefiles and Tecmake files will build for Lua 5.1. To build for other Lua versions define USE_LUA_VERSION=52 or USE_LUA_VERSION=53 in the environment.

If you need to rebuild the .lh files from the Lua files, then you will need also the path to Lua executable. This can be configured using:

```
export LUA_BIN=/usr/bin
```

Building

As a general rule (excluding system dependencies): IUP depends on CD and IM, and CD depends on IM. So start by build IM, then CD, then IUP.

To start building go the the "**src**" directory and type "**make**" (except for Lua). In IUP there are many "srcxxx" folders, so go to the up directory "iup" and type "**make**" that all the sub folders will be built. For example:

```
cd lua53/src
make -f Makefile.tecmake
cd ../..

// repeat the following for IM, FTGL, CD and IUP (in this order)

cd im
make
cd ..
```

TIP: Instead of building all the libraries, try building only the libraries you are going to use. The provided makefiles will build all the libraries, but take a look inside them and you will figure out how to build just the libraries you need.

TIP: If GTK headers or libraries are not being found, even when the libgtk*.0-dev package is installed, then their installation folder is not where our Makefiles expect. Build the GTK/GDK dependent libraries using "make USE_PKGCONFIG=Yes".

Pre-compiled Binaries

Instead of building from sources you can try to use the pre-compiled binaries. Usually they were build in the latest Ubuntu versions for 32 and 64 bits. The packages are located in the "**Linux Libraries**" directory under the **Files** section in **Source Forge**, with **"xxx-X.X_Linux26g4_lib.tar.gz"** and **"xxx-X.X_Linux26g4_64_lib.tar.gz"** names.

Do not extract different pre-compiled binaries in the same directory, create a subdirectory for each one, for example:

```
mkdir lua53
cd lua53
tar -xpvzf ../lua-5.3.3_Linux26g4_lib.tar.gz    (if not using Lua from the system)
cd ..

mkdir im
cd im
tar -xpvzf ../im-3.6.2_Linux26g4_lib.tar.gz
cd ..

mkdir cd
cd cd
tar -xpvzf ../cd-5.4_Linux26g4_lib.tar.gz
cd ..
```

```
mkdir iup
cd iup
tar -xpvzf ../iup-3.2_Linux26g4_lib.tar.gz
cd ..
```

For the installation instructions below, remove the "lib/Linux26g4" from the following examples if you are using the pre-compiled binaries.

Installation (System Directory)

After building you can copy the libraries files to the system directory. If you are inside the main directory, to install the dynamic libraries you can type, for example:

```
sudo cp -f im/lib/Linux26g4/*.so /usr/lib               [script version: install ]
sudo cp -f cd/lib/Linux26g4/*.so /usr/lib
sudo cp -f iup/lib/Linux26g4/*.so /usr/lib
```

To install the development files, then do:

```
sudo mkdir -p /usr/include/im                          [script version: install_dev ]
sudo cp -fR im/include/*.h /usr/include/im
sudo cp -f im/lib/Linux26g4/*.a /usr/lib

sudo mkdir -p /usr/include/cd
sudo cp -f cd/include/*.h /usr/include/cd
sudo cp -f cd/lib/Linux26g4/*.a /usr/lib

sudo mkdir -p /usr/include/iup
sudo cp -f iup/include/*.h /usr/include/iup
sudo cp -f iup/lib/Linux26g4/*.a /usr/lib
```

Then in your makefile use -Iim -Icd -Iiup for includes. There is no need to specify the libraries directory with -L. Development files are only necessary if you are going to compile an application or library in C/C++ that uses there libraries. To just run Lua scripts they are not necessary.

Installation (Build Directory) [Alternative]

If you **don't** want to copy the dynamic libraries to your system directory, you can use them from build directory. You will need to add the dynamic libraries folders to the LD_LIBRARY_PATH (DYLD_LIBRARY_PATH in MacOSX), for example:

```
export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/xxxx/im/lib/Linux26g4:/xxxx/cd/lib/Linux26g4:/xxxx/iup/lib/Linux26g4
or for the current folder
export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:.
```

And in your makefile will will also need to specify those paths when linking using -L/xxxx/iup/lib/Linux26g4, and for compiling use -I/xxxx/iup/include.

Installation (Lua Modules)

Lua modules in Ubuntu are installed in the "/usr/lib/lua/5.1" directory. So to be able to use the Lua "require" with IUP, CD and IM you must create symbolic links inside that directory.

```
sudo mkdir -p /usr/lib/lua/5.1                         [script version: config_lua_module ]
cd /usr/lib/lua/5.1

sudo ln -fs /usr/lib/libiuplua51.so iuplua.so
sudo ln -fs /usr/lib/libiupluacontrols51.so iupluacontrols.so
...
```

Using those links you do not need any extra configuration.

Installation (Lua Modules) [Alternative]

If you use the **alternative** installation directory, and you also do NOT use the LuaBinaries installation, then you must set the LUA_CPATH environment variable:

```
export LUA_CPATH=./\?.so\;./lib\?.so\;./lib\?51.so\;
```

Building Lua, IM, CD and IUP in Windows

This is a guide to build all the Lua, IM, CD and IUP libraries in Windows. Notice that you may not use all the libraries, although this guide will show you how to build all of them. You may then choose to build specific libraries.

System Configuration

The Tecmake configuration files are for the GNU **make** tool. So first the GNU **make** must be installed, and it must be in the PATH before other makes. MingW, MingW-w64 , Cygwin and Win-builds distributions have the GNU **make** binaries ready for download.

The **mkdir** and **rm** utilities are also necessary.

To build the dependencies file you will need: **which, sed** and **g++**. If you don't need the dependencies or some other options just ignore them. You can set NO_DEPEND=Yes to disable the dependencies build.

And some features will work best if **bash** is installed.

Cygwin and **MingW*** (with MSYS) have all these tools.

When installing **Cygwin** un-select all pre-selected items. This is easier to do in "Partial" mode view. Then select only "**make**", it will automatically select other packages that "**make**" depends on. And select the **mkdir**, **rm**, **which, sed** and **g++** packages. Change PATH in "Control Panel/System/Advanced/Environment Variables" and add "c:\cygwin\bin;".

When installing **MingW** select: C Compiler, C++ Compiler, MSYS Basic System, and MinGW Developer Toolkit. Change PATH in "Control Panel/System/Advanced/Environment Variables" and add "C:\mingw4\msys\1.0\bin;C:\mingw4\bin;".

Notice that in alternative distributions of **MingW**, like TDM-gcc or Mingw-w64, make is named "mingw32-make" and MSYS is available as a separate package.

As an alternative, Win-Bash contains a "Shell-Complete" distribution and can also be used. It contains all the tools and bash. It does not include a compiler.

Finally install the compiler of your choice, among the following supported compilers:

- Visual C++ or just the Windows SDK.
- Gnu gcc (MingW, TDM-gcc, Mingw-w64 or Cygwin)
- Open Watcom C++
- Embarcadero C++ (ex-Borland)

Tecmake Configuration

Since the compilers in Windows are not in the path, you must set a few environment variables to configure their location. For example:

```
VC10=c:/progra~2/micros~1/vc               (C:\Program Files (x86)\Microsoft Visual Studio 10.0\VC)
VC10SDK=c:/progra~1/micros~1/Windows\v7.1  (C:\Program Files\Microsoft SDKs\Windows\v7.1)
                                   (if you only installed the Windows SDK with its own compiler set,
                                    then set both variables to the same location)
                                   (VC9,VC9SDK,VC8 and PLATSDK can also be set)
MINGW4=c:/mingw
GCC4=c:/cygwin
OWC1=d:/lng/owc1
BC6=d:/lng/bc6
```

Noticed that the path used can not have spaces because of the GNU make internal processing. So you should install or copy the compiler files to a path with no spaces, or you can use the short path name instead as in the example above. To obtain the short path name you can use the "shortpath.exe" Tecmake utility or use the CMD command “dir /X”.

If you installed the Visual Studio compiler set, then to use it in the command line run the "Visual Studio Command Prompt" item in the "Microsoft Visual Studio 2010\Visual Studio Tools" start menu.

In Windows, there are several compilers that build for the same platform. So when using the Makefiles included in the distributions of those libraries you must first specify which compiler you want to use. To do that set the TEC_UNAME environment variable. This variable will also define if you are going to build static or dynamic (DLL) libraries, and if building 32 or 64 bits binaries. For example:

```
TEC_UNAME=vc10      (Visual C++ 10, static library, 32bits)
TEC_UNAME=dll10     (Visual C++ 10, dynamic library, 32bits)
TEC_UNAME=vc10_64   (Visual C++ 10, static library, 64bits)
TEC_UNAME=dll10_64  (Visual C++ 10, dynamic library, 64bits)
TEC_UNAME=mingw4    (MingW gcc 4, static library, 32bits)
TEC_UNAME=dllw4     (MingW gcc 4, dynamic library, 32bits)
TEC_UNAME=gcc4      (Cygwin Win32 gcc 4, static library, 32bits)
TEC_UNAME=cygw17    (Cygwin Posix gcc 4, both static and dynamic libraries, 32bits)
TEC_UNAME=owc1      (Open Watcom C++ 1, static library, 32bits)
TEC_UNAME=bc6       (Embarcadero C++ 6, static library, 32bits)
```

Here is an example for MingW:

```
Download MingW installation tool:
  http://sourceforge.net/projects/mingw/files/Installer/mingw-get-inst/
Install MingW:
  Select C and C++ Compiles, MSYS Basic System, and MinGW Developer Toolkit.
Configure Environment (Minimum):
  set PATH=C:\mingw4\msys\1.0\bin;C:\mingw4\bin;%PATH%
  set MINGW4=c:/mingw4
  set TEC_UNAME=mingw4
Start Building:
  make
```

Here is an example for Visual C++:

```
Download Visual C++ Express edition:
  http://www.microsoft.com/visualstudio/eng/products/visual-studio-express-for-windows-desktop
Install Visual C++ and the Windows SDK (also called Platform SDK)
Download Cygwin:
  http://www.cygwin.com/
Install Cygwin:
  Unselect all option, and select only "make"
Configure Environment (Minimum):
  set PATH=C:\cygwin\bin;%PATH%
  set VC9=C:/PROGRA~1/MICROS~1.0/VC
  set VC9SDK=C:/PROGRA~1/MICROS~2/Windows/v6.0A
Run the "CMD Shell" or "Build Environment" item in the Start Menu.
  or manually run the vcvars32.bat or vcvars64.bat script
  just once, before building any of the targets.
```

If not using the vcvars*.bat configuration scripts, then you must also set PATH:

```
REM The first two are just auxiliary variables.
set VS9=C:\Program Files (x86)\Microsoft Visual Studio 9.0
set VS9SDK=C:\Program Files\Microsoft SDKs\Windows\v6.0A\bin
set PATH=%VS9%\Common7\IDE;%VS9%\VC\BIN;%VS9%\Common7\Tools;%VS9%\Common7\Tools\bin;%VS9%\VC\VCPackages;%VS9SDK%\bin;%PATH%
```

Source Download

Download the "xxx-X.X_Sources.tar.gz" package from the "**Docs and Sources**" directory for the version you want to build. Here are links for the **Files** section in **Source Forge**:

Lua - http://sourceforge.net/projects/luabinaries/files/
IM - http://sourceforge.net/projects/imtoolkit/files/
CD - http://sourceforge.net/projects/canvasdraw/files/
IUP - http://sourceforge.net/projects/iup/files/

Unpacking

To extract the files use the tar command at a common directory, for example:

```
mkdir -p xxxx
cd xxxx

[copy the downloaded files, to the xxxx directory]

unzip lua-5.3.3_Sources.zip    [optional, see note below]
unzip zlib-1.2.8_Sources.zip
unzip freetype-2.6.3_Sources.zip
unzip ftgl-2.1.4_Sources.zip
unzip im-3.11_Sources.zip
unzip cd-5.10_Sources.zip
unzip iup-3.19_Sources.zip
```

If you are going to build all the libraries, the makefiles and projects expect the following directory tree:

```
/xxxx/
      cd/
      freetype/  (included in CD)
      ftgl/      (included in CD)
      im/
      iup/
      lua53/
      zlib/      (included in IM)
```

If you unpack all the source packages in the same directory, that structure will be automatically created.

By default the Makefiles and Tecmake files will build for Lua 5.1. To build for other Lua versions define USE_LUA_VERSION=52 or USE_LUA_VERSION=53 in the environment.

Building

As a general rule (excluding system dependencies): IUP depends on CD and IM, and CD depends on IM. So start by build IM, then CD, then IUP.

To start building go the the "**src**" directory and type "**make**". In IUP there are many "srcxxx" folders, so go to the up directory "iup" and type "**make**" that all the sub folders will be built. For example:

```
cd lua53/src
make
cd ../..

// repeat for zlib, Freetype, FTGL, IM and CD

cd iup
make
cd ..
```

TIP: Instead of building all the libraries, try building only the libraries you are going to use. The provided makefiles will build all the libraries, but take a look inside them and you will figure out how to build just one library.

Pre-compiled Binaries

Instead of building from sources you can try to use the pre-compiled binaries. Usually they were build in the latest Windows versions for 32 and 64 bits. The packages are located in the "**Windows Libraries**" directory under the **Files** section in **Source Forge**, with **"xxx-X.X_Win32_xx_lib.tar.gz"** and **"xxx-X.X_Win64_xx_lib.tar.gz"** names.

Do not extract different pre-compiled binaries in the same directory, create a subdirectory for each one, for example:

```
mkdir lua53
cd lua53
tar -xpvzf ../lua-5.3.3_Win32_vc10_lib.tar.gz
cd ..

mkdir im
cd im
tar -xpvzf ../im-3.6.2_Win32_vc10_lib.tar.gz
cd ..

mkdir cd
cd cd
tar -xpvzf ../cd-5.4_Win32_vc10_lib.tar.gz
cd ..

mkdir iup
cd iup
tar -xpvzf ../iup-3.2_Win32_vc10_lib.tar.gz
cd ..
```

Usage

For makefiles use:

```
1) "-I/xxxx/iup/include" and so on, to find include files when compiling
2) "-L/xxxx/iup/lib/vc10" and so on, to find library files when linking
3) "-liup" and so on, to specify the library files when linking
```

For IDEs the configuration involves the same 3 steps above, but each IDE has a different dialog. The IUP toolkit has a Guide for some IDEs:

Borland C++ BuilderX - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/cppbx.html
Code Blocks - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/codeblocks.html
Dev-C++ - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/dev-cpp.html
Eclipse for C++ - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/eclipse.html
Microsoft Visual C++ (Visual Studio 2003) - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/msvc.html
Microsoft Visual C++ (Visual Studio 2005) - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/msvc8.html
Open Watcom - http://www.tecgraf.puc-rio.br/iup/en/ide_guide/owc.html

Complete Samples

You can also browse the examples folder.

im_info

This is a command line application that displays information obtained from a file using the IM I/O functions, basically **imFile** functions. It depends only on the IM main library.

Here is an output sample:

```
IM Info
  File Name:
    exif_test.tif
  File Size: 9.00 Mb
  Format: TIFF - Tagged Image File Format
  Compression: NONE
  Image Count: 1
  Image #0
    Width: 2048
    Height: 1536
    Color Space: RGB
      Has Alpha: No
      Is Packed: Yes
      Is Top Down: Yes
    Data Type: byte
    Data Size: 9.00 Mb
    Attributes:
      YResolution: 72.00
      XResolution: 72.00
      DateTime: 2004:01:14 11:30:11
      Make: SONY
      ResolutionUnit: DPI
      Model: CD MAVICA
      Photometric: 2
```

You can view the source code here: im_info.cpp

im_copy

This is a command line application that copies all the information from one file to another using the IM I/O functions. It depends only on the IM main library. It is usefull for testing the drivers.

You can view the source code here: im_copy.cpp

proc_fourier

This is another command line application that process an image in the Fourier Frequency Domain. In this domain the image is a map of the spatial frequencies of the original image. It depends on the IM main library and on the IM_FFTW library. The FFTW is a very fast Fourier transform, but is contaminated by the GPL license, so everything must be also GPL. To use it in a commercial application you must contact the MIT and pay for a commercial license.

Se also Reference / Image Processing / Domain Transform Operations.

You can view the source code here: proc_fourier.cpp

im_view

This application uses IUP and CD to create a window with a canvas and draw the image into that canvas. It is a very simple application, no zoom nor scrollbar management. The image is obtained from a file using the IM I/O functions, but using the **imImage** structure to make the implementation easier.

For more IUP http://www.tecgraf.puc-rio.br/iup and more CD http://www.tecgraf.puc-rio.br/cd

You can view the source code here im_view.c, or download it with some makefiles im_view.zip.

glut_capture

This application uses GLUT and OpenGL to create a window with a canvas and draw the image into that canvas. But the image is obtained from a capture device. The image can be processed before display and a sequence of captured images can be saved in an AVI file during capture.

You can view the source code here: glut_capture.c

iupglcap

This application uses IUP and OpenGL to create a window with two canvases and draw a video capture image into one canvas. A processed image can be displayed in the second canvas. It can also process frames from a video file. It is very useful for Computer Vision courses. You can download the source code here: iupglcap.zip. You will also need to download IUP, CD and IM libraries for the compiler you use.

IMLAB

If you want to see a more complex application with all the IM features explored the IMLAB is a complete example. It displays each image in an individual image with zoom and pan capabilities. All the IM processing operations are available together with some extra operations.

For more IMLAB go to http://www.tecgraf.puc-rio.br/~scuri/imlab.

Lua Samples

To retreive information from an image file:

```
require"imlua"
local ifile, error = im.FileOpen(file_name)
local format, compression, image_count = ifile:GetInfo()
local format_desc = im.FormatInfo(format)
for i = 1, image_count do
   local width, height, color_mode, data_type, error = ifile:ReadImageInfo(i)
end
ifile:Close()
```

To edit pixels in an image and save the changes:

```
require"imlua"

local image = im.FileImageLoad(filename)

local r = image[0]
local g = image[1]
local b = image[2]

for lin = 0, image:Height() - 1, 10 do
 for col = 0, image:Width() - 1, 10 do
  r[lin][col] = 0
  g[lin][col] = 0
  b[lin][col] = 0
 end
end

image:Save("edit.bmp", "BMP")
```

To render noise:

```
require"imlua"
require"imlua_process"
local image = im.ImageCreate(500, 500, im.RGB, im.BYTE)
im.ProcessRenderRandomNoise(image)
image:Save("noise.tif", "TIFF")
```

To render using the CD library:

```
require"imlua"
require"cdlua"
require"cdluaim"

local image = im.ImageCreate(500, 500, im.RGB, im.BYTE)
local canvas = image:cdCreateCanvas()  -- Creates a CD_IMAGERGB canvas

canvas:Activate()
canvas:Background(cd.EncodeColor(255, 255, 255))
canvas:Clear()
fgcolor = cd.EncodeColor(255, 0, 0) -- red
fgcolor = cd.EncodeAlpha(fgcolor, 50) -- semi transparent
canvas:Foreground(fgcolor)
canvas:Font("Times", cd.BOLD, 24)
canvas:Text(100, 100, "Test")
canvas:Line(0,0,100,100)
canvas:Kill()

image:Save("new.bmp", "BMP")
```

Check the files samples_imlua5.tar.gz or samples_imlua5.zip for several samples in Lua. For some of them you will need also the CD and the IUP libraries. You can also browse the examples folder.

Lua Binding

Overview

All the IM functions are available in Lua, with a few exceptions. We call it **ImLua**. To use them the general application will do require"imlua", and require"imluaxxxx" to all other secondary libraries that are needed. The functions and definitions will be available under the table "im" using the following name rules:

```
imXxx  -> im.Xxx    (for functions)
IM_XXX -> im.XXX    (for definitions)
imFileXXX(ifile,... -> ifile:XXX(...     (for methods)
imImageXXX(image,... -> image:XXX(...    (for methods)
```

New functions (without equivalents in C) were implemented to create and destroy objects that do not exist in C. For instance functions were developed to create and destroy palettes. All the metatables have the "tostring" metamethod implemented to help debuging. The **imImage** metatable has the "index" metamethod so you can address its data directly in Lua. Some functions were modified to receive those objects as parameters.

Also the functions which receive values by reference in C were modified. Generally, the values of parameters that would have their values modified are now returned by the function in the same order.

Notice that, as opposed to C, in which enumeration flags are combined with the bitwise operator OR, in Lua the flags are added arithmetically.

In Lua all parameters are checked and a Lua error is emitted when the check fails.

All the objects are garbage collected by the Lua garbage collector.

Initialization

Lua 5.1 "require" can be used for all the **ImLua** libraries. You can use **require"imlua"** and so on, but the LUA_CPATH must also contains the following:

```
"./lib?51.so;"    [in UNIX]

".\\?51.dll;"     [in Windows]
```

Also compatible with Lua 5.2 and 5.3, just replace the "51" suffix by "52" or "53".

The LuaBinaries distribution already includes these modifications on the default search path.

If you are using another Lua distribution you can use the environment:

```
export LUA_CPATH=./\?.so\;./lib\?.so\;./lib\?51.so\;   [in UNIX]
```

Or you can set it in Lua before loading iup modules:

```
package.cpath = package.cpath .. "./lib?51.so;"    [in UNIX]

package.cpath = package.cpath .. ".\\?51.dll"     [in Windows]
```

The simplest form **require"im"** and so on, can not be used because there are IM dynamic libraries with names that will conflict with the names used by **require** during search.

Additionally you can statically link the **ImLua** libraries, but you must call the initialization functions manually. The **`imlua_open`** function is declared in the header file **`imlua.h`**, see the example below:

```
#include <lua.h>
#include <lualib.h>
#include <lauxlib.h>
#include <imlua.h>
```

```
void main(void)
{
  lua_State *L = lua_open();

  luaopen_string(L);
  luaopen_math(L);
  luaopen_io(L);

  imlua_open(L);

  lua_dofile("myprog.lua");

  lua_close(L);
}
```

Calling **imlua_close** is optional. In Lua it can be called using "im.Close()". It can be used to avoid a memory leak. See **imFormatRemoveAll** in File Formats. (since 3.9.1)

imImage Usage

imImage structure members are accessed using member functions in Lua. For instance:

In C	In Lua
image->width	image:Width()
image->height	image:Height()
image->color_space	image:ColorSpace()
image->data_type	image:DataType()
image->has_alpha	image:HasAlpha()

image->depth	image:Depth()

Data can also be accessed in Lua in two different ways.

First, using data indexing with plane, line and column. **image[plane]** returns an object that represents an image plane. **image[plane][line]** returns an object that represents an image line of that plane. And finally **image[plane][line][column]** returns an object that represents the pixel value of the column in the line of that plane. All indices use the same start as in C, i.e. all start at 0. Only the pixel value can has its value changed. When data_type is IM_CFLOAT then value is a table with two numbers.

Second, all pixels can be changed or retrieved at once using the "image:**SetPixels**(table)" and "table = image:**GetPixels**()" member functions. The number of elements in the table must be equal to "width * height * depth". If there is alpha the depth must be incremented by 1. If data_type is IM_CFLOAT depth must be duplicated. Data organization is the same as in the image->data member. The table indices starts at 1. (Since 3.9)

Integration with CDLua

In **CDLua** there is an additional library providing simple functions to map the **imImage** structure to the **cdBitmap** structure. And some facilities to draw an image in a CD canvas. See also the CD documentation and the IM Lua 5 Binding reference.

Color values and palettes can be created and used transparently in both libraries. Palettes and color values are 100% compatible between CD and IM.

Reference

See also the ImLua 5 Binding Reference.

Image Representation

Width and Height

In the IM library images are 2D matrices of pixels defining **width** and **height**. Stacks, Animations, Videos and Volumes are represented as a sequence of individual images.

Color Space

The pixels can have one of several **color spaces**:

- **IM_RGB**
- **IM_MAP**
- **IM_GRAY**
- **IM_BINARY**
- **IM_CMYK**
- **IM_YCBCR**
- **IM_LAB**
- **IM_LUV**
- **IM_XYZ** .

IM_MAP is a subset of the **IM_RGB** color space. It can have a maximum of 256 colors. Each value is an index into a RGB palette.

IM_GRAY usually means luma (nonlinear Luminance), but it can represent any other intensity value that is not necessarily related to color.

IM_BINARY is a subset of the **IM_GRAY** color space, and it has only 2 colors black and white. Each value can be 0 or 1. But for practical reasons we use one byte to store it.

The other color spaces are standard CIE color spaces, except CMYK that does not have a clear definition without other parameters to complement it.

Data Type

There are several numeric representations for the color component, or several **data types**:

- **IM_BYTE** (1 byte unsigned integer)
- **IM_USHORT** (2 bytes unsigned integer)
- **IM_INT** (4 bytes signed integer)
- **IM_FLOAT** (4 bytes single precision floating point real)
- **IM_CFLOAT** (2x 4 bytes single precision floating point real to compose a complex number)

There is no bit type, binary images use 1 byte (waist space but keep processing simple).

Color Mode Flags

To avoid defining another image parameter we also use a parameter called **color_mode** that it is composed by the **color_space** plus some **flags**, i.e. **color_mode = color_space + flags**. The flags are binary combined with the color space, for example color_mode = IM_RGB | IM_XXX. And several flags can be combined in the same color_mode.

There are 3 flags:

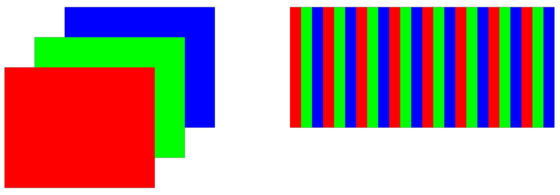
- **IM_ALPHA**
- **IM_PACKED**
- **IM_TOPDOWN**

When a flag is absent the opposite definition is assumed. For simplicity we define some macros that help handling the color mode:

- **imColorModeSpace**
- **imColorModeHasAlpha**
- **imColorModeIsPacked**
- **imColorModeIsTopDown**

Color Components Packaging (IM_PACKED or unpacked)

The number of components of the color space defines the depth of the image. The color components can be packed sequentially in one plane (like rgbrgbrgb...) or separated in several planes (like rrr...ggg...bbb...). Packed color components are normally used by graphics systems. We allow these two options because many users define their own image structure that can have a packed or an separated organization. The following picture illustrates the difference between the two options:



(flag not defined) **IM_PACKED**

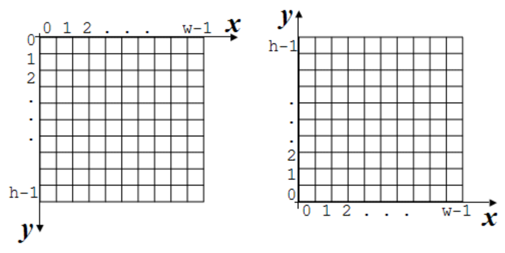
Separated and Packed RGB Components

Alpha Channel (IM_ALPHA or no alpha)

An extra component, the **alpha** channel, may be present. The number of components is then increased by one. Its organization follows the rules of packed and unpacked components.

Orientation (IM_TOPDOWN or bottom up)

Image orientation can be bottom up to top with the origin at the bottom left corner, or top down to bottom with the origin at the top left corner.



IM_TOPDOWN **(flag not defined)**

Top Down and Bottom Up Orientations

Examples

IM_RGB | **IM_ALPHA** - rgb color space with an alpha channel, bottom up orientation and separated components
IM_GRAY | **IM_TOPDOWN** - gray color space with no alpha channel and top down orientation
IM_RGB | **IM_ALPHA** | **IM_PACKED** - rgb color space with an alpha channel, bottom up orientation and packed components

Raw Data Buffer

So these four parameters define our raw image data: **width**, **height**, **color_mode** and **data_type**. The raw data buffer is always byte aligned and each component is stored sequentially in the buffer following the specified packing.

For example, if a RGB image is 4x4 pixels it will have the following organization in memory:

```
RRRRRRRRRRRRRRRRGGGGGGGGGGGGGGGGBBBBBBBBBBBBBBBB - for non packed components
0   1   2   3   0   1   2   3   0   1   2   3
```

```
RGBRGBRGBRGBRGBRGBRGBRGBRGBRGBRGBRGBRGBRGBRGBRGB - for packed components
0           1           2           3
```

In bold we visually marked some lines of data.

imImage

We could restrict the data organization by eliminating the extra flags, but several users requested these features in the library. So we keep them but restricted to raw data buffers.

For the high level image processing functions we created a structure called **imImage** that eliminates the extra flags and assume bottom up orientation and separated components. Alpha channel is supported as an extra component.

The **imImage** structure is defined using four image parameters: **width**, **height**, **color_space** and **data_type**. It is an open structure in C where you can access all the parameters. In addition to the 4 creation parameters there are many auxiliary parameters like **depth**, **count**, **line_size**, **plane_size** and **size**.

As the library is designed to work with such a wide range of image data organization, there are no general purpose functions for getting/setting individual pixels, as they would be too complicated and inefficient. Rather, you should use the components of the imImage structure to access image pixels in the most efficient way.

Bitmaps

An important subset of images is what we call a **Bitmap** image. It is an image that can be displayed in graphics devices usually using a graphics library like CD or OpenGL. For Bitmap images the color space must be **IM_RGB**, **IM_MAP**, **IM_GRAY** or **IM_BINARY**, and the data type must be **IM_BYTE**.

Image Representation Guide

Raw Data Buffer

To create a raw image buffer you can simply use the utility function:

```
int width, height, color_mode, data_type;
int size = imImageDataSize(width, height, color_mode, data_type);
void* buffer = malloc(size);
```

So if the data type is **IM_FLOAT**, we could write:

```
float* idata = (float*)buffer;
```

Then to locate the pixel at line y, column x, component d simply write:

```
float value;
if (is_packed)
  value = idata[y*width*depth + x*depth + d]
else
  value = idata[d*width*height + y*width + x]
```

But notice that this code will return values at different pixel locations for top down and bottom up orientations.

imImage

To use the **imImage** structure you must include the <im_image.h> header.

To create an **imImage** structure you can do it in several ways:

```
int width, height, color_space, data_type, palette_count;
long *palette;
void* buffer

imImage* image;

image = imImageCreate(width, height, color_space, data_type)
image = imImageInit(width, height, color_space, data_type, buffer, palette, palette_count)
image = imImageDuplicate(image)
image = imImageClone(image)
```

The **imImageInit** function allow you to initialize an **imImage** structure with an user allocated buffer. This is very useful if you use your own image structure and wants to temporally use the image processing functions of the library.

To destroy the **imImage** structure simply call **imImageDestroy(image)**. If you do "**data[0] = NULL**" before calling the destroy function then the raw data buffer will not be destroyed.

The **imImage** data buffer is allocated like the raw data buffer.

The separated color components are arranged one after another, but we access the data through an array of pointers each one starting at the beginning of each color component. So **image->data[0]** contains a pointer to all the data, and **image->data[1]** is a short cut to the second component and so on. With this you can use **image->data[0]** as a starting point for all the data, or use it as the first component.

```
count = width*height;
unsigned char* idata = (unsigned char*)image->data[0];
for (int i = 0; i < count; i++)
{
  idata[i] = 255;
}
```

or

```
for (int d = 0; d < image->depth; d++)
{
  unsigned char* idata = (unsigned char*)image->data[d];

  for (int y = 0; y < height; y++)
  {
    for (int x = 0; x < width; x++)
    {
      int offset = y * width + x;

      idata[offset] = 255;
    }
  }
}
```

The **imImage** structure contains all the image information obtained from a file, because it also has support for alpha, attributes and the palette. The palette can be used for **IM_MAP** images and for pseudo color of **IM_GRAY** images.

The conversion between image data types, color spaces and the conversion to bitmap are defined only for the **imImage** structure.

Image Representation Samples

See the Representation Guide for simple image representation samples.

Information

This is a command line application that displays information obtained from a file using the IM I/O functions, basically **imFile** functions. It depends only on the IM main library.

Here is an output sample:

```
IM Info
  File Name:
    exif_test.tif
  File Size: 9.00 Mb
  Format: TIFF - Tagged Image File Format
  Compression: NONE
  Image Count: 1
  Image #0
    Width: 2048
    Height: 1536
    Color Space: RGB
      Has Alpha: No
      Is Packed: Yes
      Is Top Down: Yes
    Data Type: byte
    Data Size: 9.00 Mb
    Attributes:
      YResolution: 72.00
      XResolution: 72.00
      DateTime: 2004:01:14 11:30:11
      Make: SONY
      ResolutionUnit: DPI
      Model: CD MAVICA
      Photometric: 2
```

You can view the source code here: im_info.cpp

View Using IUP and CD

This application uses IUP and CD to create a window with a canvas and draw the image into that canvas. It is a very simple application, no zoom nor scrollbar management. The image is obtained from a file using the IM I/O functions, but using the **imImage** structure to make the implementation easier.

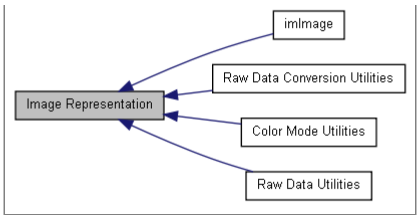
For more about IUP see http://www.tecgraf.puc-rio.br/iup and more about CD see http://www.tecgraf.puc-rio.br/cd.

You can view the source code here: im_view.c, or download it with some makefiles im_view.zip.

Modules | Enumerations

Image Representation

Collaboration diagram for Image Representation:



Modules

	Raw Data Conversion Utilities
	imImage
	Raw Data Utilities
	Color Mode Utilities

Enumerations

enum	imDataType { IM_BYTE, IM_SHORT, IM_USHORT, IM_INT, IM_FLOAT, IM_DOUBLE, IM_CFLOAT, IM_CDOUBLE }
enum	imColorSpace { IM_RGB, IM_MAP, IM_GRAY, IM_BINARY, IM_CMYK, IM_YCBCR, IM_LAB, IM_LUV, IM_XYZ }
enum	imColorModeConfig { IM_ALPHA = 0x100, IM_PACKED = 0x200, IM_TOPDOWN = 0x400 }

Detailed Description

See im.h

Enumeration Type Documentation

enum imDataType

Image data type descriptors.
See also Data Type Utilities.

Enumerator:

IM_BYTE	"unsigned char". 1 byte from 0 to 255.
IM_SHORT	"short". 2 bytes from -32,768 to 32,767.
IM_USHORT	"unsigned short". 2 bytes from 0 to 65,535.
IM_INT	"int". 4 bytes from -2,147,483,648 to 2,147,483,647.
IM_FLOAT	"float". 4 bytes single precision IEEE floating point.
IM_DOUBLE	"double". 8 bytes double precision IEEE floating point.
IM_CFLOAT	complex "float". 2 float values in sequence, real and imaginary parts.
IM_CDOUBLE	complex "double". 2 double values in sequence, real and imaginary parts.

enum imColorSpace

Image color mode color space descriptors (first byte).
See also Color Mode Utilities.

Enumerator:

IM_RGB	Red, Green and Blue (nonlinear).
IM_MAP	Indexed by RGB color map (data_type=IM_BYTE).
IM_GRAY	Shades of gray, luma (nonlinear Luminance), or an intensity value that is not related to color.
IM_BINARY	Indexed by 2 colors: black (0) and white (1) (data_type=IM_BYTE).
IM_CMYK	Cyan, Magenta, Yellow and Black (nonlinear).

IM_YCBCR	ITU-R 601 Y'CbCr. Y' is luma (nonlinear Luminance).
IM_LAB	CIE L*a*b*. L* is Lightness (nonlinear Luminance, nearly perceptually uniform).
IM_LUV	CIE L*u*v*. L* is Lightness (nonlinear Luminance, nearly perceptually uniform).
IM_XYZ	CIE XYZ. Linear Light Tristimulus, Y is linear Luminance.

enum imColorModeConfig

Image color mode configuration/extra descriptors (1 bit each in the second byte).
See also Color Mode Utilities.

Enumerator:

IM_ALPHA	adds an Alpha channel
IM_PACKED	packed components (rgbrgbrgb...)
IM_TOPDOWN	orientation from top down to bottom

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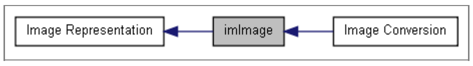
imImage
[Image Representation]

Collaboration diagram for imImage:



Data Structures

struct	_imImage
	Image Representation Structure. More...

Modules

	Image Conversion

Defines

#define	imcdCanvasPutImage(_canvas, _image, _x, _y, _w, _h, _xmin, _xmax, _ymin, _ymax)

Typedefs

typedef struct _imImage	imImage

Functions

imImage *	imImageCreate (int width, int height, int color_space, int data_type)
imImage *	imImageInit (int width, int height, int color_mode, int data_type, void *data_buffer, long *palette, int palette_count)
imImage *	imImageCreateBased (const imImage *image, int width, int height, int color_space, int data_type)
void	imImageDestroy (imImage *image)
void	imImageAddAlpha (imImage *image)
void	imImageSetAlpha (imImage *image, double alpha)
void	imImageRemoveAlpha (imImage *image)
void	imImageReshape (imImage *image, int width, int height)
void	imImageCopy (const imImage *src_image, imImage *dst_image)
void	imImageCopyData (const imImage *src_image, imImage *dst_image)
void	imImageCopyAttributes (const imImage *src_image, imImage *dst_image)
void	imImageMergeAttributes (const imImage *src_image, imImage *dst_image)
void	imImageCopyPlane (const imImage *src_image, int src_plane, imImage *dst_image, int dst_plane)
imImage *	imImageDuplicate (const imImage *image)
imImage *	imImageClone (const imImage *image)
void	imImageSetAttribute (const imImage *image, const char *attrib, int data_type, int count, const void *data)
void	imImageSetAttribInteger (const imImage *image, const char *attrib, int data_type, int value)
void	imImageSetAttribReal (const imImage *image, const char *attrib, int data_type, double value)
void	imImageSetAttribString (const imImage *image, const char *attrib, const char *value)
const void *	imImageGetAttribute (const imImage *image, const char *attrib, int *data_type, int *count)
int	imImageGetAttribInteger (const imImage *image, const char *attrib, int index)

double	imImageGetAttribReal (const imImage *image, const char *attrib, int index)
const char *	imImageGetAttribString (const imImage *image, const char *attrib)
void	imImageGetAttributeList (const imImage *image, char **attrib, int *attrib_count)
void	imImageClear (imImage *image)
int	imImageIsBitmap (const imImage *image)
void	imImageSetPalette (imImage *image, long *palette, int palette_count)
int	imImageMatchSize (const imImage *image1, const imImage *image2)
int	imImageMatchColor (const imImage *image1, const imImage *image2)
int	imImageMatchDataType (const imImage *image1, const imImage *image2)
int	imImageMatchColorSpace (const imImage *image1, const imImage *image2)
int	imImageMatch (const imImage *image1, const imImage *image2)
void	imImageSetMap (imImage *image)
void	imImageSetBinary (imImage *image)
void	imImageSetGray (imImage *image)
void	imImageMakeBinary (imImage *image)
void	imImageMakeGray (imImage *image)

Detailed Description

Base definitions and functions for image representation.
Only the image processing operations depends on these definitions, Image Storage and Image Capture are completely independent.

You can also initialize a structure with your own memory buffer, see imImageInit. To release the structure without releasing the buffer, set "data[0]" to NULL before calling imImageDestroy.

See im_image.h

Define Documentation

#define imcdCanvasPutImage	(	_canvas,	
		_image,	
		_x,	
		_y,	
		_w,	
		_h,	
		_xmin,	
		_xmax,	
		_ymin,	
		_ymax	
	)		

Value:

```
{                                                                          \
    if (_image->color_space == IM_RGB)                                       \
    {                                                                        \
      if (_image->has_alpha)                                                 \
        cdCanvasPutImageRectRGBA(_canvas, _image->width, _image->height,     \
                          (unsigned char*)_image->data[0],                   \
                          (unsigned char*)_image->data[1],                   \
                          (unsigned char*)_image->data[2],                   \
                          (unsigned char*)_image->data[3],                   \
                          _x, _y, _w, _h, _xmin, _xmax, _ymin, _ymax);       \
      else                                                                   \
        cdCanvasPutImageRectRGB(_canvas, _image->width, _image->height,      \
                          (unsigned char*)_image->data[0],                   \
                          (unsigned char*)_image->data[1],                   \
                          (unsigned char*)_image->data[2],                   \
                          _x, _y, _w, _h, _xmin, _xmax, _ymin, _ymax);       \
    }                                                                        \
    else                                                                     \
      cdCanvasPutImageRectMap(_canvas, _image->width, _image->height,        \
                        (unsigned char*)_image->data[0], _image->palette,    \
                        _x, _y, _w, _h, _xmin, _xmax, _ymin, _ymax);         \
  }
```

Utility macro to draw the image in a CD library canvas. Works only for data_type IM_BYTE, and color spaces: IM_RGB, IM_MAP, IMGRAY and IM_BINARY.

Typedef Documentation

typedef struct _imImage imImage

Image Representation Structure.

An image representation than supports all the color spaces, but planes are always unpacked and the orientation is always bottom up.

Function Documentation

imImage* imImageCreate	(	int	*width,*	
		int	*height,*	
		int	*color_space,*	
		int	*data_type*	
	)			

Creates a new image. See also imDataType and imColorSpace. Image data is cleared as imImageClear.

In Lua the IM image metatable name is "imImage". When converted to a string will return "imImage(%p) [width=%d,height=%d,color_space=%s,data_type=%s,depth=%d]" where p is replaced by the userdata address, and other values are replaced by the respective attributes. If the image is already destroyed by im.ImageDestroy, then it will return also the suffix "-destroyed".

```
im.ImageCreate(width: number, height: number, color_space: number, data_type: number) -> image: imImage [in Lua 5]
```

imImage* imImageInit	(	int	*width,*	
		int	*height,*	
		int	*color_mode,*	
		int	*data_type,*	
		void *	*data_buffer,*	
		long *	*palette,*	
		int	*palette_count*	
	)			

Initializes the image structure but does not allocates image data. See also imDataType and imColorSpace. The only addtional flag thar color_mode can has here is IM_ALPHA. To release the image structure without releasing the buffer, set "data[0]" to NULL before calling imImageDestroy.

imImage* imImageCreateBased	(	const imImage *	*image,*	
		int	*width,*	
		int	*height,*	
		int	*color_space,*	
		int	*data_type*	
	)			

Creates a new image based on an existing one.
If the addicional parameters are -1, the given image parameters are used.
The image atributes always are copied. HasAlpha is copied. See also imDataType and imColorSpace.

```
im.ImageCreateBased(image: imImage, [width: number], [height: number], [color_space: number], [data_type: number]) -> image: imImage [in Lua 5]
```

The addicional parameters in Lua can be nil, and they can also be functions with the based image as a parameter to return the respective value.

void imImageDestroy	(	imImage *	*image*	)	

Destroys the image and frees the memory used. image data is destroyed only if its data[0] is not NULL.
In Lua if this function is not called, the image is destroyed by the garbage collector.

```
im.ImageDestroy(image: imImage) [in Lua 5]
```

```
image:Destroy() [in Lua 5]
```

void imImageAddAlpha	(	imImage *	*image*	)	

Adds an alpha channel plane and sets its value to 0 (transparent).

```
image:AddAlpha() [in Lua 5]
```

void imImageSetAlpha	(	imImage *	*image,*	
		double	*alpha*	
	)			

Sets the alpha channel plane to a constant.

```
image:SetAlpha(alpha: number) [in Lua 5]
```

void imImageRemoveAlpha	(	imImage *	*image*	)	

Removes the alpha channel plane if any.

```
image:RemoveAlpha() [in Lua 5]
```

void imImageReshape	(	imImage *	*image,*	
		int	*width,*	
		int	*height*	
	)			

Changes the buffer size. Reallocate internal buffers if the new size is larger than the original.

```
image:Reshape(width: number, height: number) [in Lua 5]
```

void imImageCopy	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Copy image data and attributes from one image to another.
Images must have the same size and type.

```
image:Copy(dst_image: imImage) [in Lua 5]
```

void imImageCopyData	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Copies image data only from one image to another.

Copy image data only fom one image to another.
Images must have the same size and type.

```
image:CopyData(dst_image: imImage) [in Lua 5]
```

void imImageCopyAttributes	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Copies the image attributes from src to dst. Includes the pallete if defined in both images.

```
image:CopyAttributes(dst_image: imImage) [in Lua 5]
```

void imImageMergeAttributes	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Merges the image attributes from src to dst.
Attributes that exist in dst are not replaced. Doens NOT include the pallete.

```
image:MergeAttributes(dst_image: imImage) [in Lua 5]
```

void imImageCopyPlane	(	const imImage *	*src_image,*	
		int	*src_plane,*	
		imImage *	*dst_image,*	
		int	*dst_plane*	
	)			

Copy one image plane fom one image to another.
Images must have the same size and type.

```
image:CopyPlane(src_plane: number, dst_image: imImage, dst_plane: number) [in Lua 5]
```

imImage* imImageDuplicate	(	const imImage *	*image*	)	

Creates a copy of the image.

```
image:Duplicate() -> new_image: imImage [in Lua 5]
```

imImage* imImageClone	(	const imImage *	*image*	)	

Creates a clone of the image. i.e. same attributes but ignore contents.

```
image:Clone() -> new_image: imImage [in Lua 5]
```

void imImageSetAttribute	(	const imImage *	*image,*	
		const char *	*attrib,*	
		int	*data_type,*	
		int	*count,*	
		const void *	*data*	
	)			

Changes an extended attribute.
The data will be internally duplicated.
If data is NULL and count==0 the attribute is removed.
If count is -1 and data_type is IM_BYTE then data is zero terminated. See also imDataType.

```
image:SetAttribute(attrib: string, data_type: number, data: table of numbers or string) [in Lua 5]
```

If data_type is IM_BYTE, a string can be used as data.

void imImageSetAttribInteger	(	const imImage *	*image,*	
		const char *	*attrib,*	
		int	*data_type,*	
		int	*value*	
	)			

Changes an extended attribute as an integer.

```
image:SetAttribInteger(attrib: string, data_type: number, value: number) [in Lua 5]
```

void imImageSetAttribReal	(	const imImage *	*image,*	
		const char *	*attrib,*	
		int	*data_type,*	
		double	*value*	
	)			

Changes an extended attribute as a real.

```
image:SetAttribReal(attrib: string, data_type: number, value: number) [in Lua 5]
```

void imImageSetAttribString	(	const imImage *	*image,*
		const char *	*attrib,*

		const char *	*value*
	)		

Changes an extended attribute as a string.

```
image:SetAttribString(attrib: string, value: string) [in Lua 5]
```

const void* imImageGetAttribute	(	const imImage *	*image,*
		const char *	*attrib,*
		int *	*data_type,*
		int *	*count*
	)		

Returns an extended attribute.
Returns NULL if not found. See also imDataType.

```
image:GetAttribute(attrib: string, [as_string: boolean]) -> data: table of numbers or string, data_type: number [in Lua 5]
```

If data_type is IM_BYTE, as_string can be used to return a string instead of a table.

int imImageGetAttribInteger	(	const imImage *	*image,*
		const char *	*attrib,*
		int	*index*
	)		

Returns an extended attribute as an integer.

```
image:GetAttribInteger(attrib: string, [index: number]) -> value: number [in Lua 5]
```

double imImageGetAttribReal	(	const imImage *	*image,*
		const char *	*attrib,*
		int	*index*
	)		

Returns an extended attribute as a real.

```
image:GetAttribReal(attrib: string, [index: number]) -> value: number [in Lua 5]
```

const char* imImageGetAttribString	(	const imImage *	*image,*
		const char *	*attrib*
	)		

Returns an extended attribute as a string.

```
image:GetAttribString(attrib: string) -> value: string [in Lua 5]
```

void imImageGetAttributeList	(	const imImage *	*image,*
		char **	*attrib,*
		int *	*attrib_count*
	)		

Returns a list of the attribute names.
"attrib" must contain room enough for "attrib_count" names. Use "attrib=NULL" to return only the count.

```
image:GetAttributeList() -> data: table of strings [in Lua 5]
```

void imImageClear	(	imImage *	*image*	)

Sets all image data to zero. But if color space is YCBCR, LAB or LUV, and data type is BYTE or USHORT, then data is initialized with 128 or 32768 accordingly. Alpha is initialized as transparent (0).

```
image:Clear() [in Lua 5]
```

int imImageIsBitmap	(	const imImage *	*image*	)

Indicates that the image can be viewed in common graphic devices. Data type must be IM_BYTE. Color mode can be IM_RGB, IM_MAP, IM_GRAY or IM_BINARY.

```
image:IsBitmap() -> is_bitmap: boolean [in Lua 5]
```

void imImageSetPalette	(	imImage *	*image,*
		long *	*palette,*
		int	*palette_count*
	)		

Changes the image palette. This will destroy the existing palette and replace it with the given palette pointer. Only the pointer is stored, so the palette should be a new palette and it can not be a static array.

```
image:SetPalette(palette: imPalette) [in Lua 5]
```

int imImageMatchSize	(	const imImage *	*image1,*
		const imImage *	*image2*
	)		

Returns 1 if the images match width and height. Returns 0 otherwise.

```
image:MatchSize(image2: imImage) -> match: boolean [in Lua 5]
```

int imImageMatchColor	(	const imImage *	*image1*,
		const imImage *	*image2*
	)		

Returns 1 if the images match color mode and data type. Returns 0 otherwise.

```
image:MatchColor(image2: imImage) -> match: boolean [in Lua 5]
```

int imImageMatchDataType	(	const imImage *	*image1*,
		const imImage *	*image2*
	)		

Returns 1 if the images match width, height and data type. Returns 0 otherwise.

```
image:MatchDataType(image2: imImage) -> match: boolean [in Lua 5]
```

int imImageMatchColorSpace	(	const imImage *	*image1*,
		const imImage *	*image2*
	)		

Returns 1 if the images match width, height and color space. Returns 0 otherwise.

```
image:MatchColorSpace(image2: imImage) -> match: boolean [in Lua 5]
```

int imImageMatch	(	const imImage *	*image1*,
		const imImage *	*image2*
	)		

Returns 1 if the images match in width, height, data type and color space. Returns 0 otherwise.

```
image:Match(image2: imImage) -> match: boolean [in Lua 5]
```

void imImageSetMap	(	imImage *	*image*	)

Changes the image color space to map by just changing color_space.
Image must be BINARY or GRAY/BYTE.

```
image:SetMap() [in Lua 5]
```

void imImageSetBinary	(	imImage *	*image*	)

Changes the image color space to binary by just changing color_space and the palette. Image must be MAP or GRAY/BYTE.

```
image:SetBinary() [in Lua 5]
```

void imImageSetGray	(	imImage *	*image*	)

Changes the image color space to gray by just changing color_space and the palette. Image must be BINARY or MAP. Palette is changed only if image was BINARY.

```
image:SetGray() [in Lua 5]
```

void imImageMakeBinary	(	imImage *	*image*	)

Changes a gray BYTE data (0,255) into a binary data (0,1), done in-place. Color space is not changed. Data type must be IM_BYTE.

```
image:MakeBinary() [in Lua 5]
```

void imImageMakeGray	(	imImage *	*image*	)

Changes a binary data (0,1) into a gray BYTE data (0,255), done in-place. Color space is not changed. Data type must be IM_BYTE.

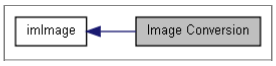
```
image:MakeGray() [in Lua 5]
```

Generated on Thu Jul 30 2020 20:43:37 for IM by doxygen *1.7.1*

Enumerations | Functions

Image Conversion
[imImage]

Collaboration diagram for Image Conversion:



Enumerations

enum	imComplex2Real { **IM_CPX_REAL**, **IM_CPX_IMAG**, **IM_CPX_MAG**, **IM_CPX_PHASE** }
enum	imGammaFactor { **IM_GAMMA_LINEAR** = 0, **IM_GAMMA_LOGLITE** = -10, **IM_GAMMA_LOGHEAVY** = -1000, **IM_GAMMA_EXPLITE** = 2, **IM_GAMMA_EXPHEAVY** = 7

	}
enum	imCastMode { IM_CAST_MINMAX, IM_CAST_FIXED, IM_CAST_DIRECT, IM_CAST_USER }

Functions

int	imConvertDataType (const imImage *src_image, imImage *dst_image, int cpx2real, double gamma, int absolute, int cast_mode)
int	imConvertColorSpace (const imImage *src_image, imImage *dst_image)
int	imConvertToBitmap (const imImage *src_image, imImage *dst_image, int cpx2real, double gamma, int absolute, int cast_mode)
void *	imImageGetOpenGLData (const imImage *image, int *glformat)
imImage *	imImageCreateFromOpenGLData (int width, int height, int glformat, const void *gldata)

Detailed Description

Converts one type of image into another. Can convert between color modes and between data types.

See im_convert.h

Enumeration Type Documentation

enum imComplex2Real

Complex to real conversions

enum imGammaFactor

Predefined Gamma factors. Gamma can be any real number. When gamma<0 use logarithmic, when gamma>0 use exponential. gamma(x,g) = ((e^(g*x))-1)/(exp(g)-1) gamma(x,g) = (log((g*x)+1))/(log(g+1))

enum imCastMode

Predefined Cast Modes
See also Color Manipulation Color Manipulation, Color Component Intervals section.

Enumerator:

IM_CAST_MINMAX	scan for min and max values.
IM_CAST_FIXED	use predefined min-max values.
IM_CAST_DIRECT	direct type cast the value.
IM_CAST_USER	user attributes called "UserMin" and "UserMax", both double values.

Function Documentation

int imConvertDataType	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*cpx2real,*
		double	*gamma,*
		int	*absolute,*
		int	*cast_mode*
	)		

Changes the image data type, using a complex2real conversion, a gamma factor, and an absolute mode (modulus).
When demoting the data type the function will scan source for min/max values or use fixed values (cast_mode) to scale the result according to the target range.
Except complex to real that will use only the complex2real conversion.
Images must be of the same size and color mode. If data type is the same nothing is done.
Returns IM_ERR_NONE, IM_ERR_MEM, IM_ERR_DATA or IM_ERR_COUNTER, see also imErrorCodes.
See also imDataType, Data Type Utilities, imComplex2Real, imGammaFactor and imCastMode.

```
im.ConvertDataType(src_image: imImage, dst_image: imImage, cpx2real: number, gamma: number, absolute: boolean, cast_mode: number) -> error: number [in Lua 5]
```

```
im.ConvertDataTypeNew(image: imImage, data_type: number, cpx2real: number, gamma: number, absolute: boolean, cast_mode: number) -> error: number, new_image: imImage  [in I
```

int imConvertColorSpace	(	const imImage *	*src_image,*
		imImage *	*dst_image*
	)		

Converts one color space to another.
Images must be of the same size and data type. If color mode is the same nothing is done.
CMYK can be converted to RGB only, and it is a very simple conversion.
All colors can be converted to Binary, the non zero gray values are converted to 1.
RGB to Map uses the median cut implementation from the free IJG JPEG software, copyright Thomas G. Lane.
Alpha channel is considered and Transparency* attributes are converted to alpha channel.
All other color space conversions assume sRGB and CIE definitions, see Color Manipulation.
Returns IM_ERR_NONE, IM_ERR_DATA or IM_ERR_COUNTER, see also imErrorCodes.
See also imColorSpace, imColorModeConfig and Color Mode Utilities.

```
im.ConvertColorSpace(src_image: imImage, dst_image: imImage) -> error: number [in Lua 5]
```

```
im.ConvertColorSpaceNew(image: imImage, color_space: number, has_alpha: boolean) -> error: number, new_image: imImage [in Lua 5]
```

int imConvertToBitmap	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*cpx2real,*
		double	*gamma,*
		int	*absolute,*
		int	*cast_mode*
	)		

Converts the image to its bitmap equivalent, uses imConvertColorSpace and imConvertDataType.
Returns IM_ERR_NONE, IM_ERR_MEM, IM_ERR_DATA or IM_ERR_COUNTER, see also imErrorCodes. See also imImageIsBitmap, imComplex2Real, imGammaFactor and imCastMode.
The function im.ConvertToBitmapNew uses the default conversion result from imColorModeToBitmap if color_space is nil.

```
im.ConvertToBitmap(src_image: imImage, dst_image: imImage, cpx2real: number, gamma: number, absolute: boolean, cast_mode: number) -> error: number [in Lua 5]
```

```
im.ConvertToBitmapNew(image: imImage, color_space: number, has_alpha: boolean, cpx2real: number, gamma: number, absolute: boolean, cast_mode: number) -> error: number, new
```

void* imImageGetOpenGLData	(	const imImage *	*image,*
		int *	*glformat*
	)		

Returns an OpenGL compatible data buffer. Also returns the correspondent pixel format.
The memory allocated is stored in the attribute "GLDATA" with BYTE type. And it will exists while the image exists.
It can be cleared by setting the attribute to NULL.
MAP images are converted to RGB, and BINARY images are converted to GRAY. Alpha channel is considered and Transparency* attributes are converted to alpha channel. So calculate depth from glformat, not from image depth.

```
image:GetOpenGLData() -> gldata: userdata, glformat: number [in Lua 5]
```

imImage* imImageCreateFromOpenGLData	(	int	*width,*
		int	*height,*
		int	*glformat,*
		const void *	*gldata*
	)		

Creates an image from an OpenGL data.

```
im.ImageCreateFromOpenGLData(width, height, glformat: number, gldata: userdata) -> image: imImage [in Lua 5]
```

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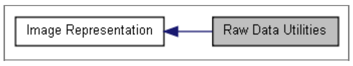
Functions

Raw Data Utilities
[Image Representation]

Collaboration diagram for Raw Data Utilities:



Functions

int	imImageDataSize (int width, int height, int color_mode, int data_type)
int	imImageLineSize (int width, int color_mode, int data_type)
int	imImageLineCount (int width, int color_mode)
int	imImageCheckFormat (int color_mode, int data_type)

Detailed Description

See im_util.h

Function Documentation

int imImageDataSize	(	int	*width,*
		int	*height,*
		int	*color_mode,*
		int	*data_type*
	)		

Returns the size of the data buffer.

```
im.ImageDataSize(width: number, height: number, color_mode: number, data_type: number) -> datasize: number [in Lua 5]
```

int imImageLineSize	(	int	*width,*
		int	*color_mode,*
		int	*data_type*
	)		

Returns the size of one line of the data buffer.
This depends if the components are packed. If packed includes all components, if not includes only one.

```
im.ImageLineSize(width: number, color_mode: number, data_type: number) -> linesize: number [in Lua 5]
```

int imImageLineCount	(	int	*width,*	
		int	*color_mode*	
	)			

Returns the number of elements of one line of the data buffer.
This depends if the components are packed. If packed includes all components, if not includes only one.

```
im.ImageLineCount(width: number, color_mode: number) -> linecount: number [in Lua 5]
```

int imImageCheckFormat	(	int	*color_mode,*	
		int	*data_type*	
	)			

Check if the combination color_mode+data_type is valid.

```
im.ImageCheckFormat(color_mode: number, data_type: number) -> check: boolean [in Lua 5]
```

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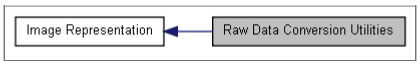
Functions

Raw Data Conversion Utilities
[Image Representation]

Collaboration diagram for Raw Data Conversion Utilities:



Functions

void	imConvertPacking (const void *src_data, void *dst_data, int width, int height, int src_depth, int dst_depth, int data_type, int src_is_packed)
void	imConvertMapToRGB (unsigned char *data, int count, int depth, int packed, long *palette, int palette_count)

Detailed Description

Utilities for raw data buffers.

See im_convert.h

Function Documentation

void imConvertPacking	(	const void *	*src_data,*	
		void *	*dst_data,*	
		int	*width,*	
		int	*height,*	
		int	*src_depth,*	
		int	*dst_depth,*	
		int	*data_type,*	
		int	*src_is_packed*	
	)			

Changes the packing of the data buffer. Both must have the same width, height and data_type.
It can be used to copy data even if depth=1.
Unsed in OpenGL data conversions.

void imConvertMapToRGB	(	unsigned char *	*data,*	
		int	*count,*	
		int	*depth,*	
		int	*packed,*	
		long *	*palette,*	
		int	*palette_count*	
	)			

Changes in-place a MAP data into a RGB data. The data must have room for the RGB image.
depth can be 3 or 4. count=width*height.
Unsed in OpenGL data conversions.

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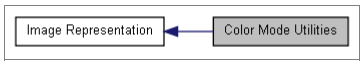
Defines | Functions

Color Mode Utilities
[Image Representation]

Collaboration diagram for Color Mode Utilities:



Defines

#define	imColorModeSpace(_cm) (_cm & 0xFF)
#define	imColorModeMatch(_cm1, _cm2) (imColorModeSpace(_cm1) == imColorModeSpace(_cm2))
#define	imColorModeHasAlpha(_cm) (_cm & IM_ALPHA)
#define	imColorModeIsPacked(_cm) (_cm & IM_PACKED)
#define	imColorModeIsTopDown(_cm) (_cm & IM_TOPDOWN)
#define	IM_MAXDEPTH 5

Functions

const char *	imColorModeSpaceName (int color_mode)
const char *	imColorModeComponentName (int color_space, int component)
int	imColorModeDepth (int color_mode)
int	imColorModeToBitmap (int color_mode)
int	imColorModeIsBitmap (int color_mode, int data_type)

Detailed Description

See im_util.h

Define Documentation

#define imColorModeSpace	(	_cm	)	(_cm & 0xFF)

Returns the color space of the color mode.

```
im.ColorModeSpace(color_mode: number) -> color_space: number [in Lua 5]
```

#define imColorModeMatch	(	_cm1,	
		_cm2	
	)		(imColorModeSpace(_cm1) == imColorModeSpace(_cm2))

Check if the two color modes match. Only the color space is compared.

```
im.ColorModeMatch(color_mode1: number, color_mode2: number) -> match: boolean [in Lua 5]
```

#define imColorModeHasAlpha	(	_cm	)	(_cm & IM_ALPHA)

Check if the color mode has an alpha channel.

```
im.ColorModeHasAlpha(color_mode: number) -> has_alpha: boolean [in Lua 5]
```

#define imColorModeIsPacked	(	_cm	)	(_cm & IM_PACKED)

Check if the color mode components are packed in one plane.

```
im.ColorModeIsPacked(color_mode: number) -> is_packed: boolean [in Lua 5]
```

#define imColorModeIsTopDown	(	_cm	)	(_cm & IM_TOPDOWN)

Check if the color mode orients the image from top down to bottom.

```
im.ColorModeIsTopDown(color_mode: number) -> is_top_down: boolean [in Lua 5]
```

#define IM_MAXDEPTH   5

Max depth is 4+1 (cmyk+alpha)

Function Documentation

const char* imColorModeSpaceName	(	int	*color_mode*	)

Returns the color mode name.

```
im.ColorModeSpaceName(color_mode: number) -> name: string [in Lua 5]
```

const char* imColorModeComponentName	(	int	*color_space,*
		int	*component*
	)		

Returns the color mode space component name.

```
im.ColorModeComponentName(color_mode: number) -> name: string [in Lua 5]
```

int imColorModeDepth	(	int	*color_mode*	)

Returns the number of components of the color space including alpha.

```
im.ColorModeDepth(color_mode: number) -> depth: number [in Lua 5]
```

int imColorModeToBitmap	(	int	*color_mode*	)	

Returns the color space of the equivalent display bitmap image.
Original packing and alpha are ignored. Returns IM_RGB, IM_GRAY, IM_MAP or IM_BINARY.

```
im.ColorModeToBitmap(color_mode: number) -> color_space: number [in Lua 5]
```

int imColorModeIsBitmap	(	int	*color_mode,*	
		int	*data_type*	
	)			

Check if the color mode and data_type defines a display bitmap image.

```
im.ColorModeIsBitmap(color_mode: number, data_type: number) -> is_bitmap: boolean [in Lua 5]
```

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Image Storage

Essentially all the file formats save the same image data. There is no such thing like a GIF image, instead we have a color indexed image that can be saved in a file with a GIF format, or a TIFF format, etc. However the compression encoding can be lossy and degrade the original image. The point is file formats and image data are two different things.

A file format is a file organization of the image data and its attributes. The IM library model considers all the file formats under the same model, including image, video, animation, stacks and volume file formats. When there is more than one image each one is treated as an independent frame. Each frame can have its own parameters and set of attributes.

The abstract model we use has the following structure:

Format Identifier
Compression
Image Count
Image Information: parameters, attributes, palette
Image Data
Image Information: parameters, attributes, palette
Image Data
...

The compression is usually the same for all the images in the file, but it can be changed after loading an image. For tradicional file formats image count is always 1. Image information must always be loaded or saved before image data.

We consider only formats that starts with a signature so we can recognize the format without using its file extension. If there is more than one driver that handles the same signature the first registered driver will open the file. Since the internal drivers are automatically registered all the external drivers can be loaded first if no **imFile** function has been called. In this way you can also control which external driver goes first.

Storage Guide

Reading

When reading the file extension is not relevant to determine the file format, but it is used to speed up the process of finding the correct format. With few exceptions the format drivers that access multiple images can read them in any sequence you want.

During the read process the original data can be converted to some options of user data. Not all conversions are available. You can convert any data to a bitmap version of it, and you can select any of the color mode flags **IM_ALPHA**, **IM_PACKED** and **IM_TOPDOWN**, regardless of the file original configuration.

Remember that even if all the images in the file have the same parameters you still have to call **imFileReadImageInfo** before calling **imFileReadImageData**.

In the following example all the images in the file are loaded.

```
char format[10], compression[10];
int error, image_count;
int width, height, color_mode, data_type;
void* data;

imFile* ifile = imFileOpen("test.tif", &error);
if (error != IM_ERR_NONE)
  // handle the error

imFileGetInfo(ifile, format, compression, &image_count);

for (i = 0; i < image_count, i++)
{
  error = imFileReadImageInfo(ifile, i, &width, &height, &color_mode, &data_type);
  if (error != IM_ERR_NONE)
    // handle the error

  // prepare data

  error = imFileReadImageData(ifile, data, 0, -1); // no bitmap convertion, use original color mode flags
  if (error != IM_ERR_NONE)
    // handle the error

  // store data somewhere
}

imFileClose(ifile);
```

A more simple code loads only the first image in the file:

```
imFile* ifile = imFileOpen(file_name, &error);

imFileReadImageInfo(ifile, 0, &width, &height, &color_mode, &data_type);

imFileReadImageData(ifile, data, 0, -1);

imFileClose(ifile);
```

If you are using the **imImage** structure it is easier:

```
imFile* ifile = imFileOpen(file_name, &error);

imImage* image = imFileLoadImage(ifile, 0, &error);
```

```
// or use imFileLoadBitmap to force a bitmap conversion

imFileClose(ifile);
```

Or the simplest version:

```
imImage* image = imFileImageLoad(file_name, 0, &error);
```

Writing

When writing there is no color space or data type conversion. Only color mode flags can be different: **IM_ALPHA**, **IM_PACKED** and **IM_TOPDOWN**. You just have to describe your data and the **imFileWriteImageData** will handle the color mode flag differences.

Of course you still have to check the error codes because, not all color spaces and data types are supported by each format.

When saving a sequence of images you must provide each image in the order that they will be in the file. For a video or animation start from frame 0 and go on, you can not jump or change the frame order. Also when saving videos you should not forget to save the numbers of frames per second in the attribute "FPS", the default value is 15.

For all the formats it is not necessary to set the compression, each driver will choose a default compression. But you may set it using the function **imFileSetInfo**.

To save several images to the same file:

```
int error, width, height;
void *data;

imFile* ifile = imFileNew("test.tif", "TIFF", &error);
if (error != IM_ERR_NONE)
  // handle the error

for (i = 0; i < image_count, i++)
{
  error = imFileWriteImageInfo(ifile, width, height, IM_RGB, IM_BYTE);
  if (error != IM_ERR_NONE)
    // handle the error

  error = imFileWriteImageData(ifile, data);
  if (error != IM_ERR_NONE)
    // handle the error
}

imFileClose(ifile);
```

But remember that not all file formats supports several images. To save just one image is more simple:

```
imFile* ifile = imFileNew(file_name, format, &error);

error = imFileWriteImageInfo(ifile, width, height, color_mode, data_type);

error = imFileWriteImageData(ifile, data);

imFileClose(ifile);
```

If you are using the **imImage** structure it is easier:

```
imFile* ifile = imFileNew(file_name, format, &error);

error = imFileSaveImage(ifile, image);

imFileClose(ifile);
```

Or the simplest version:

```
error = imFileImageSave(file_name, format, image);
```

Error Messages

Here is a sample error message display using IUP and IM error codes:

```
static void imIupErrorMessage(int error, int interactive)
{
  char* lang = IupGetLanguage();
  char *msg, *title;
  if (strcmp(lang, "ENGLISH")==0)
  {
    title = "Error";
    switch (error)
    {
    case IM_ERR_OPEN:
      msg = "Error Opening File.";
      break;
    case IM_ERR_MEM:
      msg = "Insuficient memory.";
      break;
    case IM_ERR_ACCESS:
      msg = "Error Accessing File.";
      break;
    case IM_ERR_DATA:
      msg = "Image type not Suported.";
      break;
    case IM_ERR_FORMAT:
      msg = "Invalid Format.";
      break;
    case IM_ERR_COMPRESS:
      msg = "Invalid or unsupported compression.";
      break;
    default:
      msg = "Unknown Error.";
    }
  }
  else
  {
    title = "Erro";
    switch (error)
    {
    case IM_ERR_OPEN:
      msg = "Erro Abrindo Arquivo.";
      break;
    case IM_ERR_MEM:
      msg = "Memória Insuficiente.";
      break;
    case IM_ERR_ACCESS:
      msg = "Erro Acessando Arquivo.";
      break;
    case IM_ERR_DATA:
      msg = "Tipo de Imagem não Suportado.";
      break;
    case IM_ERR_FORMAT:
      msg = "Formato Inválido.";
      break;
    case IM_ERR_COMPRESS:
      msg = "Compressão Inválida ou não Suportada.";
      break;
    default:
      msg = "Erro Desconhecido.";
    }
  }

  if (interactive)
    IupMessage(title, msg);
  else
    printf("%s: %s", title, msg);
}
```

About File Formats

TIFF is still the most complete format available. It could be better if Adobe releases the revision 7, but it is on stand by. TIFF supports all the IM image representation concepts. In fact we were partially inspired by the TIFF specification. My suggestion is whenever possible use TIFF.

But TIFF may not be the ideal format for many situations. The W3C standards include only JPEG, GIF and PNG for Web browsers. JPEG forces the image to be RGB or Gray with a lossy compressed. GIF forces the image to be MAP with LZW compression. PNG forces the image to be RGB, MAP, Gray or Binary, with Deflate compression. So these characteristics are necessary to force small values for faster downloads.

JPEG is to be used for photographic content, PNG should be used for the remaining cases, but GIF is still the best to do simple animated images.

Except for some specific cases where a format is needed for compatibility, the other formats are less important. TGA, PCX, RAS, SGI and BMP have almost the same utility.

JP2 must be used for JPEG-2000 compression, would be nice if a new TIFF specification includes this standard.

Since PNM has a textual header it is very simple to teach for students so they can actually "see" the header. It is also a format easy to share images, but it does not do much more than that.

The TIFF and the GIF format also have support for multiple images. This does not necessarily defines an animation, pyramid nor a volume, but some times they are used in these ways.

GIF became very popular to build animations for the Web, and since the LZW patent expired Unisys realized that charging the usage isn't going to work and so they did not renew it. LZW is fully supported at IM.

IM also supports video formats like AVI and WMV as external libraries. In these cases the frames are also loaded as a sequence of individual images. Sound is not supported.

TIFF, JPEG and PNG have an extensive list of attributes, most of them are listed in the documentation, but some custom attributes may come up when reading an image from file.

New File Formats

Again the easiest way is to look at the source code of an already implemented format. The RAS, BMP, TGA and SGI formats are very simple to follow.

Basically you have to implement a class that inherits from **imFormat** and implement its virtual methods. You can use the **imBinFile** functions for I/O or use an external SDK.

For more information see File Format SDK.

Memory I/O and Others

For the majority of the formats, with the exception of the ones that use external SDKs, the I/O is done by the **imBinFile** module.

This module can be configured to access other types of media by implementing a driver. There are some predefined drivers see Reference / Utilities / Binary File Access.

One very useful is the **Memory Buffer** where you can read and write a file in memory. The activation is very simple, it needs to happen just before the **imFileOpen/imFileNew** functions. But the file name must be a pointer to an **imBinMemoryFileName** structure instead of a string. Se the example bellow:

```
int old_mode = imBinFileSetCurrentModule(IM_MEMFILE);

imBinMemoryFileName MemFileName; // This structure must exists
    while the file remains open.

    MemFileName.buffer = NULL; // Let the library initializes the buffer,


    // but it must be freed the the application, free(MemFileName.buffer)
    MemFileName.size = 1024; // The initial size

    MemFileName.reallocate = 1.5; // The reallocation will increase 50% the
    buffer.


    // This is used only when writing with a variable buffer.


    // Use 0 to fix the buffer size.

int error;

    imFile* ifile = imFileNew((const char*)&MemFileName, "GIF", &error);

imBinFileSetCurrentModule(old_mode); // The mode needs to be active
    only for the imFileOpen/imFileNew call.

if (error != IM_ERR_NONE) ....
```

Another driver interesting is the **Subfile** where you can read and write from a file that is already open. This is very important for formats that can have an embedded format inside. In this module the file_name is a pointer to an **imBinFile** structure from any other module that uses the **imBinFile** functions. The **imBinFileSize** will return the full file size, but the **imBinFileSeekTo** and **imBinFileTell** functions will compensate the position when the subfile was open.

Using **imBinFileSetCurrentModule(IM_SUBFILE)** just like the example above will allow you to open a subfile using the **imFileOpen/imFileNew** functions.

More Storage Samples

See the Storage Guide for simple storage samples.

Information

This is a command line application that displays information obtained from a file using the IM I/O functions, basically **imFile** functions. It depends only on the IM main library.

Here is an output sample:

```
IM Info
  File Name:
    exif_test.tif
  File Size: 9.00 Mb
  Format: TIFF - Tagged Image File Format
  Compression: NONE
  Image Count: 1
  Image #0
    Width: 2048
    Height: 1536
    Color Space: RGB
      Has Alpha: No
      Is Packed: Yes
      Is Top Down: Yes
    Data Type: byte
    Data Size: 9.00 Mb
    Attributes:
      YResolution: 72.00
      XResolution: 72.00
      DateTime: 2004:01:14 11:30:11
      Make: SONY
      ResolutionUnit: DPI
      Model: CD MAVICA
      Photometric: 2
```

You can view the source code here: im_info.cpp

Copy

This is a command line application that copies all the information from one file to another using the IM I/O functions. It depends only on the IM main library. It is usefull for testing the drivers.

You can view the source code here: im_copy.cpp

Load Bitmap from Resource File

In Windows if you have a bitmap stored in a resource file, like this:

```
bitmap_test BITMAP bitmap_test.bmp
```

The you could retreive it using the following code:

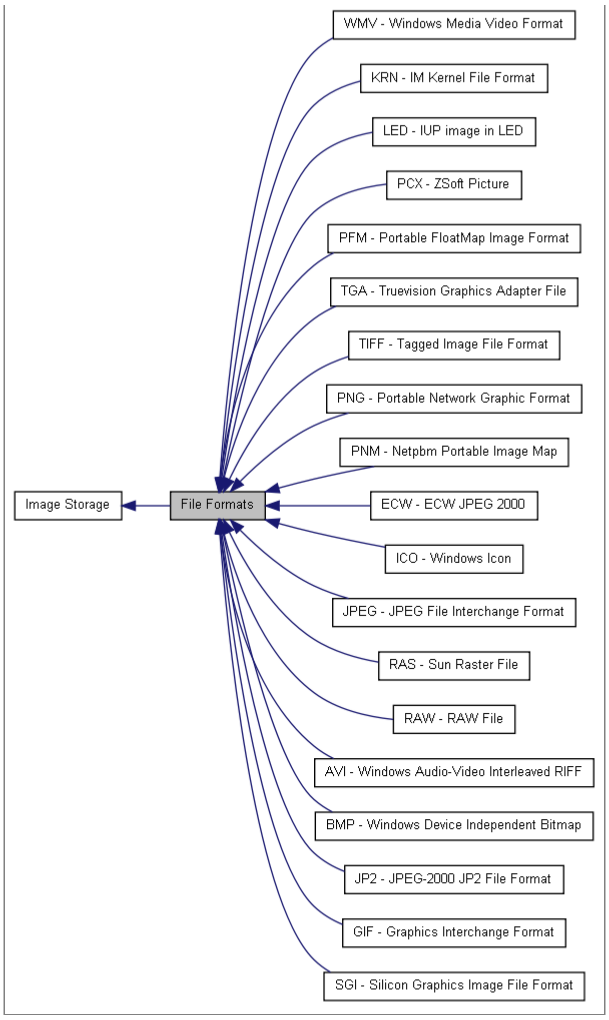
```
#include <windows.h>
#include <im.h>
#include <im_dib.h>

HBITMAP hBmp = LoadBitmap(hInstance, "bitmap_test");
imDib* dib = imDibFromHBitmap(hBmp, NULL);
imImage* image imDibToImage(dib);
imDibDestroy(dib);
```

Modules | Functions

File Formats
[Image Storage]

Collaboration diagram for File Formats:


WMV - Windows Media Video Format
KRN - IM Kernel File Format
LED - IUP image in LED
PCX - ZSoft Picture
PFM - Portable FloatMap Image Format
TGA - Truevision Graphics Adapter File
TIFF - Tagged Image File Format
PNG - Portable Network Graphic Format
PNM - Netpbm Portable Image Map
Image Storage
File Formats
ECW - ECW JPEG 2000
ICO - Windows Icon
JPEG - JPEG File Interchange Format
RAS - Sun Raster File
RAW - RAW File
AVI - Windows Audio-Video Interleaved RIFF
BMP - Windows Device Independent Bitmap
JP2 - JPEG-2000 JP2 File Format
GIF - Graphics Interchange Format
SGI - Silicon Graphics Image File Format

Modules

	TIFF - Tagged Image File Format
	JPEG - JPEG File Interchange Format
	PNG - Portable Network Graphic Format
	GIF - Graphics Interchange Format
	BMP - Windows Device Independent Bitmap
	RAS - Sun Raster File
	LED - IUP image in LED
	SGI - Silicon Graphics Image File Format
	PCX - ZSoft Picture
	TGA - Truevision Graphics Adapter File
	PNM - Netpbm Portable Image Map
	PFM - Portable FloatMap Image Format
	ICO - Windows Icon
	KRN - IM Kernel File Format
	AVI - Windows Audio-Video Interleaved RIFF
	ECW - ECW JPEG 2000
	JP2 - JPEG-2000 JP2 File Format
	RAW - RAW File
	WMV - Windows Media Video Format

Functions

void	imFormatRegisterInternal (void)
void	imFormatRemoveAll (void)
void	imFormatList (char **format_list, int *format_count)
int	imFormatInfo (const char *format, char *desc, char *ext, int *can_sequence)
int	imFormatInfoExtra (const char *format, char *extra)
int	imFormatCompressions (const char *format, char **comp, int *comp_count, int color_mode, int data_type)
int	imFormatCanWriteImage (const char *format, const char *compression, int color_mode, int data_type)

Detailed Description

See im.h

Internal Predefined File Formats:

- "BMP" - Windows Device Independent Bitmap
- "GIF" - Graphics Interchange Format
- "ICO" - Windows Icon
- "JPEG" - JPEG File Interchange Format
- "LED" - IUP image in LED
- "PCX" - ZSoft Picture
- "PFM" - Portable FloatMap Image Format
- "PNG" - Portable Network Graphic Format
- "PNM" - Netpbm Portable Image Map
- "RAS" - Sun Raster File
- "RAW" - RAW File
- "SGI" - Silicon Graphics Image File Format
- "TGA" - Truevision Targa
- "TIFF" - Tagged Image File Format

Other Supported File Formats:

- "JP2" - JPEG-2000 JP2 File Format
- "AVI" - Windows Audio-Video Interleaved RIFF
- "WMV" - Windows Media Video Format

Some Known Compressions:

- "NONE" - No Compression.
- "RLE" - Run Lenght Encoding.
- "LZW" - Lempel, Ziff and Welsh.
- "JPEG" - Join Photographics Experts Group.
- "DEFLATE" - LZ77 variation (ZIP)

Function Documentation

void imFormatRegisterInternal	(	void	)

Registers all the internal formats.
It is automatically called internally when a format is accessed, but can be called to force the internal formats to be registered before other formats. Notice that additional formats when registered will be registered before the internal formats if imFormatRegisterInternal is not called yet.
To control the register order is useful when two format drivers handle the same format. The first registered format will always be used first.

void imFormatRemoveAll	(	void	)

Remove all registered formats. Call this if you are checking memory leaks.

void imFormatList	(	char **	*format_list,*
		int *	*format_count*
	)		

Returns a list of the registered formats.
format_list is an array of format identifiers. Each format identifier is 10 chars max, maximum of 50 formats. You can use "char* format_list[50]".

```
im.FormatList() -> format_list: table of strings [in Lua 5]
```

int imFormatInfo	(	const char *	*format,*
		char *	*desc,*
		char *	*ext,*
		int *	*can_sequence*
	)		

Returns the format description.
Format description is 50 chars max.
Extensions are separated like "*.tif;*.tiff;", 50 chars max.
Returns an error code. The parameters can be NULL, except format. See also File Formats.

```
im.FormatInfo(format: string) -> error: number, desc: string, ext: string, can_sequence: boolean [in Lua 5]
```

int imFormatInfoExtra	(	const char *	*format,*
		char *	*extra*
	)		

Returns the format information of the third party library used to support the format.
Format extra is 50 chars max.
Returns an error code. See also File Formats.

```
im.FormatInfoExtra(format: string) -> error: number, extra: string [in Lua 5]
```

int imFormatCompressions	(	const char *	*format,*
		char **	*comp,*
		int *	*comp_count,*
		int	*color_mode,*
		int	*data_type*
	)		

Returns the format compressions.
Compressions are 20 chars max each, maximum of 50 compressions. You can use "char* comp[50]".
color_mode and data_type are optional, use -1 to ignore them.
If you use them they will select only the allowed compressions checked like in imFormatCanWriteImage.

Returns an error code. See also File Formats, imErrorCodes, imDataType, imColorSpace and imColorModeConfig.

```
im.FormatCompressions(format: string, [color_mode: number], [data_type: number]) -> error: number, comp: table of strings [in Lua 5]
```

int imFormatCanWriteImage	(	const char *	*format,*
		const char *	*compression,*
		int	*color_mode,*
		int	*data_type*
	)		

Checks if the format support the given image class at the given compression.
Returns an error code. See also File Formats, imErrorCodes, imDataType, imColorSpace and imColorModeConfig.

```
im.FormatCanWriteImage(format: string, compression: string, color_mode: number, data_type: number) -> can_write: boolean [in Lua 5]
```

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Functions

RAW - RAW File
[File Formats]

Collaboration diagram for RAW - RAW File:

Functions

imFile *	imFileOpenRaw (const char *file_name, int *error)
imFile *	imFileNewRaw (const char *file_name, int *error)

Detailed Description

The file must be open/created with the functions imFileOpenRaw and imFileNewRaw.

Description

Internal Implementation.

Supports RAW binary images. This is an unstructured and uncompressed binary data. It is NOT a Camera RAW file generated in many professional digital cameras.
You must know image parameters a priori and must set the IM_INT attributes "Width", "Height", "ColorMode", "DataType" before the imFileReadImageInfo/imFileWriteImageInfo functions.

The data must be in binary form, but can start in an arbitrary offset from the begining of the file, use attribute "StartOffset". The default is at 0 offset.

Integer sign and double precision can be converted using attribute "SwitchType".
The conversions will be BYTE<->CHAR, USHORT<->SHORT, INT<->UINT, FLOAT<->DOUBLE.

Byte Order can be Little Endian (Intel=1) or Big Endian (Motorola=0), use the attribute "ByteOrder", the default is the current CPU.

The lines can be aligned to a BYTE (1), WORD (2) or DWORD (4) boundaries, ue attribute "Padding" with the respective value.

If the compression is ASCII the data is stored in textual format, instead of binary. In this case SwitchType and ByteOrder are ignored, and Padding should be 0.

When reading, if data type is BYTE, color space is RGB and data is packed, then the attribute "RGB16" is consulted. It can has values "555" or "565" indicating a packed 16 bits RGB pixel is stored with the given bit distribution for R, G and B.

See im_raw.h

Features

```
Data Types: <all>
Color Spaces: all, except MAP.
Compressions:
  NONE - no compression [default]
  ASCII (textual data)
Can have more than one image, depends on "StartOffset" attribute.
Can have an alpha channel.
Components can be packed or not.
Lines arranged from top down to bottom or bottom up to top.

Attributes:
  Width, Height, ColorMode, DataType IM_INT (1)
  ImageCount[1], StartOffset[0], SwitchType[FALSE], ByteOrder[IM_LITTLEENDIAN], Padding[0]  IM_INT (1)

Comments:
  In fact ASCII is an expansion, not a compression, because the file will be larger than binary data.
```

Function Documentation

imFile* imFileOpenRaw	(	const char *	*file_name,*
		int *	*error*
	)		

Opens a RAW image file. See also imErrorCodes.

```
im.FileOpenRaw(file_name: string) -> ifile: imFile, error: number [in Lua 5]
```

imFile* imFileNewRaw	(	const char *	*file_name,*
		int *	*error*
	)		

Creates a RAW image file. See also imErrorCodes.

```
im.FileNewRaw(file_name: string) -> ifile: imFile, error: number [in Lua 5]
```

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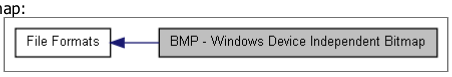
BMP - Windows Device Independent Bitmap

[File Formats]

Collaboration diagram for BMP - Windows Device Independent Bitmap:



Description

Windows Copyright Microsoft Corporation.

Internal Implementation.

Features

```
Data Types: Byte
Color Spaces: RGB, MAP and Binary (Gray saved as MAP)
Compressions:
  NONE - no compression [default]
  RLE  - Run Lenght Encoding (only for MAP and Gray)
Only one image.
Can have an alpha channel (only for RGB)
Internally the components are always packed.
Lines arranged from top down to bottom or bottom up to top. But are saved always as bottom up.

Attributes:
  ResolutionUnit (string) ["DPC", "DPI"]
  XResolution, YResolution IM_FLOAT (1)

Comments:
  Reads OS2 1.x and Windows 3, but writes Windows 3 always.
  Version 4 and 5 BMPs are not supported.
```

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GIF - Graphics Interchange Format

[File Formats]

Collaboration diagram for GIF - Graphics Interchange Format:

Description

Copyright (c) 1987,1988,1989,1990 CompuServe Incorporated.
GIF is a Service Mark property of CompuServe Incorporated.
Graphics Interchange Format Programming Reference, 1990.
LZW Copyright Unisys.

Patial Internal Implementation.
Decoding and encoding code were extracted from GIFLib 1.0.
Copyright (c) 1989 Gershon Elber.

Features

```
Data Types: Byte
Color Spaces: MAP only, (Gray and Binary saved as MAP)
Compressions:
  LZW - Lempel-Ziv & Welch      [default]
Can have more than one image.
No alpha channel.
Internally the lines are arranged from top down to bottom.

Attributes:
  ScreenHeight, ScreenWidth IM_USHORT (1) screen size [default to the first image size]
  Interlaced IM_INT (1 | 0) default 0
  Description (string)
  TransparencyIndex IM_BYTE (1)
  XScreen, YScreen IM_USHORT (1) screen position
  UserInput IM_BYTE (1) [1, 0]
  Disposal (string) [UNDEF, LEAVE, RBACK, RPREV]
  Delay IM_USHORT (1) [time to wait betweed frames in 1/100 of a second]
  Iterations IM_USHORT (1) (NETSCAPE2.0 Application Extension) [The number of times to repeat the animation. 0 means to repeat forever. ]

Comments:
  Attributes after the last image are ignored.
  Reads GIF87 and GIF89, but writes GIF89 always.
  Ignored attributes: Background Color Index, Pixel Aspect Ratio,
                      Plain Text Extensions, Application Extensions...
```

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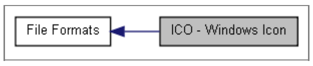
ICO - Windows Icon

[File Formats]

Collaboration diagram for ICO - Windows Icon:



Description

Windows Copyright Microsoft Corporation.

Internal Implementation.

Features

```
Data Types: Byte
Color Spaces: RGB, MAP and Binary (Gray saved as MAP)
Compressions:
  NONE - no compression [default]
Can have more than one image. But reading and writing is limited to 10 images max,
  and all images must have different sizes and bpp.
Can have an alpha channel (only for RGB)
Internally the components are always packed.
Internally the lines are arranged from bottom up to top.

Attributes:
  TransparencyIndex IM_BYTE (1)

Comments:
  If the user specifies an alpha channel, the AND mask is loaded as alpha if
    the file color mode does not contain the IM_ALPHA flag.
  For MAP imagens, if the user does not specifies an alpha channel
    the TransparencyIndex is used to initialize the AND mask when writing,
    and if the user does specifies an alpha channel
    the most repeated index with transparency will be the transparent index.
  Although any size and common bpp can be used is recomended to use the typical configurations:
    16x16, 32x32, 48x48, 64x64 or 96x96
    2 colors, 16 colors, 256 colors, 24bpp or 32bpp
```

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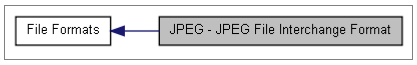
JPEG - JPEG File Interchange Format

[File Formats]

Collaboration diagram for JPEG - JPEG File Interchange Format:



Description

ISO/IEC 10918 (1994, 1995, 1997, 1999)
http://www.jpeg.org/

Access to the JPEG file format uses libjpeg version 9d.
http://www.ijg.org
Copyright (C) 1994-2020, Thomas G. Lane, Guido Vollbeding
from the Independent JPEG Group.

Access to the EXIF attributes uses libEXIF version 0.6.21.
http://sourceforge.net/projects/libexif
Copyright (C) 2001-2009, Lutz Müller et. al.

Features

```
Data Types: Byte
Color Spaces: Gray, RGB, CMYK and YCbCr (Binary Saved as Gray)
Compressions:
  JPEG - ISO JPEG  [default]
Only one image.
No alpha channel.
Internally the components are always packed.
Internally the lines are arranged from top down to bottom.
Handle(1) returns jpeg_decompress_struct* when reading, and
                  jpeg_compress_struct* when writing (libJPEG structures).

Attributes:
  AutoYCbCr IM_INT (1) (controls YCbCr auto conversion) default 1
  JPEGQuality IM_INT (1) [0-100, default 75] (write only)
  ResolutionUnit (string) ["DPC", "DPI"]
  XResolution, YResolution IM_FLOAT (1)
  Interlaced (same as Progressive) IM_INT (1 | 0) default 0
  Description (string)
  (lots of Exif tags)

Changes to libJPEG:
  new file created: jconfig.h from jconfig.txt
  These changes can be ignored when using an external libJPEG distribution

Changes to libEXIF:
  new files config.h and _stdint.h
  small fixes to improve compilation.
  These changes can be ignored when using an external libEXIF distribution

Comments:
  Other APPx markers are ignored.
  No thumbnail support.
  RGB images are automatically converted to YCbCr when saved.
  Also YcbCr are automatically converted to RGB when loaded. Use AutoYCbCr=0 to disable this behavior.
```

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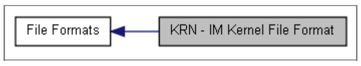
KRN - IM Kernel File Format

[File Formats]

Collaboration diagram for KRN - IM Kernel File Format:



Description

Textual format to provied a simple way to create kernel convolution images.

Internal Implementation.

Features

```
Data Types: Int, Float
Color Spaces: Gray
Compressions:
  NONE - no compression [default]
Only one image.
No alpha channel.
Internally the lines are arranged from top down to bottom.

Attributes:
  Description (string)

Comments:
  The format is very simple, inspired by PNM.
  It was developed because PNM does not have support for INT and FLOAT.
  Remeber that usually convolution operations use kernel size an odd number.

Format Model:
  IMKERNEL
  Description up to 512 characters
  width height
  type (0 - IM_INT, 1 - IM_FLOAT)
  data...

Example:
  IMKERNEL
  Gradian
  3 3
  0
  0 -1 0
  0  1 0
  0  0 0
```

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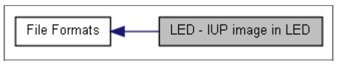
LED - IUP image in LED

[File Formats]

Collaboration diagram for LED - IUP image in LED:



Description

Copyright Tecgraf/PUC-Rio and PETROBRAS/CENPES.

Internal Implementation.

Features

```
Data Types: Byte
Color Spaces: MAP only (Gray and Binary saved as MAP)
Compressions:
  NONE - no compression  [default]
Only one image.
No alpha channel.
Internally the lines are arranged from top down to bottom.

Attributes:
  none

Comments:
  LED file must start with "LEDImage = IMAGE[".
```

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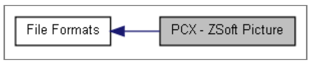
PCX - ZSoft Picture

[File Formats]

Collaboration diagram for PCX - ZSoft Picture:



Description

Copyright ZSoft Corporation.
ZSoft (1988) PCX Technical Reference Manual.

Internal Implementation.

Features

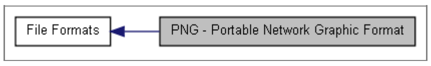
```
Data Types: Byte
Color Spaces: RGB, MAP and Binary (Gray saved as MAP)
Compressions:
  NONE - no compression
  RLE  - Run Lenght Encoding [default - since uncompressed PCX is not well supported]
Only one image.
No alpha channel.
Internally the components are always packed.
```

```
    Internally the lines are arranged from top down to bottom.

    Attributes:
      ResolutionUnit (string) ["DPC", "DPI"]
      XResolution, YResolution IM_FLOAT (1)
      XScreen, YScreen IM_USHORT (1) screen position

    Comments:
      Reads Versions 0-5, but writes Version 5 always.
```

PNG - Portable Network Graphic Format

[[File Formats](#)]

Collaboration diagram for PNG - Portable Network Graphic Format:



Description

Access to the PNG file format uses libpng version 1.6.23.
http://www.libpng.org
Copyright (c) 2000-2002, 2004, 2006-2015 Glenn Randers-Pehrson

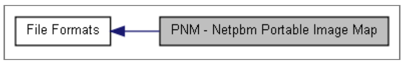
Features

```
    Data Types: Byte and UShort
    Color Spaces: Gray, RGB, MAP and Binary
    Compressions:
      DEFLATE - LZ77 variation (ZIP) [default]
    Only one image.
    Can have an alpha channel.
    Internally the components are always packed.
    Internally the lines are arranged from top down to bottom.
    Handle(1) returns png_structp libPNG structure.

    Attributes:
      ZIPQuality IM_INT (1) [1-9, default 6] (write only)
      ResolutionUnit (string) ["DPC", "DPI"]
      XResolution, YResolution IM_FLOAT (1)
      Interlaced (same as Progressive) IM_INT (1 | 0) default 0
      Gamma IM_FLOAT (1)
      WhitePoint IMFLOAT (2)
      PrimaryChromaticities  IMFLOAT (6)
      XPosition, YPosition IM_FLOAT (1)
      sRGBIntent IM_INT (1) [0: Perceptual, 1: Relative colorimetric, 2: Saturation, 3: Absolute colorimetric]
      TransparencyMap IM_BYTE (N) (for MAP images is the alpha value of the corresponding palette index)
      TransparencyIndex IM_BYTE (1) (for MAP images is the first index that has minimum alpha in TransparencyMap, for GRAY images is the index that it is fully transparent
      TransparencyColor IM_BYTE (3) (for RGB images is the color that is full transparent)
      CalibrationName, CalibrationUnits (string)
      CalibrationLimits IM_INT (2)
      CalibrationEquation IM_BYTE (1) [0-Linear,1-Exponential,2-Arbitrary,3-HyperbolicSine)]
      CalibrationParam (string) [params separated by '\\n']
      Title, Author, Description, Copyright, DateTime (string)
      Software, Disclaimer, Warning, Source, Comment, ...       (string)
      DateTimeModified (string) [when writing uses the current system time]
      ICCProfile IM_BYTE (N)
      ScaleUnit (string) ["meters", "radians"]
      XScale, YScale IM_FLOAT (1)

    Comments:
      When saving PNG image with TransparencyIndex or TransparencyMap, TransparencyMap has precedence,
        so set it to NULL if you changed TransparencyIndex.
      Attributes set after the image are ignored.
```

PNM - Netpbm Portable Image Map

[[File Formats](#)]

Collaboration diagram for PNM - Netpbm Portable Image Map:



Description

PNM formats Copyright Jef Poskanzer

Internal Implementation.

Features

```
    Data Types: Byte and UShort
    Color Spaces: Gray, RGB and Binary
    Compressions:
      NONE - no compression [default]
      ASCII (textual data)
    Can have more than one image, but sequencial access only.
    No alpha channel.
    Internally the components are always packed.
    Internally the lines are arranged from top down to bottom.

    Attributes:
      Description (string)

    Comments:
      In fact ASCII is an expansion, not a compression, because the file will be larger than binary data.
```

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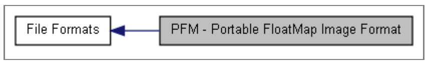
PFM - Portable FloatMap Image Format
[File Formats]

Collaboration diagram for PFM - Portable FloatMap Image Format:



Description

Internal Implementation.

Features

```
Data Types: Float
Color Spaces: Gray and RGB
Compressions:
  NONE - no compression [default]

No alpha channel.
Internally the components are always packed.
Internally the lines are arranged from bottom to top.
```

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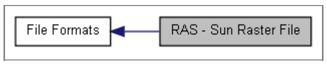
RAS - Sun Raster File
[File Formats]

Collaboration diagram for RAS - Sun Raster File:



Description

Copyright Sun Corporation.

Internal Implementation.

Features

```
    Data Types: Byte
    Color Spaces: Gray, RGB, MAP and Binary
    Compressions:
      NONE - no compression   [default]
      RLE  - Run Lenght Encoding
    Only one image.
    Can have an alpha channel (only for IM_RGB)
    Internally the components are always packed.
    Internally the lines are arranged from top down to bottom.

    Attributes:
      none
```

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SGI - Silicon Graphics Image File Format
[File Formats]

Collaboration diagram for SGI - Silicon Graphics Image File Format:

Description

SGI is a trademark of Silicon Graphics, Inc.

Internal Implementation.

Features

```
    Data Types: Byte and UShort
    Color Spaces: Gray and RGB (Binary saved as Gray, MAP with fixed palette when reading only)
    Compressions:
      NONE - no compression  [default]
      RLE  - Run Lenght Encoding
    Only one image.
    Can have an alpha channel (only for IM_RGB)
    Internally the components are always packed.
    Internally the lines are arranged from bottom up to top.

    Attributes:
      Description (string)
```

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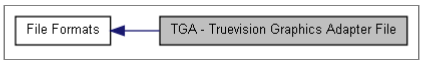
TGA - Truevision Graphics Adapter File
[File Formats]

Collaboration diagram for TGA - Truevision Graphics Adapter File:



Description

Truevision TGA File Format Specification Version 2.0
Technical Manual Version 2.2 January, 1991
Copyright 1989, 1990, 1991 Truevision, Inc.

Internal Implementation.

Features

```
Data Types: Byte
Color Spaces: Gray, RGB and MAP (Binary saved as Gray)
Compressions:
  NONE - no compression [default]
  RLE  - Run Lenght Encoding
Only one image.
Can have an alpha channel (only for RGB)
Internally the components are always packed.
Internally the lines are arranged from bottom up to top or from top down to bottom.

Attributes:
  XScreen, YScreen IM_USHORT (1) screen position
  Title, Author, Description, JobName, Software (string)
  SoftwareVersion (read only) (string)
  DateTimeModified (string) [when writing uses the current system time]
  Gamma IM_FLOAT (1)
```

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TIFF - Tagged Image File Format

[File Formats]

Collaboration diagram for TIFF - Tagged Image File Format:

Description

Copyright (c) 1986-1988, 1992 by Adobe Systems Incorporated.
Originally created by a group of companies, the Aldus Corporation kept the copyright until Aldus was acquired by Adobe.
TIFF Revision 6.0 Final — June 3, 1992
http://www.adobe.com/Support/TechNotes.html

Access to the TIFF file format uses libTIFF version 4.1.0
http://www.simplesystems.org/libtiff/
https://libtiff.gitlab.io/libtiff/
http://libtiff.maptools.org/
Copyright (c) 1988-1997 Sam Leffler
Copyright (c) 1991-1997 Silicon Graphics, Inc.

Features

```
Data Types: <all>
Color Spaces: Gray, RGB, CMYK, YCbCr, Lab, XYZ, Map and Binary.
Compressions:
  NONE - no compression  [default for IEEE Floating Point Data]
  CCITTRLE - CCITT modified Huffman RLE (binary only) [default for Binary]
  CCITTFAX3 - CCITT Group 3 fax         (binary only)
  CCITTFAX4 - CCITT Group 4 fax         (binary only)
  LZW - Lempel-Ziv & Welch  [default]
  JPEG - ISO JPEG    [default for YCBCR]
  NEXT - NeXT 2-bit RLE (2 bpp only)
  CCITTRLEW - CCITT modified Huffman RLE with word alignment (binary only)
  RLE - Packbits (Macintosh RLE) [default for MAP]
  THUNDERSCAN - ThunderScan 4-bit RLE (only for 2 or 4 bpp)
  PIXARLOG - Pixar companded 11-bit ZIP (only byte, ushort and float)
  DEFLATE - LZ77 variation (ZIP)
  ADOBE_DEFLATE - Adobe LZ77 variation
  SGILOG - SGI Log Luminance RLE for L and Luv (only byte, ushort and float) [default for XYZ]
  SGILOG24 - SGI Log 24-bit packed for Luv (only byte, ushort and float)
Can have more than one image.
Can have an alpha channel.
Components can be packed or not.
Lines arranged from top down to bottom or bottom up to top.
Handle(1) returns a TIFF* libTIFF structure.

Attributes:
  Photometric IM_USHORT (1) (when writing this will complement the color_mode information, for Mask, MinIsWhite, ITULab and ICCLab)
  ExtraSampleInfo IM_USHORT (1) (description of alpha channel: 0- uknown, 1- pre-multiplied, 2-normal)
  JPEGQuality IM_INT (1) [0-100, default 75] (write only)
  ZIPQuality IM_INT (1) [1-9, default 6] (write only)
  ResolutionUnit (string) ["DPC", "DPI"]
  XResolution, YResolution IM_FLOAT (1)
  Description, Author, Copyright, DateTime, DocumentName,
  PageName, TargetPrinter, Make, Model, Software, HostComputer (string)
  InkNames (strings separated by '0's)
  InkSet IM_USHORT (1)
  NumberOfInks IM_USHORT (1)
  DotRange IM_USHORT (2)
  TransferFunction0, TransferFunction1, TransferFunction3 IM_USHORT [gray=0, rgb=012]
  ReferenceBlackWhite IMFLOAT (6)
  WhitePoint IMFLOAT (2)
  PrimaryChromaticities  IMFLOAT (6)
  YCbCrCoefficients IM_FLOAT (3)
  YCbCrSubSampling IM_USHORT (2)
  YCbCrPositioning IM_USHORT (1)
  PageNumber IM_USHORT (2)
  StoNits IM_DOUBLE (1)
  XPosition, YPosition IM_FLOAT (1)
  SMinSampleValue, SMaxSampleValue IM_FLOAT (1)
  HalftoneHints IM_USHORT (2)
  SubfileType IM_INT (1)
  ICCProfile IM_BYTE (N)
  MultiBandCount IM_USHORT (1)    [Number of bands in a multiband gray image.]
  MultiBandSelect IM_USHORT (1)   [Band number to read one band of a multiband gray image. Must be set before reading image info.]
  and other TIFF tags as they are described in the TIFF documentation.
  GeoTIFF tags:
    GeoTiePoints, GeoTransformationMatrix, "Intergraph TransformationMatrix", GeoPixelScale, GeoDoubleParams IM_DOUBLE (N)
    GeoASCIIParams (string)
  Read-only support for EXIF tags as they are described in the EXIF 2.2 documentation. See http://www.exif.org/
  DNG tags as they are described in the DNG documentation. See http://www.adobe.com/br/products/dng/
    Tags BlackLevel, DefaultCropOrigin and DefaultCropSize are incorrectly interpreted by libTIFF so they are ignored.
    Raw image is loaded in place of the thumbnail image in the main IFD.
    SubIFDCount IM_USHORT (1)    [Number of subifds of the current image.]
    SubIFDSelect IM_USHORT (1)   [Subifd number to be read. Must be set before reading image info.]
  (other attributes can be obtained by using libTIFF directly using the Handle(1) function)

Comments:
  LogLuv is in fact Y'+CIE(u,v), so we choose to always convert it to XYZ.
  SubIFD is handled only for DNG.
  Since LZW patent expired, LZW compression is enabled. LZW Copyright Unisys.
  libGeoTIFF can be used without XTIFF initialization. Use Handle(1) to obtain a TIFF*.

Changes:
  "tiff_jpeg.c" - commented "downsampled_output = TRUE" and downsampled_input = TRUE.
  "tiff_fax3.c" - removed "inline"
  "tif_strip.c" - fixed scanline_size
  New files "tif_config.h" and "tifconf.h" to match our needs.
  New file "tiff_binfile.c" that implement I/O rotines using imBinFile.
  Search for "IMLIB" to see the changes.
  These changes can be ignored when using an external libTIFF distribution,
  but in this case the handling of upsampled YCbCr raw data will be compromissed.
```

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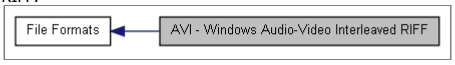
Functions

AVI - Windows Audio-Video Interleaved RIFF

[File Formats]

Collaboration diagram for AVI - Windows Audio-Video Interleaved RIFF:



Functions

void	imFormatRegisterAVI (void)

Detailed Description

Description

Windows Copyright Microsoft Corporation.

Access to the AVI format uses Windows AVIFile library. Available in Windows Only.
When writing a new file you must use an ".avi" extension, or the Windows API will fail.
You must link the application with "im_avi.lib" and you must call the function imFormatRegisterAVI once to register the format into the IM core library. In Lua call require"imlua_avi".
Depends also on the VFW library (vfw32.lib). When using the "im_avi.dll" this extra library is not necessary.
If using Cygwin or MingW must link with "-lvfw32". Old versions of Cygwin and MingW use the "-lvfw_ms32" and "-lvfw_avi32".

See im_format_avi.h

Features

```
Data Types: Byte
Color Spaces: RGB, MAP and Binary (Gray saved as MAP)
Compressions (installed in Windows XP by default):
  NONE     - no compression [default]
  RLE      - Microsoft RLE (8bpp only)
  CINEPACK - Cinepak Codec by Radius
  MSVC     - Microsoft Video 1 (old)  (8bpp and 16bpp only)
  M261     - Microsoft H.261 Video Codec
  M263     - Microsoft H.263 Video Codec
  I420     - Intel 4:2:0 Video Codec (same as M263)
  IV32     - Intel Indeo Video Codec 3.2 (old)
  IV41     - Intel Indeo Video Codec 4.5 (old)
  IV50     - Intel Indeo Video 5.1
  IYUV     - Intel IYUV Codec
  MPG4     - Microsoft MPEG-4 Video Codec V1 (not MPEG-4 compliant) (old)
  MP42     - Microsoft MPEG-4 Video Codec V2 (not MPEG-4 compliant)
  CUSTOM   - (show compression dialog)
  DIVX     - DivX 5.0.4 Codec (DivX must be installed)
  (others, must be the 4 charaters of the fourfcc code)
Can have more than one image.
Can have an alpha channel (only for RGB)
Internally the components are always packed.
Lines arranged from top down to bottom or bottom up to top. But are saved always as bottom up.
Handle(0) returns NULL. imBinFile is not supported.
Handle(1) returns PAVIFILE.
Handle(2) returns PAVISTREAM.

Attributes:
  FPS IM_FLOAT (1) (should set when writing, default 15)
  AVIQuality IM_INT (1) [1-10000, default -1] (write only) [unsed if compression=CUSTOM]
  KeyFrameRate IM_INT (1) (write only) [key frame frequency, if 0 not using key frames, default 15, unsed if compression=CUSTOM]
  DataRate IM_INT (1) (write only) [kilobits/second, default 2400, unsed if compression=CUSTOM]

Comments:
  Reads only the first video stream. Other streams are ignored.
  All the images have the same size, you must call imFileReadImageInfo/imFileWriteImageInfo
    at least once.
  For codecs comparsion and download go to:
    http://graphics.lcs.mit.edu/~tbuehler/video/codecs/
    http://www.fourcc.org
```

Function Documentation

void imFormatRegisterAVI	(	void		)	

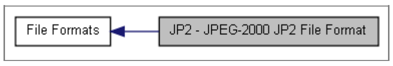
Register the AVI Format.
In Lua, when using require"imlua_avi" this function will be automatically called.

Functions

JP2 - JPEG-2000 JP2 File Format

[File Formats]

Collaboration diagram for JP2 - JPEG-2000 JP2 File Format:



Functions

void	imFormatRegisterJP2 (void)

Detailed Description

Description

ISO/IEC 15444 (2000, 2003)
http://www.jpeg.org/

You must link the application with "im_jp2.lib" and you must call the function imFormatRegisterJP2 once to register the format into the IM core library. In Lua call require"imlua_jp2".

Access to the JPEG2000 file format uses libJasper version 2.0.14
https://www.ece.uvic.ca/~frodo/jasper/
Copyright (c) 2001-2016 Michael David Adams.

See im_format_jp2.h

Features

```
    Data Types: Byte and UShort
    Color Spaces: Binary, Gray, RGB, YCbCr, Lab and XYZ
    Compressions:
      JPEG-2000 - ISO JPEG 2000  [default]
    Only one image.
    Can have an alpha channel.
    Internally the components are always unpacked.
    Internally the lines are arranged from top down to bottom.
    Handle(1) returns jas_image_t*
    Handle(2) returns jas_stream_t*

    Attributes:
      CompressionRatio IM_FLOAT (1) [write only, example: Ratio=7 just like 7:1]

    Comments:
      We read code stream syntax and JP2, but we write always as JP2.
      Used definitions EXCLUDE_JPG_SUPPORT,EXCLUDE_MIF_SUPPORT,
                       EXCLUDE_PNM_SUPPORT,EXCLUDE_RAS_SUPPORT,
                       EXCLUDE_BMP_SUPPORT,EXCLUDE_PGX_SUPPORT
      Changed jas_config.h to match our needs.
      New file jas_binfile.c
      Changed base/jas_stream.c to export jas_stream_create and jas_stream_initbuf.
      The counter is for memory transfer only.
      These changes can be ignored when using an external libJasper distribution,
      but in this case the imBinFile global features will not work.
```

Function Documentation

void imFormatRegisterJP2	(	void		)	

Register the JP2 Format.
In Lua, when using require"imlua_jp2" this function will be automatically called.

Functions

WMV - Windows Media Video Format

[File Formats]

Collaboration diagram for WMV - Windows Media Video Format:

Functions

void	imFormatRegisterWMV (void)

Detailed Description

Description

Advanced Systems Format (ASF)
Windows Copyright Microsoft Corporation.

Access to the WMV format uses Windows Media SDK. Available in Windows Only.
You must link the application with "im_wmv.lib" and you must call the function imFormatRegisterWMV once to register the format into the IM core library. In Lua call require"imlua_wmv".
Depends also on the WMF SDK (wmvcore.lib). When using the "im_wmv.dll" this extra library is not necessary.

The application users should have the WMV codec 9 installed: http://www.microsoft.com/windows/windowsmedia/format/codecdownload.aspx

You must agree with the WMF SDK EULA to use the SDK.
http://wmlicense.smdisp.net/v9sdk/

For more information:
http://www.microsoft.com/windows/windowsmedia/9series/sdk.aspx
http://msdn.microsoft.com/library/en-us/wmform/htm/introducingwindowsmediaformat.asp

See im_format_wmv.h

Features

```
Data Types: Byte
Color Spaces: RGB and MAP (Gray and Binary saved as MAP)
Compressions (installed in Windows XP by default):
  NONE       - no compression
  MPEG-4v3   - Windows Media MPEG-4 Video V3
  MPEG-4v1   - ISO MPEG-4 Video V1
  WMV7       - Windows Media Video  V7
  WMV7Screen - Windows Media Screen V7
  WMV8       - Windows Media Video  V8
  WMV9Screen - Windows Media Video 9 Screen
  WMV9       - Windows Media Video 9 [default]
  Unknown    - Others
Can have more than one image.
Can have an alpha channel (only for RGB) ?
Internally the components are always packed.
Lines arranged from top down to bottom or bottom up to top.
Handle(0) return NULL. imBinFile is not supported.
Handle(1) returns IWMSyncReader* when reading, IWMWriter* when writing.

Attributes:
  FPS IM_FLOAT (1) (should set when writing, default 15)
  WMFQuality IM_INT (1) [0-100, default 50] (write only)
  MaxKeyFrameTime IM_INT (1) (write only) [maximum key frame interval in miliseconds, default 5 seconds]
  DataRate IM_INT (1) (write only) [kilobits/second, default 2400]
  VBR IM_INT (1) [0, 1] (write only) [0 - Constant Bit Rate (default), 1 - Variable Bit Rate (Quality-Based)]
  (and several others from the file-level attributes) For ex:
    Title, Author, Copyright, Description (string)
    Duration IM_INT [100-nanosecond units]
    Seekable, HasAudio, HasVideo, Is_Protected, Is_Trusted, IsVBR IM_INT (1) [0, 1]
    NumberOfFrames IM_INT (1)

Comments:
  IMPORTANT - The "image_count" and the "FPS" attribute may not be available from the file,
    we try to estimate from the duration and from the average time between frames, or using the default value.
  We do not handle DRM protected files (Digital Rights Management).
  Reads only the first video stream. Other streams are ignored.
  All the images have the same size, you must call imFileReadImageInfo/imFileWriteImageInfo
    at least once.
  For optimal random reading, the file should be indexed previously.
  If not indexed by frame, random positioning may not be precise.
  Sequencial reading will always be precise.
  When writing we use a custom profile and time indexing only.
  We do not support multipass encoding.
  Since the driver uses COM, CoInitialize(NULL) and CoUninitialize() are called every Open/Close.
```

Function Documentation

void imFormatRegisterWMV	(	void		)	

Register the WMF Format.
In Lua, when using require"imlua_wmv" this function will be automatically called.

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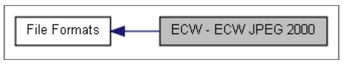
Functions

ECW - ECW JPEG 2000
[File Formats]

Collaboration diagram for ECW - ECW JPEG 2000:



Functions

void	imFormatRegisterECW (void)

Detailed Description

Description

ECW JPEG 2000 Copyright 1998 Earth Resource Mapping Ltd. Two formats are supported with this module. The ECW (Enhanced Compression Wavelet) format and the ISO JPEG 2000 format.

Access to the ECW format uses the ECW JPEG 2000 SDK version 3.3. Available in Windows, Linux and Solaris Only. But source code is also available.
You must link the application with "im_ecw.lib" and you must call the function imFormatRegisterECW once to register the format into the IM core library.
Depends also on the ECW JPEG 2000 SDK libraries (NCSEcw.lib).

When using other JPEG 2000 libraries the first registered library will be used to guess the file format. Use the extension *.ecw to shortcut to this implementation of the JPEG 2000 format.

See im_format_ecw.h

http://www.ermapper.com/ecw/
The three types of licenses available for the ECW JPEG 2000 SDK are as follows:

```
- ECW JPEG 2000 SDK Free Use License Agreement - This license governs the free use of
  the ECW JPEG 2000 SDK with Unlimited Decompression and Limited Compression (Less
  than 500MB).
- ECW JPEG 2000 SDK Public Use License Agreement - This license governs the use of the
  ECW SDK with Unlimited Decompression and Unlimited Compression for applications
  licensed under a GNU General Public style license.
- ECW JPEG 2000 SDK Commercial Use License Agreement - This license governs the use
  of the ECW JPEG 2000 SDK with Unlimited Decompression and Unlimited Compression
  for commercial applications.
```

Features

```
Data Types: Byte, Short, UShort, Float
Color Spaces: BINARY, GRAY, RGB, YCBCR
Compressions:
  ECW - Enhanced Compression Wavelet
  JPEG-2000 - ISO JPEG 2000
Only one image.
Can have an alpha channel
Internally the components are always packed.
Lines arranged from top down to bottom.
Handle() returns NCSFileView* when reading, NCSEcwCompressClient* when writing.

Attributes:
  CompressionRatio   IM_FLOAT (1) [example: Ratio=7 just like 7:1]
  OriginX, OriginY   IM_FLOAT (1)
  Rotation           IM_FLOAT (1)
  CellIncrementX, CellIncrementY    IM_FLOAT (1)
  CellUnits (string)
  Datum (string)
  Projection (string)
  ViewWidth, ViewHeight                    IM_INT (1)    [view zoom]
  ViewXmin, ViewYmin, ViewXmax, ViewYmax   IM_INT (1)    [view limits]
  MultiBandCount IM_USHORT (1)    [Number of bands in a multiband gray image.]
  MultiBandSelect IM_USHORT (1)   [Band number to read one band of a multiband gray image. Must be set before reading image info.]

Comments:
  Only read support is implemented.
  To read a region of the image you must set the View* attributes before reading the image data.
  After reading a partial image the width and height returned in ReadImageInfo is the view size.
  The view limits define the region to be read.
  The view size is the actual size of the image, so the result can be zoomed.
```

Function Documentation

void imFormatRegisterECW	(	void		)

Register the ECW Format

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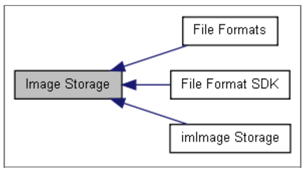
Modules | Typedefs | Enumerations | Functions

Image Storage

Collaboration diagram for Image Storage:



Modules

	File Format SDK
	imImage Storage
	File Formats

Typedefs

typedef struct _imFile	imFile

Enumerations

enum	imErrorCodes {
	IM_ERR_NONE, IM_ERR_OPEN, IM_ERR_ACCESS, IM_ERR_FORMAT,
	IM_ERR_DATA, IM_ERR_COMPRESS, IM_ERR_MEM, IM_ERR_COUNTER
	}

Functions

imFile *	imFileOpen (const char *file_name, int *error)
imFile *	imFileOpenAs (const char *file_name, const char *format, int *error)
imFile *	imFileNew (const char *file_name, const char *format, int *error)
void	imFileClose (imFile *ifile)
void *	imFileHandle (imFile *ifile, int index)

void	imFileGetInfo (imFile *ifile, char *format, char *compression, int *image_count)
void	imFileSetInfo (imFile *ifile, const char *compression)
void	imFileSetAttribute (imFile *ifile, const char *attrib, int data_type, int count, const void *data)
void	imFileSetAttribInteger (const imFile *ifile, const char *attrib, int data_type, int value)
void	imFileSetAttribReal (const imFile *ifile, const char *attrib, int data_type, double value)
void	imFileSetAttribString (const imFile *ifile, const char *attrib, const char *value)
const void *	imFileGetAttribute (imFile *ifile, const char *attrib, int *data_type, int *count)
int	imFileGetAttribInteger (const imFile *ifile, const char *attrib, int index)
double	imFileGetAttribReal (const imFile *ifile, const char *attrib, int index)
const char *	imFileGetAttribString (const imFile *ifile, const char *attrib)
void	imFileGetAttributeList (imFile *ifile, char **attrib, int *attrib_count)
void	imFileGetPalette (imFile *ifile, long *palette, int *palette_count)
void	imFileSetPalette (imFile *ifile, long *palette, int palette_count)
int	imFileReadImageInfo (imFile *ifile, int index, int *width, int *height, int *file_color_mode, int *file_data_type)
int	imFileWriteImageInfo (imFile *ifile, int width, int height, int user_color_mode, int user_data_type)
int	imFileReadImageData (imFile *ifile, void *data, int convert2bitmap, int color_mode_flags)
int	imFileWriteImageData (imFile *ifile, void *data)

Detailed Description

See im.h

Enumeration Type Documentation

enum imErrorCodes

File Access Error Codes

In Lua use im.ErrorStr(err) to convert the error number into a string.

Enumerator:

IM_ERR_NONE	No error.
IM_ERR_OPEN	Error while opening the file (read or write).
IM_ERR_ACCESS	Error while accessing the file (read or write).
IM_ERR_FORMAT	Invalid or unrecognized file format.
IM_ERR_DATA	Invalid or unsupported data.
IM_ERR_COMPRESS	Invalid or unsupported compression.
IM_ERR_MEM	Insufficient memory
IM_ERR_COUNTER	Interrupted by the counter

Function Documentation

imFile* imFileOpen	(	const char *	*file_name,*
		int *	*error*
	)		

Opens the file for reading. It must exists. Also reads file header. It will try to identify the file format. See also imErrorCodes.
In Lua the IM file metatable name is "imFile". When converted to a string will return "imFile(%p)" where p is replaced by the userdata address. If the file is already closed by im.FileClose, then it will return also the suffix "-closed".

```
im.FileOpen(file_name: string) -> ifile: imFile, error: number [in Lua 5]
```

imFile* imFileOpenAs	(	const char *	*file_name,*
		const char *	*format,*
		int *	*error*
	)		

Opens the file for reading using a specific format. It must exists. Also reads file header. See also imErrorCodes and File Formats.

```
im.FileOpenAs(file_name, format: string) -> ifile: imFile, error: number [in Lua 5]
```

imFile* imFileNew	(	const char *	*file_name,*
		const char *	*format,*
		int *	*error*
	)		

Creates a new file for writing using a specific format. If the file exists will be replaced.
It will only initialize the format driver and create the file, no data is actually written. See also imErrorCodes and File Formats.

```
im.FileNew(file_name: string, format: string) -> ifile: imFile, error: number [in Lua 5]
```

void imFileClose	(	imFile *	*ifile*	)

Closes the file.
In Lua if this function is not called, the file is closed by the garbage collector.

```
im.FileClose(ifile: imFile) [in Lua 5]
```

```
ifile:Close() [in Lua 5]
```

void* imFileHandle	(	imFile *	*ifile,*
		int	*index*
	)		

Returns an internal handle. index=0 returns always an imBinFile* handle, but for some formats returns NULL because they do not use imBinFile (like AVI and WMV). index=1 return an internal structure used by the format, usually is a handle to a third party library structure. This is file format dependent.

```
ifile:Handle() -> handle: userdata [in Lua 5]
```

void imFileGetInfo	(	imFile *	*ifile,*
		char *	*format,*
		char *	*compression,*
		int *	*image_count*
	)		

Returns file information. image_count is the number of images in a stack or the number of frames in a video/animation or the depth of a volume data.
compression and image_count can be NULL.
These information are also available as attributes:

```
FileFormat (string)
```

```
FileCompression (string)
```

```
FileImageCount IM_INT (1)
```

See also File Formats.

```
ifile:GetInfo() -> format: string, compression: string, image_count: number [in Lua 5]
```

void imFileSetInfo	(	imFile *	*ifile,*
		const char *	*compression*
	)		

Changes the write compression method.
If the compression is not supported will return an error code when writing.
Use NULL to set the default compression. You can use the imFileGetInfo to retrieve the actual compression but only after imFileWriteImageInfo. Only a few formats allow you to change the compression between frames.

```
ifile:SetInfo(compression: string) [in Lua 5]
```

void imFileSetAttribute	(	imFile *	*ifile,*
		const char *	*attrib,*
		int	*data_type,*
		int	*count,*
		const void *	*data*
	)		

Changes an extended attribute.
The data will be internally duplicated.
If data is NULL the attribute is removed. If data_type is BYTE then count can be -1 to indicate a NULL terminated string. See also imDataType.

```
ifile:SetAttribute(attrib: string, data_type: number, data: table of numbers or string) [in Lua 5]
```

If data_type is IM_BYTE, as_string can be used as data.

void imFileSetAttribInteger	(	const imFile *	*ifile,*
		const char *	*attrib,*
		int	*data_type,*
		int	*value*
	)		

Changes an extended attribute as an integer.

void imFileSetAttribReal	(	const imFile *	*ifile,*
		const char *	*attrib,*
		int	*data_type,*
		double	*value*
	)		

Changes an extended attribute as a real.

void imFileSetAttribString	(	const imFile *	*ifile,*	
		const char *	*attrib,*	
		const char *	*value*	
	)			

Changes an extended attribute as a string.

const void* imFileGetAttribute	(	imFile *	*ifile,*	
		const char *	*attrib,*	
		int *	*data_type,*	
		int *	*count*	
	)			

Returns an extended attribute.
Returns NULL if not found. data_type and count can be NULL. See also imDataType.

```
ifile:GetAttribute(attrib: string, [as_string: boolean]) -> data: table of numbers or string, data_type: number [in Lua 5]
```

If data_type is IM_BYTE, as_string can be used to return a string instead of a table.

```
ifile:GetAttributeRaw(attrib: string) -> data: userdata, data_type, count: number [in Lua 5]
```

int imFileGetAttribInteger	(	const imFile *	*ifile,*	
		const char *	*attrib,*	
		int	*index*	
	)			

Returns an extended attribute as an integer.

double imFileGetAttribReal	(	const imFile *	*ifile,*	
		const char *	*attrib,*	
		int	*index*	
	)			

Returns an extended attribute as a real.

const char* imFileGetAttribString	(	const imFile *	*ifile,*	
		const char *	*attrib*	
	)			

Returns an extended attribute as a string.

void imFileGetAttributeList	(	imFile *	*ifile,*	
		char **	*attrib,*	
		int *	*attrib_count*	
	)			

Returns a list of the attribute names.
"attrib" must contain room enough for "attrib_count" names. Use "attrib=NULL" to return only the count.

```
ifile:GetAttributeList() -> data: table of strings [in Lua 5]
```

void imFileGetPalette	(	imFile *	*ifile,*	
		long *	*palette,*	
		int *	*palette_count*	
	)			

Returns the palette if any.
"palette" must be a 256 colors allocated array.
Returns zero in "palette_count" if there is no palette. "palette_count" is >0 and <=256.

```
ifile:GetPalette() -> palette: imPalette [in Lua 5]
```

void imFileSetPalette	(	imFile *	*ifile,*	
		long *	*palette,*	
		int	*palette_count*	
	)			

Changes the pallete.
"palette_count" is >0 and <=256.

```
ifile:SetPalette(palette: imPalette) [in Lua 5]
```

int imFileReadImageInfo	(	imFile *	*ifile,*	
		int	*index,*	
		int *	*width,*	
		int *	*height,*	
		int *	*file_color_mode,*	
		int *	*file_data_type*	

	)		

Reads the image header if any and returns image information.
Reads also the extended image attributes, so other image attributes will be available only after calling this function.
Returns an error code. index specifies the image number between 0 and image_count-1.
Some drivers reads only in sequence, so "index" can be ignored by the format driver.
Any parameters can be NULL. This function must be called at least once, check each format documentation. See also imErrorCodes, imDataType, imColorSpace and imColorModeConfig.

```
ifile:ReadImageInfo([index: number]) -> error: number, width: number, height: number, file_color_mode: number, file_data_type: number [in Lua 5]
```

Default index is 0.

int imFileWriteImageInfo	(	imFile *	*ifile,*	
		int	*width,*	
		int	*height,*	
		int	*user_color_mode,*	
		int	*user_data_type*	
	)			

Writes the image header. Writes the file header at the first time it is called. Writes also the extended image attributes.
Must call imFileSetPalette and set other attributes before calling this function.
In some formats the color space will be converted to match file format specification.
Returns an error code. This function must be called at least once, check each format documentation. See also imErrorCodes, imDataType, imColorSpace and imColorModeConfig.

```
ifile:WriteImageInfo(width: number, height: number, user_color_mode: number, user_data_type: number) -> error: number [in Lua 5]
```

int imFileReadImageData	(	imFile *	*ifile,*	
		void *	*data,*	
		int	*convert2bitmap,*	
		int	*color_mode_flags*	
	)			

Reads the image data with or without conversion.
The data can be converted to bitmap when reading. Data type conversion to byte will always scan for min-max then scale to 0-255, except integer values that min-max are already between 0-255.
Complex to real conversions will use the magnitude.
Color mode flags contains packed, alpha and top-bottom information. If flag is 0 means unpacked, no alpha and bottom up. If flag is -1 the file original flags are used.
Returns an error code. See also imErrorCodes, imDataType, imColorSpace and imColorModeConfig.

```
ifile:ReadImageData(data: userdata, convert2bitmap: boolean, color_mode_flags: number) -> error: number [in Lua 5]
```

int imFileWriteImageData	(	imFile *	*ifile,*	
		void *	*data*	
	)			

Writes the image data.
Returns an error code.

```
ifile:WriteImageData(data: userdata) -> error: number [in Lua 5]
```

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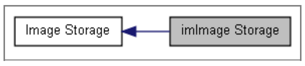
Functions

imImage Storage
[Image Storage]

Collaboration diagram for imImage Storage:



Functions

imImage *	imFileLoadImage (imFile *ifile, int index, int *error)
void	imFileLoadImageFrame (imFile *ifile, int index, imImage *image, int *error)
imImage *	imFileLoadBitmap (imFile *ifile, int index, int *error)
imImage *	imFileLoadImageRegion (imFile *ifile, int index, int bitmap, int *error, int xmin, int xmax, int ymin, int ymax, int width, int height)
void	imFileLoadBitmapFrame (imFile *ifile, int index, imImage *image, int *error)
int	imFileSaveImage (imFile *ifile, const imImage *image)
imImage *	imFileImageLoad (const char *file_name, int index, int *error)
imImage *	imFileImageLoadBitmap (const char *file_name, int index, int *error)
imImage *	imFileImageLoadRegion (const char *file_name, int index, int bitmap, int *error, int xmin, int xmax, int ymin, int ymax, int width, int height)
int	imFileImageSave (const char *file_name, const char *format, const imImage *image)

Detailed Description

Functions to simplify the process of reading and writting imImage structures. Will also load and save the alpha planes when possible.

See im_image.h

Function Documentation

imImage* imFileLoadImage	(	imFile *	*ifile,*	
		int	*index,*	
		int *	*error*	
	)			

Loads an image from an already open file. Returns NULL if failed.
This will call imFileReadImageInfo and imFileReadImageData.
index specifies the image number between 0 and image_count-1.
The returned image will be of the same color_space and data_type of the image in the file.
Attributes from the file will be stored at the image. See also imErrorCodes.

```
ifile:LoadImage([index: number]) -> image: imImage, error: number [in Lua 5]
```

Default index is 0.

void imFileLoadImageFrame	(	imFile *	*ifile,*	
		int	*index,*	
		imImage *	*image,*	
		int *	*error*	
	)			

Loads an image from an already open file. Returns NULL if failed.
This function assumes that the image in the file has the same parameters as the given image.
This will call imFileReadImageInfo and imFileReadImageData.
index specifies the image number between 0 and image_count-1.
The returned image will be of the same color_space and data_type of the image in the file.
Attributes from the file will be stored at the image. See also imErrorCodes.

```
ifile:LoadImageFrame(index: number, image: imImage) -> error: number [in Lua 5]
```

Default index is 0.

imImage* imFileLoadBitmap	(	imFile *	*ifile,*	
		int	*index,*	
		int *	*error*	
	)			

Loads an image from an already open file, but forces the image to be a bitmap.
The returned imagem will be always a Bitmap image, with color_space RGB, MAP, GRAY or BINARY, and data_type IM_BYTE.
index specifies the image number between 0 and image_count-1.
Returns NULL if failed. Attributes from the file will be stored at the image. See also imErrorCodes.

```
ifile:LoadBitmap([index: number]) -> image: imImage, error: number [in Lua 5]
```

Default index is 0.

imImage* imFileLoadImageRegion	(	imFile *	*ifile,*	
		int	*index,*	
		int	*bitmap,*	
		int *	*error,*	
		int	*xmin,*	
		int	*xmax,*	
		int	*ymin,*	
		int	*ymax,*	
		int	*width,*	
		int	*height*	
	)			

Loads an image region from an already open file. Returns NULL if failed.
This will call imFileReadImageInfo and imFileReadImageData.
index specifies the image number between 0 and image_count-1.
The returned image will be of the same color_space and data_type of the image in the file, or will be a Bitmap image.
Attributes from the file will be stored at the image. See also imErrorCodes.
For now, it works only for the ECW file format.

```
ifile:LoadRegion(index, bitmap, xmin, xmax, ymin, ymax, width, height: number) -> image: imImage, error: number [in Lua 5]
```

Default index is 0.

void imFileLoadBitmapFrame	(	imFile *	*ifile,*	
		int	*index,*	
		imImage *	*image,*	
		int *	*error*	
	)			

Loads an image from an already open file, but forces the image to be a bitmap.
This function assumes that the image in the file has the same parameters as the given image.
The imagem must be a Bitmap image, with color_space RGB, MAP, GRAY or BINARY, and data_type IM_BYTE.
index specifies the image number between 0 and image_count-1.
Returns NULL if failed. Attributes from the file will be stored at the image. See also imErrorCodes.

```
ifile:LoadBitmapFrame(index: number, image: imImage) -> error: number [in Lua 5]
```

Default index is 0.

int imFileSaveImage	(	imFile *	*ifile,*
		const imImage *	*image*
	)		

Saves the image to an already open file.
This will call imFileWriteImageInfo and imFileWriteImageData.
Attributes from the image will be stored at the file. Returns error code.

```
ifile:SaveImage(image: imImage) -> error: number [in Lua 5]
```

imImage* imFileImageLoad	(	const char *	*file_name,*
		int	*index,*
		int *	*error*
	)		

Loads an image from file. Open, loads and closes the file.
index specifies the image number between 0 and image_count-1.
Returns NULL if failed. Attributes from the file will be stored at the image. See also imErrorCodes.

```
im.FileImageLoad(file_name: string, [index: number]) -> image: imImage, error: number [in Lua 5]
```

Default index is 0.

imImage* imFileImageLoadBitmap	(	const char *	*file_name,*
		int	*index,*
		int *	*error*
	)		

Loads an image from file, but forces the image to be a bitmap. Open, loads and closes the file.
index specifies the image number between 0 and image_count-1.
Returns NULL if failed. Attributes from the file will be stored at the image. See also imErrorCodes.

```
im.FileImageLoadBitmap(file_name: string, [index: number]) -> image: imImage, error: number [in Lua 5]
```

Default index is 0.

imImage* imFileImageLoadRegion	(	const char *	*file_name,*
		int	*index,*
		int	*bitmap,*
		int *	*error,*
		int	*xmin,*
		int	*xmax,*
		int	*ymin,*
		int	*ymax,*
		int	*width,*
		int	*height*
	)		

Loads an image region from file. Open, loads and closes the file.
index specifies the image number between 0 and image_count-1.
Returns NULL if failed. Attributes from the file will be stored at the image. See also imErrorCodes.
For now, it works only for the ECW file format.

```
im.FileImageLoadRegion(file_name: string, index, bitmap, xmin, xmax, ymin, ymax, width, height: number, ) -> image: imImage, error: number [in Lua 5]
```

Default index is 0.

int imFileImageSave	(	const char *	*file_name,*
		const char *	*format,*
		const imImage *	*image*
	)		

Saves the image to file. Open, saves and closes the file.
Returns error code.
Attributes from the image will be stored at the file.

```
im.FileImageSave(file_name: string, format: string, image: imImage) -> error: number [in Lua 5]
```

```
image:Save(file_name: string, format: string) -> error: number [in Lua 5]
```

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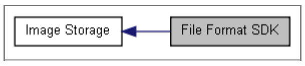
Data Structures | Functions

File Format SDK
[Image Storage]

Collaboration diagram for File Format SDK:



Data Structures

struct	_imFile
	Image File Structure (SDK Use Only). More...
class	imFileFormatBase
	Image File Format Virtual Base Class (SDK Use Only). More...
class	imFormat
	Image File Format Descriptor Class (SDK Use Only). More...

Functions

int	imFileLineBufferCount (imFile *ifile)
void	imFileLineBufferInc (imFile *ifile, int *line, int *plane)
void	imFileLineBufferRead (imFile *ifile, void *data, int line, int plane)
void	imFileLineBufferWrite (imFile *ifile, const void *data, int line, int plane)
int	imFileLineSizeAligned (int width, int bpp, int align)
void	imFileSetBaseAttributes (imFile *ifile)
void	imFormatRegister (imFormat *iformat)

Detailed Description

All the file formats are based on theses structures. Use them to create new file formats.
The LineBuffer functions will help transfer image from format buffer to application buffer and vice-versa.

See im_file.h

Function Documentation

int imFileLineBufferCount	(	imFile *	*ifile*	)

Number of lines to be accessed.

void imFileLineBufferInc	(	imFile *	*ifile,*	
		int *	*line,*	
		int *	*plane*	
	)			

Increments the line and plane counters.

void imFileLineBufferRead	(	imFile *	*ifile,*	
		void *	*data,*	
		int	*line,*	
		int	*plane*	
	)			

Converts from FILE color mode to USER color mode.

void imFileLineBufferWrite	(	imFile *	*ifile,*	
		const void *	*data,*	
		int	*line,*	
		int	*plane*	
	)			

Converts from USER color mode to FILE color mode.

int imFileLineSizeAligned	(	int	*width,*	
		int	*bpp,*	
		int	*align*	
	)			

Utility to calculate the line size in byte with a specified alignment.
"align" can be 1, 2 or 4.

void imFileSetBaseAttributes	(	imFile *	*ifile*	)

Set the attributes FileFormat, FileCompression and FileImageCount.
Used in imFileOpen and imFileOpenAs, and after the attribute list cleared with RemoveAll.

void imFormatRegister	(	imFormat *	*iformat*	)

Register a format driver.

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Image Capture

The capture support is designed for live video, it is not for passive digital cameras that only transfer the already taken pictures. Are valid: USB cameras (like most Webcams), Firewire (IEEE 1394) cameras, and analog video capture boards, including TV Tuners. These are called devices.

The capture functions allows you to:

- list the available devices
- connect to a device

- configure the device
- retrieve an image

You can list the installed devices and once you connect to a specific device you can control its parameters. Each connected device captures data frames continuously when in Live state otherwise it stays in standby. You can connect to more than one device at the same time.

Once connected the user can retrieve frames from the device any time. This can be done with one function call, or inside a closed loop for several frames, or inside an idle function to periodically update the screen. The user is not notified when a new frame is available, but every time the user retrieve a frame, if successful, it is a new frame, old frames are discarded when a new frame arrives.

Currently it is implemented only in Microsoft Windows.

Capture Guide

Using

You can list the installed capture devices using:

```
int imVideoCaptureDeviceCount(void)
const char* imVideoCaptureDeviceDesc(int device)
```

If a device was removed or added in run time, you must update the list calling:

```
int imVideoCaptureReloadDevices(void)
```

To handle devices you must create a **imVideoCapture** structure using the function **imVideoCaptureCreate**. With this handle you can manage any of the available devices, but only one device. The handle must be destroyed with **imVideoCaptureDestroy**.

If you want to access two or more devices at the same time you must create two different structures, but be aware that this usually work for high quality devices like Firewire and USB 2.0. Webcams that use USB1.x can be used if connected to different USB 2.0 controllers.

The next thing is to connect to a specific device, because all the other remaining functions depends on this connection. Just call **imVideoCaptureConnect** with one of the available capture device numbers.

You control when a device start processing frames using **imVideoCaptureLive**. Once live the frames can be captured using **imVideoCaptureFrame**. Or you can use **imVideoCaptureOneFrame**, it will start capturing, returns the captured frame and stop capturing.

But before capturing a frame you may want to configure the device. You can do it using Attributes, or at least in Windows you can do it using the configuration dialogs with a call to **imVideoCaptureShowDialog**.

A very simple sequence of operations to capture just one frame from the first device available:

```
imVideoCapture* vc = imVideoCaptureCreate();
if (!imVideoCaptureConnect(vc, 0))
  return;

int width, height;
imVideoCaptureGetImageSize(vc, &width, &height);

// initializes the data pointer
void* data = malloc(width*height*3);

imVideoCaptureOneFrame(vc, data, IM_RGB);
imVideoCaptureDestroy(vc);
```

The capture library is completely independent from the other libraries. It just uses the same description of the data buffer used in **imFileReadImageData**.

Building

You should include the <im_capture.h> header and link with the "im_capture.lib" library. This library is independent of all IM libraries. In Lua call require"imlua_capture".

To link with the capture library in Windows using Visual C you will need the file "strmiids.lib".

To link it using Dev-C++ or Mingw 3 you will need the "**im_capture.dll**" from one of the Visual C++ build. Then use the dlltool to get a "**libim_capture.a**" library:

```
dlltool -d im_capture.def -D im_capture.dll -l libim_capture.a
```

But you will also depend on the msvcr*.dll.

To compile the capture source code you will need the Direct X 9 SDK and Windows SDK for Windows Vista (both very old, therefore I put a compact version of both in the download folder). Notice that since Direct X uses COM, CoInitialize(NULL) is called when the devices are enumerated.

Capture Samples

Capture and GLUT

This application uses GLUT and OpenGL to create a window with a canvas and draw the image into that canvas. But the image is obtained from a capture device. The image can be processed before display and a sequence of captured images can be saved in an AVI file during capture.

You can view the source code here: glut_capture.c

Capture and IUP

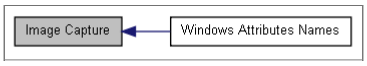
This application uses IUP and OpenGL to create a window with two canvases and draw a video capture image into one canvas. A processed image can be displayed in the second canvas. It can also process frames from a video file.

You can download the source code and some compiler projects here: iupglcap.zip

Data Structures | Modules | Typedefs | Functions

Image Capture

Collaboration diagram for Image Capture:



Data Structures

class	imCapture
	Video Capture Wrapper Class. More...

Modules

	Windows Attributes Names

Typedefs

typedef struct _imVideoCapture	imVideoCapture

Functions

int IM_DECL	imVideoCaptureDeviceCount (void)
const char *IM_DECL	imVideoCaptureDeviceDesc (int device)
const char *IM_DECL	imVideoCaptureDeviceExDesc (int device)
const char *IM_DECL	imVideoCaptureDevicePath (int device)
const char *IM_DECL	imVideoCaptureDeviceVendorInfo (int device)
int IM_DECL	imVideoCaptureReloadDevices (void)
void IM_DECL	imVideoCaptureReleaseDevices (void)
imVideoCapture *IM_DECL	imVideoCaptureCreate (void)
void IM_DECL	imVideoCaptureDestroy (imVideoCapture *vc)
int IM_DECL	imVideoCaptureConnect (imVideoCapture *vc, int device)
void IM_DECL	imVideoCaptureDisconnect (imVideoCapture *vc)
int IM_DECL	imVideoCaptureDialogCount (imVideoCapture *vc)
int IM_DECL	imVideoCaptureShowDialog (imVideoCapture *vc, int dialog, void *parent)
const char *IM_DECL	imVideoCaptureDialogDesc (imVideoCapture *vc, int dialog)
int IM_DECL	imVideoCaptureSetInOut (imVideoCapture *vc, int input, int output, int cross)
int IM_DECL	imVideoCaptureFormatCount (imVideoCapture *vc)
int IM_DECL	imVideoCaptureGetFormat (imVideoCapture *vc, int format, int *width, int *height, char *desc)
int IM_DECL	imVideoCaptureSetFormat (imVideoCapture *vc, int format)
void IM_DECL	imVideoCaptureGetImageSize (imVideoCapture *vc, int *width, int *height)
int IM_DECL	imVideoCaptureSetImageSize (imVideoCapture *vc, int width, int height)
int IM_DECL	imVideoCaptureFrame (imVideoCapture *vc, unsigned char *data, int color_mode, int timeout)
int IM_DECL	imVideoCaptureOneFrame (imVideoCapture *vc, unsigned char *data, int color_mode)
int IM_DECL	imVideoCaptureLive (imVideoCapture *vc, int live)
int IM_DECL	imVideoCaptureResetAttribute (imVideoCapture *vc, const char *attrib, int fauto)
int IM_DECL	imVideoCaptureGetAttribute (imVideoCapture *vc, const char *attrib, double *percent)
int IM_DECL	imVideoCaptureSetAttribute (imVideoCapture *vc, const char *attrib, double percent)
const char **IM_DECL	imVideoCaptureGetAttributeList (imVideoCapture *vc, int *num_attrib)

Detailed Description

Functions to capture images from live video devices.

See im_capture.h

Function Documentation

int IM_DECL imVideoCaptureDeviceCount (void)

Returns the number of available devices.

```
im.VideoCaptureDeviceCount() -> count: number [in Lua 5]
```

const char* IM_DECL imVideoCaptureDeviceDesc (int *device*)

Returns the device description. Returns NULL only if it is an invalid device.

```
im.VideoCaptureDeviceDesc(device: number) -> desc: string [in Lua 5]
```

const char* IM_DECL imVideoCaptureDeviceExDesc (int *device*)

Returns the extended device description. May return NULL.

```
im.VideoCaptureDeviceExDesc(device: number) -> desc: string [in Lua 5]
```

const char* IM_DECL imVideoCaptureDevicePath (int *device*)

Returns the device path configuration. This is a unique string.

```
im.VideoCaptureDevicePath(device: number) -> desc: string [in Lua 5]
```

const char* IM_DECL imVideoCaptureDeviceVendorInfo (int *device*)

Returns the vendor information. May return NULL.

```
im.VideoCaptureDeviceVendorInfo(device: number) -> desc: string [in Lua 5]
```

int IM_DECL imVideoCaptureReloadDevices	(	void		)	

Reload the device list. The devices can be dynamically removed or added to the system. Returns the number of available devices.

```
im.imVideoCaptureReloadDevices() -> count: number [in Lua 5]
```

void IM_DECL imVideoCaptureReleaseDevices	(	void		)	

Release the device list. Useful is you need to track leak erros in your application.

```
im.imVideoCaptureReleaseDevices() [in Lua 5]
```

imVideoCapture* IM_DECL imVideoCaptureCreate	(	void		)	

Creates a new imVideoCapture object.
Returns NULL if there is no capture device available.
In Windows returns NULL if DirectX version is older than 8.
In Lua the IM videocapture metatable name is "imVideoCapture". When converted to a string will return "imVideoCapture(%p)" where p is replaced by the userdata address. If the videocapture is already destroyed by im.VideoCaptureDestroy, then it will return also the suffix "-destroyed".

```
im.VideoCaptureCreate() -> vc: imVideoCapture [in Lua 5]
```

void IM_DECL imVideoCaptureDestroy	(	imVideoCapture *	*vc*	)	

Destroys a imVideoCapture object.
In Lua if this function is not called, the videocapture is destroyed by the garbage collector.

```
im.VideoCaptureDestroy(vc: imVideoCapture) [in Lua 5]
```

```
vc:Destroy() [in Lua 5]
```

int IM_DECL imVideoCaptureConnect	(	imVideoCapture *	*vc,*	
		int	*device*	
	)			

Connects to a capture device. More than one imVideoCapture object can be created but they must be connected to different devices.
If the object is connected it will disconnect first.
Use -1 to return the current connected device, in this case returns -1 if not connected.
Returns zero if failed.

```
vc:Connect([device: number]) -> ret: number [in Lua 5]
```

void IM_DECL imVideoCaptureDisconnect	(	imVideoCapture *	*vc*	)	

Disconnect from a capture device.

```
vc:Disconnect() [in Lua 5]
```

int IM_DECL imVideoCaptureDialogCount	(	imVideoCapture *	*vc*	)	

Returns the number of available configuration dialogs.

```
vc:DialogCount() -> count: number [in Lua 5]
```

int IM_DECL imVideoCaptureShowDialog	(	imVideoCapture *	*vc,*	
		int	*dialog,*	
		void *	*parent*	
	)			

Displays a configuration modal dialog of the connected device.
In Windows, the capturing will be stopped in some cases.
In Windows parent is a HWND of a parent window, it can be NULL.
dialog can be from 0 to imVideoCaptureDialogCount.
Returns zero if failed.

```
vc:ShowDialog(dialog: number, parent: userdata) -> error: boolean [in Lua 5]
```

const char* IM_DECL imVideoCaptureDialogDesc	(	imVideoCapture *	*vc,*	
		int	*dialog*	
	)			

Returns the description of a configuration dialog. dialog can be from 0 to imVideoCaptureDialogCount.

```
vc:DialogDesc(dialog: number) -> desc: string [in Lua 5]
```

int IM_DECL imVideoCaptureSetInOut	(	imVideoCapture *	*vc,*	
		int	*input,*	
		int	*output,*	
		int	*cross*	
	)			

Allows to control the input and output of devices that have multiple input and outputs. The cross index controls in which stage the input/output will be set. Usually use 1, but some capture boards has a second stage. In Direct X it controls the crossbars.

```
vc:SetInOut(input, output, cross: number) -> error: boolean [in Lua 5]
```

int IM_DECL imVideoCaptureFormatCount	(	imVideoCapture *	*vc*	)	

Returns the number of available video formats.
Returns zero if failed.

```
vc:FormatCount() -> count: number [in Lua 5]
```

int IM_DECL imVideoCaptureGetFormat	(	imVideoCapture *	*vc,*	
		int	*format,*	
		int *	*width,*	
		int *	*height,*	
		char *	*desc*	
	)			

Returns information about the video format.
format can be from 0 to imVideoCaptureFormatCount.
desc should be of size 10.
The image size is usually the maximum size for that format. Other sizes can be available using imVideoCaptureSetImageSize.
Returns zero if failed.

```
vc:GetFormat(format: number) -> error: boolean, width: number, height: number, desc: string [in Lua 5]
```

int IM_DECL imVideoCaptureSetFormat	(	imVideoCapture *	*vc,*	
		int	*format*	
	)			

Changes the video format of the connected device.
Should NOT work for DV devices. Use imVideoCaptureSetImageSize only.
Use -1 to return the current format, in this case returns -1 if failed.
When the format is changed in the dialog, for some formats the returned format is the preferred format, not the current format.
This will not affect color_mode of the capture image.
Returns zero if failed.

```
vc:SetFormat([format: number]) -> error: boolean | format: number [in Lua 5]
```

void IM_DECL imVideoCaptureGetImageSize	(	imVideoCapture *	*vc,*	
		int *	*width,*	
		int *	*height*	
	)			

Returns the current image size of the connected device.
width and height returns 0 if not connected.

```
vc:GetImageSize() -> width: number, height: number [in Lua 5]
```

int IM_DECL imVideoCaptureSetImageSize	(	imVideoCapture *	*vc,*	
		int	*width,*	
		int	*height*	
	)			

Changes the image size of the connected device.
Similar to imVideoCaptureSetFormat, but changes only the size.
Valid sizes can be obtained with imVideoCaptureGetFormat.
Returns zero if failed.

```
vc:SetImageSize(width: number, height: number) -> error: boolean [in Lua 5]
```

int IM_DECL imVideoCaptureFrame	(	imVideoCapture *	*vc,*	
		unsigned char *	*data,*	
		int	*color_mode,*	
		int	*timeout*	
	)			

Returns a new captured frame. Use -1 for infinite timeout.
Color space can be IM_RGB or IM_GRAY, and mode can be packed (IM_PACKED) or not.
Data type is always IM_BYTE.
It can not have an alpha channel and orientation is always bottom up.
Returns zero if failed or timeout expired, the buffer is not changed.

```
vc:Frame(image: imImage, timeout: number) -> error: boolean [in Lua 5]
```

int IM_DECL imVideoCaptureOneFrame	(	imVideoCapture *	*vc,*	
		unsigned char *	*data,*	
		int	*color_mode*	
	)			

Start capturing, returns the new captured frame and stop capturing.
This is more useful if you are switching between devices.
Data format is the same as imVideoCaptureFrame.
Returns zero if failed.

```
vc:OneFrame(image: imImage) -> error: boolean [in Lua 5]
```

int IM_DECL imVideoCaptureLive	(	imVideoCapture *	*vc,*
		int	*live*
	)		

Start capturing.
Use -1 to return the current state.
Returns zero if failed.

```
vc:Live([live: number]) -> error: boolean | live: number [in Lua 5]
```

int IM_DECL imVideoCaptureResetAttribute	(	imVideoCapture *	*vc,*
		const char *	*attrib,*
		int	*fauto*
	)		

Resets a camera or video attribute to the default value or to the automatic setting.
Not all attributes support automatic modes.
Returns zero if failed.

```
vc:ResetAttribute(attrib: string, fauto: boolean) -> error: boolean [in Lua 5]
```

int IM_DECL imVideoCaptureGetAttribute	(	imVideoCapture *	*vc,*
		const char *	*attrib,*
		double *	*percent*
	)		

Returns a camera or video attribute in percentage of the valid range value.
Returns zero if failed or attribute not supported.

```
vc:GetAttribute(attrib: string) -> error: boolean, percent: number [in Lua 5]
```

int IM_DECL imVideoCaptureSetAttribute	(	imVideoCapture *	*vc,*
		const char *	*attrib,*
		double	*percent*
	)		

Changes a camera or video attribute in percentage of the valid range value.
Returns zero if failed or attribute not supported.

```
vc:SetAttribute(attrib: string, percent: number) -> error: boolean [in Lua 5]
```

const char** IM_DECL imVideoCaptureGetAttributeList	(	imVideoCapture *	*vc,*
		int *	*num_attrib*
	)		

Returns a list of the description of the valid attributes for the device class.
But each device may still not support some of the returned attributes.
Use the return value of imVideoCaptureGetAttribute to check if the attribute is supported.

```
vc:GetAttributeList() -> attrib_list: table of strings [in Lua 5]
```

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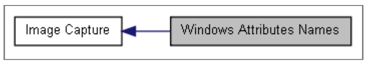
Windows Attributes Names
[Image Capture]

Collaboration diagram for Windows Attributes Names:



Not all attributes are supported by each device. Use the return value of imVideoCaptureGetAttribute to check if the attribute is supported.

```
VideoBrightness - Specifies the brightness, also called the black level.
VideoContrast - Specifies the contrast, expressed as gain factor.
VideoHue - Specifies the hue angle.
VideoSaturation - Specifies the saturation.
VideoSharpness - Specifies the sharpness.
VideoGamma - Specifies the gamma.
VideoColorEnable - Specifies the color enable setting. (0/100)
VideoWhiteBalance - Specifies the white balance, as a color temperature in degrees Kelvin.
VideoBacklightCompensation - Specifies the backlight compensation setting. (0/100)
VideoGain - Specifies the gain adjustment.
CameraPanAngle - Specifies the camera's pan angle. To 100 rotate right, To 0 rotate left (view from above).
CameraTiltAngle - Specifies the camera's tilt angle.  To 100 rotate up, To 0 rotate down.
CameraRollAngle - Specifies the camera's roll angle. To 100 rotate right, To 0 rotate left.
CameraLensZoom - Specifies the camera's zoom setting.
CameraExposure - Specifies the exposure setting.
CameraIris - Specifies the camera's iris setting.
CameraFocus - Specifies the camera's focus setting, as the distance to the optimally focused target.
FlipHorizontal - Specifies the video will be flipped in the horizontal direction.
FlipVertical - Specifies the video will be flipped in the vertical direction.
AnalogFormat - Specifies the video format standard NTSC, PAL, etc. Valid values:
    NTSC_M     = 0
    NTSC_M_J   = 1
    NTSC_433   = 2
    PAL_B      = 3
    PAL_D      = 4
    PAL_H      = 5
    PAL_I      = 6
    PAL_M      = 7
    PAL_N      = 8
```

```
      PAL_60     = 9
      SECAM_B    = 10
      SECAM_D    = 11
      SECAM_G    = 12
      SECAM_H    = 13
      SECAM_K    = 14
      SECAM_K1   = 15
      SECAM_L    = 16
      SECAM_L1   = 17
      PAL_N_COMBO = 18
```

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Image Processing

We use the simpliest model possible, a function with input data, output data and control parameters.

The operations have usually one or more input images, and one or more output images. We avoid implementing in-place operations, but many operations can use the same data for input and output. The data type, color mode and size of the images depends on the operation. Sometimes the operations can change the data type to increase the precision of the results, but normally only a few operations will change the size (resize and geometric) and color mode (color conversion). All of these details are described in each function documentation, check before using them.

There is no ROI (Region Of Interest) management, but you can **imProcessCrop**, **imProcess***, then **imProcessInsert** the result in the original image.

The image data of the output image is assumed to be zero before any operation. This is always true after creating a new image, but if you are reusing an image for several operation use **imImageClear** to zero the image data between operations.

Image Processing Guide

Using

You should include one or more headers: <im_process_ana.h>, <im_process_glo.h>, <im_process_loc.h> and <im_process_pon.h>. And you must link with the "im_process.a/im_process.lib" library. In Lua call require"imlua_process".

The processing operations are very simple to use. Usually you just have to call the respective function. But you will have to ensure yourself that the image parameters for the input and output data are correct. Here is an example:

```
void imProcessFlip(const imImage* src_image, imImage* dst_image);
```

The processing operations are exclusive for the **imImage** structure. This makes the implementation cleaner and much easier to process color images since the planes are separated. But remmber that you can always use the **imImageInit** function to initializes an **imImage** structure with your own buffer.

The image data of the output image is assumed to be zero before any operation. This is always true after creating a new image, but if you are reusing an image for several operation use **imImageClear** to zero the image data between operations.

New Operations

An operation complexity is directly affected by the number of data types it will operate.

If it is only one, than it is as simple as:

```
void DoProc(imbyte* data, int width, int height)
{
  for (int y = 0; y < height; y++)
  {
    for (int x = 0; x < width; x++)
    {
      // Do something
      int offset = y * width + x;

      data[offset] = 0;
    }
  }
}

void SampleProc(imImage* image)
{
  // a loop for all the color planes
  for (int d = 0; d < image->depth; d++)
  {
    // Notice that the same operation may be used to process each color component
    DoProc((imbyte*)image->data[d], image->width, image->height);
  }
}
```

Or if you want to use templates to allow a more number of types:

```
template <class T>
void DoProc2(const T* src_data, T* dst_data, int count)
{
  for (int i = 0; i < count; i++)
  {
    src_data[i] = dst_data[i];

    // or a more low level approach

    *src_data++ = *dst_data++;
  }
}

// This is a sample that do not depends on the spatial distribution of the data.
// It uses data[0], the pointer where all depths depends on.

void SampleProc2(const imImage* src_image, imImage* dst_image)
{
  int total_count = src_image->count * src_image->depth;
  switch(src_image->data_type)
  {
  case IM_BYTE:
    DoProc((imbyte*)src_image->data[0], (imbyte*)dst_image->data[0], total_count);
    break;
  case IM_USHORT:
    DoProc((imushort*)src_image->data[0], (imushort*)dst_image->data[0], total_count);
    break;
  case IM_INT:
    DoProc((int*)src_image->data[0], (int*)dst_image->data[0], total_count);
    break;
  case IM_FLOAT:
    DoProc((float*)src_image->data[0], (float*)dst_image->data[0], total_count);
    break;
  case IM_CFLOAT:
    DoProc((imcfloat*)src_image->data[0], (imcfloat*)dst_image->data[0], total_count);
    break;
  }
}
```

The first sample can be implemented in C, but the second sample can not, it must be in C++. Check the manual and the source code for many operations already available.

Counters

To add support for the counter callback to a new operation is very simple. The following code shows how:

```
int counter = imCounterBegin("Process Test 1");
imCounterTotal(counter, count_steps, "Processing");

for (int i = 0; i < count_steps; i++)
{
  // Do something


  if (!imCounterInc(counter))
    return IM_ERR_COUNTER;
}

imCounterEnd(counter);
```

Every time you call **imCounterTotal** between a **imCounterBegin/imCounterEnd** for the same counter means that you are starting a count at that counter. So one operation can be composed by many sub-operations and still have a counter to display progress. For example, each call to the **imFileReadImageData** starts a new count for the same counter.

A nice thing to do when counting is not to display too small progress. To accomplish that in the implementation of the counter callback consider a minimum delay from one display to another.

See Utilities / Counter.

Image Processing Samples

Fourier Transform

This is another command line application that process an image in the Fourier Frequency Domain. In this domain the image is a map of the spatial frequencies of the original image. It depends on the IM main library and on the IM_FFTW library. The FFTW is a very fast Fourier transform, but is contaminated by the GPL license, so everything must be also GPL. To use it in a commercial application you must contact the MIT and pay for a commercial license.

Se also Reference / Image Processing / Domain Transform Operations.

You can view the source code here: proc_fourier.cpp

Hough Lines

The Hough transform can be used to detect lines in an image. But it results are highly dependent on other operations done before and after the transform. Here you can see a small pseudo code that illustrates a possible sequence of operations to detect lines using the Hough transform.

First the canny operator will isolate the borders, the threshold will mark the candidate pixels. After the transform the local maximum are isolated to detect the line parameters of the lines that have many pixels from the candidate ones. The last operation will just draw the detected lines over the original gray scale image.

```
imProcessCanny(in,out,stddev)
imProcessHysteresisThreshold(in,out,low,high)

imProcessHoughLines(in,out)
imProcessLocalMaxThreshold(in,out,size,min)

imProcessHoughLinesDraw(in1,in2,in3,out)
```

Or a more complete sequence using another approach:

```
gray = imImageCreate(width, height, IM_GRAY, IM_BYTE);
binary = imImageCreate(width, height, IM_BINARY, IM_BYTE);
binary2 = imImageClone(binary);

rhomax = sqrt(width*width +height*height)/2;
hough_height=2*rhomax+1;
hough = imImageCreate(180, hough_height, IM_GRAY, IM_INT);
hough_binary = imImageCreate(180, hough_height, IM_BINARY, IM_BYTE);

imConvertColorSpace(rgb, gray);

// very important step, the quality of the detected lines are highly dependent on
// the quality of the binary image
// Using a simple threshold like in here maybe not a good solution for your image
imProcessPercentThreshold(gray, binary, percent=50);

// eliminates unwanted objects, depending on the quality of the threshold
// this step can be skiped
imProcessBinMorphClose(binary, binary2, 3, 1);
imProcessPrune(binary2, binary, 4, size=100, 0);

// Is there any holes in the objects?
// Holes also have borders...
imProcessFillHoles(binary, binary2, 4);

// leave only the object borders
imProcessPerimeterLine(binary2, binary);

// here you should have near only the lines you want to detect.
// if there are more or less lines that you want redo the previous steps

imProcessHoughLines(binary, hough);
imProcessLocalMaxThreshold(hough, hough_binary, 7, 100);

// this is optional, it will draw the results
imProcessHoughLinesDraw(gray,hough,hough_binary,draw_hough);
```

In the result of **imProcessLocalMaxThreshold** there will be several white pixels. They represent the detected lines. Defining:

```
Y = a * X + b
cos(theta) * X + sin(theta) * Y = rho
```

```
where:
  X = x - width/2
  Y = y - height/2

because the origin of the transform is in the center of the image
```

Each coordinate in the transform has values in the intervals:

```
theta = 0 .. 179  (horizontal coordinate of the hough space)
rho = -rhomax .. rhomax    (vertical coordinate of the hough space,
                            vertically centered in the image)

where:
    rhomax = sqrt(width*width + height*height) /2            (width and height of the original image)
```

For each (xi, yi) point found in the result image:

```
theta = xi;
rho = yi - rhomax;

then:

a = -cos(theta)/sin(theta);
b = (rho + (width/2)*cos(theta) + (height/2)*sin(theta))/sin(theta);
```

The complex formula for "b" came from the fact that we have to shift the result to the image origin at (0,0).

Image Analysis

The following pseudo code ilustrates the sequence of operations to measure regions. This is also called Blob Analysis.

First the regions are isolated from background using a threshold. Then regions too small or too large are eliminated and the holes are filled in this example. After the regions are found we can start measuring properties of the regions like area and perimeter.

```
imProcessSliceThreshold(in, out, level1, level2)
imProcessPrune(in, out, connect, size1, size2)
imProcessFillHoles(in, out, connect)
imAnalyzeFindRegions(in, out, connect)
imAnalyzeMeasureArea(in, area)
imAnalyzeMeasurePerimeter(in, perim)
```

Modules

Image Processing

Collaboration diagram for Image Processing:

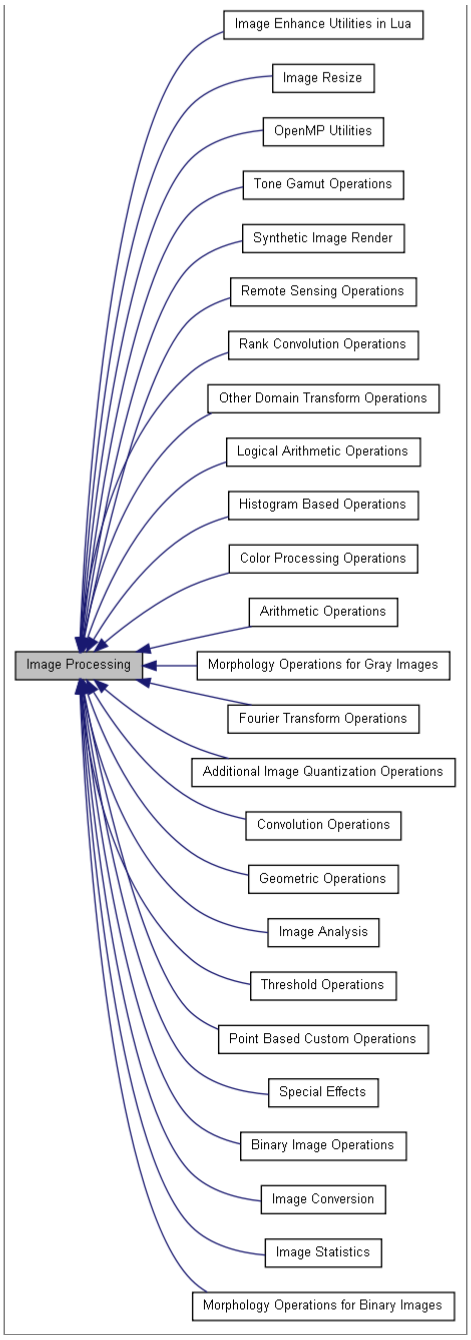
Image Enhance Utilities in Lua
Image Resize
OpenMP Utilities
Tone Gamut Operations
Synthetic Image Render
Remote Sensing Operations
Rank Convolution Operations
Other Domain Transform Operations
Logical Arithmetic Operations
Histogram Based Operations
Color Processing Operations
Arithmetic Operations
Image Processing
Morphology Operations for Gray Images
Fourier Transform Operations
Additional Image Quantization Operations
Convolution Operations
Geometric Operations
Image Analysis
Threshold Operations
Point Based Custom Operations
Special Effects
Binary Image Operations
Image Conversion
Image Statistics
Morphology Operations for Binary Images

Modules

Detailed Description

Several image processing functions based on the imImage structure.

You must link the application with "im_process.lib/.a/.so". In Lua call require"imlua_process".
Some complex operations use the Counter.
There is no check on the input/output image properties, check each function documentation before using it.

To enable OpenMP support use the "im_process_omp.lib/.a/.so" libraries. In Lua call require"imlua_process_omp".
Notice that multi-threading can be slower than single thread because of the overhead introduced by the threads configuration.
When using the "im_process_omp" library you can reduce that overhead by using the imProcessOpenMPSetMinCount and imProcessOpenMPSetNumThreads functions. But notice that this is not the same thing as using the library without support for OpenMP.

The parallelization in im_process involves only loops, usually for all the pixels in the image. To accomplish that we had to first isolate the Counter code, so the counting could also be done in parallel. Then we made sure that all loops contain only local variables to avoid unnecessary shared variables that could lead to incorrect results. In a few places we use the "atomic" directive to be able to compute histograms and other counts. But min/max computation must be done in single thread because of limitations in OpenMP support in C (in Fortran it would be easy to implement).

For more information on OpenMP:
http://www.openmp.org

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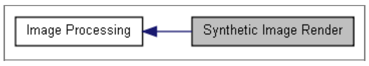
Typedefs | Functions

Synthetic Image Render
[Image Processing]

Collaboration diagram for Synthetic Image Render:



Typedefs

typedef double(*	imRenderFunc)(int x, int y, int d, double *params)
typedef double(*	imRenderCondFunc)(int x, int y, int d, int *cond, double *params)

Functions

int	imProcessRenderOp (imImage *image, imRenderFunc func, const char *render_name, double *params, int plus)
int	imProcessRenderOpAlpha (imImage *image, imRenderFunc func, const char *render_name, double *params, int plus)
int	imProcessRenderCondOp (imImage *image, imRenderCondFunc func, const char *render_name, double *params)
int	imProcessRenderCondOpAlpha (imImage *image, imRenderCondFunc func, const char *render_name, double *params)
int	imProcessRenderAddSpeckleNoise (const imImage *src_image, imImage *dst_image, double percent)
int	imProcessRenderAddGaussianNoise (const imImage *src_image, imImage *dst_image, double mean, double stddev)
int	imProcessRenderAddUniformNoise (const imImage *src_image, imImage *dst_image, double mean, double stddev)
int	imProcessRenderRandomNoise (imImage *image)
int	imProcessRenderConstant (imImage *image, double *value)
int	imProcessRenderWheel (imImage *image, int internal_radius, int external_radius)
int	imProcessRenderCone (imImage *image, int radius)
int	imProcessRenderTent (imImage *image, int tent_width, int tent_height)
int	imProcessRenderRamp (imImage *image, int start, int end, int vert_dir)
int	imProcessRenderBox (imImage *image, int box_width, int box_height)
int	imProcessRenderSinc (imImage *image, double x_period, double y_period)
int	imProcessRenderGaussian (imImage *image, double stddev)
int	imProcessRenderLapOfGaussian (imImage *image, double stddev)
int	imProcessRenderCosine (imImage *image, double x_period, double y_period)
int	imProcessRenderGrid (imImage *image, int x_space, int y_space)
int	imProcessRenderChessboard (imImage *image, int x_space, int y_space)
void	imProcessRenderFloodFill (imImage *image, int start_x, int start_y, double *replace_color, double tolerance)

Detailed Description

Renders some 2D mathematical functions as images. All the functions operates in-place and supports all data types except complex.
These functions are mean to be used in gray images, but color images can also be used. For color images the rendering will be repeated for each plane, except for the alpha plane when present.

See im_process_pnt.h

Typedef Documentation

typedef double(* imRenderFunc)(int x, int y, int d, double *params)

Render Funtion

Render Function.

```
func(x: number, y: number, d: number, params: table) -> value: number [in Lua 5]
```

typedef double(* imRenderCondFunc)(int x, int y, int d, int *cond, double *params)

Render Conditional Function.

```
func(x: number, y: number, d: number, params: table) -> value: number, cond: boolean [in Lua 5]
```

Function Documentation

int imProcessRenderOp	(	imImage *	*image,*
		imRenderFunc	*func,*
		const char *	*render_name,*
		double *	*params,*
		int	*plus*
	)		

Render a synthetic image using a render function.
plus will make the render be added to the current image data, or else all data will be replaced. All the render functions use this or the conditional function.
Returns zero if the counter aborted.

```
im.ProcessRenderOp(image: imImage, func: function, render_name: string, params: table, plus: boolean) -> counter: boolean [in Lua 5]
```

int imProcessRenderOpAlpha	(	imImage *	*image,*
		imRenderFunc	*func,*
		const char *	*render_name,*
		double *	*params,*
		int	*plus*
	)		

Same as imProcessRenderOp but with alpha channel support. (since 3.14) Can also be used if the image does not have alpha.

```
im.ProcessRenderOpAlpha(image: imImage, func: function, render_name: string, params: table, plus: boolean) -> counter: boolean [in Lua 5]
```

int imProcessRenderCondOp	(	imImage *	*image,*
		imRenderCondFunc	*func,*
		const char *	*render_name,*
		double *	*params*
	)		

Render a synthetic image using a conditional render function.
Data will be rendered only if the conditional parameter is true.
Returns zero if the counter aborted.

```
im.ProcessRenderCondOp(image: imImage, func: function, render_name: string, params: table) -> counter: boolean [in Lua 5]
```

int imProcessRenderCondOpAlpha	(	imImage *	*image,*
		imRenderCondFunc	*func,*
		const char *	*render_name,*
		double *	*params*
	)		

Same as imProcessRenderOp but with alpha channel support. (since 3.14) Can also be used if the image does not have alpha.

```
im.ProcessRenderCondOpAlpha(image: imImage, func: function, render_name: string, params: table) -> counter: boolean [in Lua 5]
```

int imProcessRenderAddSpeckleNoise	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		double	*percent*
	)		

Render speckle noise on existing data. Can be done in-place.

```
im.ProcessRenderAddSpeckleNoise(src_image: imImage, dst_image: imImage, percent: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessRenderAddSpeckleNoiseNew(src_image: imImage, percent: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessRenderAddGaussianNoise	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		double	*mean,*
		double	*stddev*
	)		

Render gaussian noise on existing data. Can be done in-place.

```
im.ProcessRenderAddGaussianNoise(src_image: imImage, dst_image: imImage, mean: number, stddev: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessRenderAddGaussianNoiseNew(src_image: imImage, mean: number, stddev: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessRenderAddUniformNoise	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double	*mean,*	
		double	*stddev*	
	)			

Render uniform noise on existing data. Can be done in-place.

```
im.ProcessRenderAddUniformNoise(src_image: imImage, dst_image: imImage, mean: number, stddev: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessRenderAddUniformNoiseNew(src_image: imImage, mean: number, stddev: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessRenderRandomNoise	(	imImage *	*image*	)	

Render random noise.

```
im.ProcessRenderRandomNoise(image: imImage) -> counter: boolean [in Lua 5]
```

int imProcessRenderConstant	(	imImage *	*image,*	
		double *	*value*	
	)			

Render a constant. The number of values must match the depth of the image. Value must have the same number of the image depth including alpha. Alpha channel is supported (since 3.14).

```
im.ProcessRenderConstant(image: imImage, value: table of number) -> counter: boolean [in Lua 5]
```

int imProcessRenderWheel	(	imImage *	*image,*	
		int	*internal_radius,*	
		int	*external_radius*	
	)			

Render a centered wheel.

```
im.ProcessRenderWheel(image: imImage, internal_radius: number, external_radius: number) -> counter: boolean [in Lua 5]
```

int imProcessRenderCone	(	imImage *	*image,*	
		int	*radius*	
	)			

Render a centered cone.

```
im.ProcessRenderCone(image: imImage, radius: number) -> counter: boolean [in Lua 5]
```

int imProcessRenderTent	(	imImage *	*image,*	
		int	*tent_width,*	
		int	*tent_height*	
	)			

Render a centered tent.

```
im.ProcessRenderTent(image: imImage, tent_width: number, tent_height: number) -> counter: boolean [in Lua 5]
```

int imProcessRenderRamp	(	imImage *	*image,*	
		int	*start,*	
		int	*end,*	
		int	*vert_dir*	
	)			

Render a ramp. Direction can be vertical (1) or horizontal (0).

```
im.ProcessRenderRamp(image: imImage, start: number, end: number, vert_dir: boolean) -> counter: boolean [in Lua 5]
```

int imProcessRenderBox	(	imImage *	*image,*	
		int	*box_width,*	
		int	*box_height*	
	)			

Render a centered box.

```
im.ProcessRenderBox(image: imImage, box_width: number, box_height: number) -> counter: boolean [in Lua 5]
```

int imProcessRenderSinc	(	imImage *	*image,*	
		double	*x_period,*	
		double	*y_period*	
	)			

Render a centered sinc.

```
im.ProcessRenderSinc(image: imImage, x_period: number, y_period: number) -> counter: boolean [in Lua 5]
```

int imProcessRenderGaussian	(	imImage *	*image,*	
		double	*stddev*	
	)			

Render a centered gaussian.

```
im.ProcessRenderGaussian(image: imImage, stddev: number) -> counter: boolean [in Lua 5]
```

int imProcessRenderLapOfGaussian	(	imImage *	*image,*	
		double	*stddev*	
	)			

Render the laplacian of a centered gaussian.

```
im.ProcessRenderLapOfGaussian(image: imImage, stddev: number) -> counter: boolean [in Lua 5]
```

int imProcessRenderCosine	(	imImage *	*image,*	
		double	*x_period,*	
		double	*y_period*	
	)			

Render a centered cosine.

```
im.ProcessRenderCosine(image: imImage, x_period: number, y_period: number) -> counter: boolean [in Lua 5]
```

int imProcessRenderGrid	(	imImage *	*image,*	
		int	*x_space,*	
		int	*y_space*	
	)			

Render a centered grid.

```
im.ProcessRenderGrid(image: imImage, x_space: number, y_space: number) -> counter: boolean [in Lua 5]
```

int imProcessRenderChessboard	(	imImage *	*image,*	
		int	*x_space,*	
		int	*y_space*	
	)			

Render a centered chessboard.

```
im.ProcessRenderChessboard(image: imImage, x_space: number, y_space: number) -> counter: boolean [in Lua 5]
```

void imProcessRenderFloodFill	(	imImage *	*image,*	
		int	*start_x,*	
		int	*start_y,*	
		double *	*replace_color,*	
		double	*tolerance*	
	)			

Render a color or gray flood fill.
If image has the IM_RGB color space, then replace_color must have 3 components, or 4 when alpha is present.
If image has the IM_GRAY or IM_MAP color space, then replace_color must have 1 component.
For IM_MAP images the colors in the palette will be compared instead of the indices (since 3.14). Alpha channel is supported in IM_RGB images (since 3.14), alpha will also be considered in the comparison.

```
im.ProcessRenderFloodFill(image: imImage, start_x, start_y: number, replace_color: table of 3 numbers, tolerance: number)  [in Lua 5]
```

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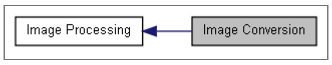
Functions

Image Conversion
[Image Processing]

Collaboration diagram for Image Conversion:



Functions	
int	imProcessConvertDataType (const imImage *src_image, imImage *dst_image, int cpx2real, double gamma, int absolute, int cast_mode)
int	imProcessConvertColorSpace (const imImage *src_image, imImage *dst_image)
int	imProcessConvertToBitmap (const imImage *src_image, imImage *dst_image, int cpx2real, double gamma, int absolute, int cast_mode)

Detailed Description

Same as imConvert functions but using OpenMP when enabled.

See im_process_pnt.h

Function Documentation

int imProcessConvertDataType	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*cpx2real,*
		double	*gamma,*
		int	*absolute,*
		int	*cast_mode*
	)		

Same as imConvertDataType.

```
im.ProcessConvertDataType(src_image: imImage, dst_image: imImage, cpx2real: number, gamma: number, absolute: boolean, cast_mode: number) -> error: number [in Lua 5]
```

```
im.ProcessConvertDataTypeNew(image: imImage, data_type: number, cpx2real: number, gamma: number, absolute: boolean, cast_mode: number) -> error: number, new_image: imImage
```

int imProcessConvertColorSpace	(	const imImage *	*src_image,*
		imImage *	*dst_image*
	)		

Same as imConvertColorSpace.

```
im.ProcessConvertColorSpace(src_image: imImage, dst_image: imImage) -> error: number [in Lua 5]
```

```
im.ProcessConvertColorSpaceNew(image: imImage, color_space: number, has_alpha: boolean) -> error: number, new_image: imImage [in Lua 5]
```

int imProcessConvertToBitmap	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*cpx2real,*
		double	*gamma,*
		int	*absolute,*
		int	*cast_mode*
	)		

Same as imConvertToBitmap.

```
im.ProcessConvertToBitmap(src_image: imImage, dst_image: imImage, cpx2real: number, gamma: number, absolute: boolean, cast_mode: number) -> error: number [in Lua 5]
```

```
im.ProcessConvertToBitmapNew(image: imImage, color_space: number, has_alpha: boolean, cpx2real: number, gamma: number, absolute: boolean, cast_mode: number) -> error: numb
```

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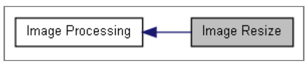
Functions

Image Resize
[Image Processing]

Collaboration diagram for Image Resize:



Functions

int	imProcessReduce (const imImage *src_image, imImage *dst_image, int order)
int	imProcessResize (const imImage *src_image, imImage *dst_image, int order)
int	imProcessReduceBy4 (const imImage *src_image, imImage *dst_image)
int	imProcessCrop (const imImage *src_image, imImage *dst_image, int xmin, int ymin)
int	imProcessInsert (const imImage *src_image, const imImage *region_image, imImage *dst_image, int xmin, int ymin)
int	imProcessAddMargins (const imImage *src_image, imImage *dst_image, int xmin, int ymin)

Detailed Description

Operations to change the image size.
All size operations include the alpha channel if any.

See im_process_loc.h

Function Documentation

int imProcessReduce	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*order*
	)		

Only reduze the image size using the given decimation order.
Supported decimation orders:

- 0 - zero order (mean) [default in Lua for MAP and BINARY]
- 1 - first order (bilinear decimation) [default in Lua] Images must be of the same type. If image type is IM_MAP or IM_BINARY, must use order=0.

Returns zero if the counter aborted.

```
im.ProcessReduce(src_image: imImage, dst_image: imImage, order: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessReduceNew(image: imImage, width, height[, order]: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessResize	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*order*	
	)			

Change the image size using the given interpolation order.
Supported interpolation orders:

- 0 - zero order (near neighborhood) [default in Lua for MAP and BINARY]
- 1 - first order (bilinear interpolation) [default in Lua]
- 3 - third order (bicubic interpolation) Images must be of the same type. If image type is IM_MAP or IM_BINARY, must use order=0.
  Returns zero if the counter aborted.

```
im.ProcessResize(src_image: imImage, dst_image: imImage, order: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessResizeNew(image: imImage, width, height[, order]: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessReduceBy4	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Reduze the image area by 4 (w/2,h/2).
Uses a fast average of neighbors. Images must be of the same type. Target image size must be source image width/2, height/2. Can not operate on IM_MAP nor IM_BINARY images. Returns zero if the counter aborted.

```
im.ProcessReduceBy4(src_image: imImage, dst_image: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessReduceBy4New(image: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessCrop	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*xmin,*	
		int	*ymin*	
	)			

Extract a rectangular region from an image.
Images must be of the same type. Target image size must be smaller than source image width-xmin, height-ymin.
ymin and xmin must be >0 and <size. Returns zero if the counter aborted.

```
im.ProcessCrop(src_image: imImage, dst_image: imImage, xmin: number, ymin: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessCropNew(image: imImage, xmin, xmax, ymin, ymax: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessInsert	(	const imImage *	*src_image,*	
		const imImage *	*region_image,*	
		imImage *	*dst_image,*	
		int	*xmin,*	
		int	*ymin*	
	)			

Insert a rectangular region in an image.
Images must be of the same type. Region image size can be larger than source image.
ymin and xmin must be >0 and <size.
Source and target must be of the same size. Can be done in-place. Returns zero if the counter aborted.

```
im.ProcessInsert(src_image: imImage, region_image: imImage, dst_image: imImage, xmin: number, ymin: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessInsertNew(image: imImage, region_image: imImage, xmin: number, ymin: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessAddMargins	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*xmin,*	
		int	*ymin*	
	)			

Increase the image size by adding pixels with zero value.
Images must be of the same type. Target image size must be greatter or equal than source image width+xmin, height+ymin. Returns zero if the counter aborted.

```
im.ProcessAddMargins(src_image: imImage, dst_image: imImage, xmin: number, ymin: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessAddMarginsNew(image: imImage, xmin, xmax, ymin, ymax: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

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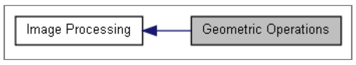
Functions

Geometric Operations

[Image Processing]

Collaboration diagram for Geometric Operations:



Functions

void	imProcessCalcRotateSize (int width, int height, int *new_width, int *new_height, double cos0, double sin0)
int	imProcessRotate (const imImage *src_image, imImage *dst_image, double cos0, double sin0, int order)
int	imProcessRotateRef (const imImage *src_image, imImage *dst_image, double cos0, double sin0, int x, int y, int to_origin, int order)
int	imProcessRotate90 (const imImage *src_image, imImage *dst_image, int dir_clockwise)
int	imProcessRotate180 (const imImage *src_image, imImage *dst_image)
int	imProcessMirror (const imImage *src_image, imImage *dst_image)
int	imProcessFlip (const imImage *src_image, imImage *dst_image)
int	imProcessRadial (const imImage *src_image, imImage *dst_image, double k1, int order)
int	imProcessLensDistort (const imImage *src_image, imImage *dst_image, double a, double b, double c, int order)
int	imProcessSwirl (const imImage *src_image, imImage *dst_image, double k1, int order)
int	imProcessInterlaceSplit (const imImage *src_image, imImage *dst_image1, imImage *dst_image2)

Detailed Description

Operations to change the shape of the image.
All geometric operations include the alpha channel if any.

See im_process_loc.h

Function Documentation

void imProcessCalcRotateSize	(	int	*width,*
		int	*height,*
		int *	*new_width,*
		int *	*new_height,*
		double	*cos0,*
		double	*sin0*
	)		

Calculates the size of the new image after rotation.

```
im.ProcessCalcRotateSize(width: number, height: number, cos0: number, sin0: number) [in Lua 5]
```

int imProcessRotate	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		double	*cos0,*
		double	*sin0,*
		int	*order*
	)		

Rotates the image using the given interpolation order (see imProcessResize).
Images must be of the same type. The target size can be calculated using imProcessCalcRotateSize to fit the new image size, or can be any size, including the original size. The rotation is relative to the center of the image.
Returns zero if the counter aborted.

```
im.ProcessRotate(src_image: imImage, dst_image: imImage, cos0: number, sin0: number[, order]: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessRotateNew(image: imImage, cos0, sin0, order: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessRotateRef	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		double	*cos0,*
		double	*sin0,*
		int	*x,*
		int	*y,*
		int	*to_origin,*
		int	*order*
	)		

Rotates the image using the given interpolation order (see imProcessResize).
Images must be of the same type. Target can have any size, including the original size.
The rotation is relative to the reference point. But the result can be shifted to the origin.
Returns zero if the counter aborted.

```
im.ProcessRotateRef(src_image: imImage, dst_image: imImage, cos0: number, sin0: number, x: number, y: number, to_origin: boolean, order: number) -> counter: boolean [in Lu
```

```
im.ProcessRotateRefNew(image: imImage, cos0: number, sin0: number, x: number, y: number, to_origin: boolean[, order]: number) -> counter: boolean, new_image: imImage [in I
```

int imProcessRotate90	(	const imImage *	*src_image,*

		imImage *	*dst_image,*
		int	*dir_clockwise*
	)		

Rotates the image in 90 degrees counterclockwise or clockwise. Swap columns by lines.
Images must be of the same type. Target width and height must be source height and width.
Direction can be clockwise (1) or counter clockwise (-1). Returns zero if the counter aborted.

```
im.ProcessRotate90(src_image: imImage, dst_image: imImage, dir_clockwise: boolean) -> counter: boolean [in Lua 5]
```

```
im.ProcessRotate90New(image: imImage, dir_clockwise: boolean) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessRotate180	(	const imImage *	*src_image,*
		imImage *	*dst_image*
	)		

Rotates the image in 180 degrees. Swap columns and swap lines.
Images must be of the same type and size. Returns zero if the counter aborted.

```
im.ProcessRotate180(src_image: imImage, dst_image: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessRotate180New(image: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessMirror	(	const imImage *	*src_image,*
		imImage *	*dst_image*
	)		

Mirror the image in a horizontal flip. Swap columns.
Images must be of the same type and size. Can be done in-place. Returns zero if the counter aborted.

```
im.ProcessMirror(src_image: imImage, dst_image: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessMirrorNew(image: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessFlip	(	const imImage *	*src_image,*
		imImage *	*dst_image*
	)		

Apply a vertical flip. Swap lines.
Images must be of the same type and size. Can be done in-place. Returns zero if the counter aborted.

```
im.ProcessFlip(src_image: imImage, dst_image: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessFlipNew(image: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessRadial	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		double	*k1,*
		int	*order*
	)		

Apply a radial distortion using the given interpolation order (see imProcessResize).
Images must be of the same type and size. Returns zero if the counter aborted.

```
im.ProcessRadial(src_image: imImage, dst_image: imImage, k1: number, order: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessRadialNew(image: imImage, k1: number[, order]: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessLensDistort	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		double	*a,*
		double	*b,*
		double	*c,*
		int	*order*
	)		

Apply a lens distortion correction using the given interpolation order (see imProcessResize).
a, b, and c are the lens parameters.
Images must be of the same type and size. Returns zero if the counter aborted.

```
im.ProcessLensDistort(src_image: imImage, dst_image: imImage, a, b, c: number, order: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessLensDistortNew(image: imImage, a, b, c: number[, order]: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessSwirl	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		double	*k1,*
		int	*order*
	)		

Apply a swirl distortion using the given interpolation order (see imProcessResize).

Apply a swirl distortion using the given interpolation order (see imProcessResize).
Images must be of the same type and size. Returns zero if the counter aborted.

```
im.ProcessSwirl(src_image: imImage, dst_image: imImage, k: number, order: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessSwirlNew(image: imImage, k: number[, order]: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessInterlaceSplit	(	const imImage *	*src_image,*	
		imImage *	*dst_image1,*	
		imImage *	*dst_image2*	
	)			

Split the image in two images, one containing the odd lines and other containing the even lines.
Images must be of the same type. Height of the output images must be half the height of the input image. If the height of the input image is odd then the first image must have height equals to half+1. Returns zero if the counter aborted.

```
im.ProcessInterlaceSplit(src_image: imImage, dst_image1: imImage, dst_image2: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessInterlaceSplitNew(image: imImage) -> counter: boolean, new_image1: imImage, new_image2: imImage [in Lua 5]
```

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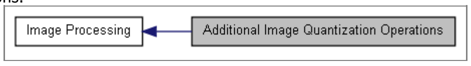
Functions

Additional Image Quantization Operations
[Image Processing]

Collaboration diagram for Additional Image Quantization Operations:



Functions

void	imProcessQuantizeRGBUniform (const imImage *src_image, imImage *dst_image, int do_dither)
void	imProcessQuantizeRGBMedianCut (const imImage *image, imImage *NewImage)
void	imProcessQuantizeGrayUniform (const imImage *src_image, imImage *dst_image, int grays)
void	imProcessQuantizeGrayMedianCut (imImage *src_image, imImage *dst_image, int grays)

Detailed Description

Additionally operations to the imConvertColorSpace function.

See im_process_pnt.h

Function Documentation

void imProcessQuantizeRGBUniform	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*do_dither*	
	)			

Converts a RGB image to a MAP image using uniform quantization.
with an optional 8x8 ordered dither. The RGB image must have data type IM_BYTE.

```
im.ProcessQuantizeRGBUniform(src_image: imImage, dst_image: imImage, do_dither: boolean) [in Lua 5]
```

```
im.ProcessQuantizeRGBUniformNew(src_image: imImage, do_dither: boolean) -> new_image: imImage [in Lua 5]
```

void imProcessQuantizeRGBMedianCut	(	const imImage *	*image,*	
		imImage *	*NewImage*	
	)			

Converts a RGB image to a MAP image using median cut quantization.
The RGB image must have data type IM_BYTE.

```
im.ProcessQuantizeRGBMedianCut(src_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessQuantizeRGBMedianCutNew(src_image: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessQuantizeGrayUniform	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*grays*	
	)			

Quantizes a gray scale image in less that 256 grays using uniform quantization.
Both images should be IM_BYTE/IM_GRAY, the target can be IM_MAP. Can be done in-place.
The result is in the 0-255 range, except when target is IM_MAP that is in the 0-(grays-1) range.

```
im.ProcessQuantizeGrayUniform(src_image: imImage, dst_image: imImage, grays: number) [in Lua 5]
```

```
im.ProcessQuantizeGrayUniformNew(src_image: imImage, grays: number) -> new_image: imImage [in Lua 5]
```

void imProcessQuantizeGrayMedianCut	(	imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*grays*	
	)			

Quantizes a gray scale image in less that 256 grays using median cut quantization.
Both images should be IM_BYTE/IM_GRAY. Can be done in-place.

```
im.ProcessQuantizeGrayMedianCut(src_image: imImage, dst_image: imImage, grays: number) [in Lua 5]
```

```
im.ProcessQuantizeGrayMedianCutNew(src_image: imImage, grays: number) -> new_image: imImage [in Lua 5]
```

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Functions

Color Processing Operations

[Image Processing]

Collaboration diagram for Color Processing Operations:

Functions

void	imProcessSplitYChroma (const imImage *src_image, imImage *y_image, imImage *chroma_image)
void	imProcessSplitHSI (const imImage *src_image, imImage *h_image, imImage *s_image, imImage *i_image)
void	imProcessMergeHSI (const imImage *h_image, const imImage *s_image, const imImage *i_image, imImage *dst_image)
void	imProcessSplitComponents (const imImage *src_image, imImage **dst_image_list)
void	imProcessMergeComponents (const imImage **src_image_list, imImage *dst_image)
void	imProcessNormalizeComponents (const imImage *src_image, imImage *dst_image)
void	imProcessReplaceColor (const imImage *src_image, imImage *dst_image, double *src_color, double *dst_color)
void	imProcessSetAlphaColor (const imImage *src_image, imImage *dst_image, double *src_color, double dst_alpha)
void	imProcessPseudoColor (const imImage *src_image, imImage *dst_image)
void	imProcessFixBGR (const imImage *src_image, imImage *dst_image)
void	imProcessSelectHue (const imImage *src_image, imImage *dst_image, double hue_start, double hue_end)
void	imProcessSelectHSI (const imImage *src_image, imImage *dst_image, double hue_start, double hue_end, double sat_start, double sat_end, double int_start, double int_end)

Detailed Description

Operations to change the color components configuration.

See im_process_pnt.h

Function Documentation

void imProcessSplitYChroma	(	const imImage *	*src_image,*	
		imImage *	*y_image,*	
		imImage *	*chroma_image*	
	)			

Split a RGB image into luma and chroma.
Chroma is calculated as R-Y,G-Y,B-Y. Source image must be IM_RGB/IM_BYTE.
luma image is IM_GRAY/IM_BYTE and chroma is IM_RGB/IM_BYTE.
Source and target must have the same size.

```
im.ProcessSplitYChroma(src_image: imImage, y_image: imImage, chroma_image: imImage) [in Lua 5]
```

```
im.ProcessSplitYChromaNew(src_image: imImage) -> y_image: imImage, chroma_image: imImage [in Lua 5]
```

void imProcessSplitHSI	(	const imImage *	*src_image,*	
		imImage *	*h_image,*	
		imImage *	*s_image,*	
		imImage *	*i_image*	
	)			

Split a RGB image into HSI planes.
Source image can be IM_RGB+IM_BYTE or IM_RGB+IM_FLOAT/IM_DOUBLE only. Target images are all IM_GRAY+IM_FLOAT/IM_DOUBLE.
Source images must normalized to 0-1 if type is IM_FLOAT/IM_DOUBLE (imProcessToneGamut can be used). See HSI Color Coordinate System Conversions for a definition of the color conversion.
Source and target must have the same size.

```
im.ProcessSplitHSI(src_image: imImage, h_image: imImage, s_image: imImage, i_image: imImage) [in Lua 5]
```

```
im.ProcessSplitHSINew(src_image: imImage) -> h_image: imImage, s_image: imImage, i_image: imImage [in Lua 5]
```

void imProcessMergeHSI	(	const imImage *	*h_image,*
		const imImage *	*s_image,*

		const imImage *	*i_image,*	
		imImage *	*dst_image*	
	)			

Merge HSI planes into a RGB image.
Source images must be IM_GRAY+IM_FLOAT/IM_DOUBLE. Target image can be IM_RGB+IM_BYTE or IM_RGB+IM_FLOAT/IM_DOUBLE only.
Source and target must have the same size. See HSI Color Coordinate System Conversions for a definition of the color conversion.

```
im.ProcessMergeHSI(h_image: imImage, s_image: imImage, i_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessMergeHSINew(h_image: imImage, s_image: imImage, i_image: imImage) -> dst_image: imImage [in Lua 5]
```

void imProcessSplitComponents	(	const imImage *	*src_image,*	
		imImage **	*dst_image_list*	
	)			

Split a multicomponent image into separate components, including alpha.
Target images must be IM_GRAY. Size and data types must be all the same.
The number of target images must match the depth of the source image, including alpha.

```
im.ProcessSplitComponents(src_image: imImage, dst_image_list: table of imImage) [in Lua 5]
```

```
im.ProcessSplitComponentsNew(src_image: imImage) -> dst_image_list: table of imImage [in Lua 5]
```

void imProcessMergeComponents	(	const imImage **	*src_image_list,*	
		imImage *	*dst_image*	
	)			

Merges separate components into a multicomponent image, including alpha.
Source images must be IM_GRAY. Size and data types must be all the same.
The number of source images must match the depth of the target image, including alpha.

```
im.ProcessMergeComponents(src_image_list: table of imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessMergeComponentsNew(src_image_list: table of imImage) -> dst_image: imImage [in Lua 5]
```

void imProcessNormalizeComponents	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Normalize the color components by their sum. Example: c1 = c1/(c1+c2+c3).
It will not change the alpha channel if any. Target must be IM_FLOAT or IM_DOUBLE.

```
im.ProcessNormalizeComponents(src_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessNormalizeComponentsNew(src_image: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessReplaceColor	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double *	*src_color,*	
		double *	*dst_color*	
	)			

Replaces the source color by the target color.
The color will be type casted to the image data type.
The colors must have the same number of components of the images.
Supports all color spaces and all data types except complex.

```
im.ProcessReplaceColor(src_image: imImage, dst_image: imImage, src_color: table of numbers, dst_color: table of numbers) [in Lua 5]
```

```
im.ProcessReplaceColorNew(src_image: imImage, src_color: table of numbers, dst_color: table of numbers) -> new_image: imImage [in Lua 5]
```

void imProcessSetAlphaColor	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double *	*src_color,*	
		double	*dst_alpha*	
	)			

Sets the alpha channel in target where the given color occurs in source, elsewhere alpha remains untouched.
The color must have the same number of components of the source image.
If target does not have an alpha channel, then its plane=0 is used.
Supports all color spaces for source and all data types except complex. Images must have the same size.

```
im.ProcessSetAlphaColor(src_image: imImage, dst_image: imImage, src_color: table of numbers, dst_alpha: number) [in Lua 5]
```

void imProcessPseudoColor	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Creates a pseudo color version of a GRAY image.
Images must have same size. Destiny must be IM_RGB/IM_BYTE.
The colors are created from gray values using them to index Hue angles from 0 to 360, and as Intensity values, with maximum Saturation.

```
im.ProcessPseudoColor(src_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessPseudoColorNew(src_image: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessFixBGR	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Fix BGR order to RGB. Images must match. And must have color space RGB.

```
im.ProcessFixBGR(src_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessFixBGRNew(src_image: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessSelectHue	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double	*hue_start,*	
		double	*hue_end*	
	)			

Uses a hue interval to isolate where color predominates. Images must match. And must have color space RGB.

```
im.ProcessSelectHue(src_image: imImage, dst_image: imImage, hue_start, hue_end: number) [in Lua 5]
```

```
im.ProcessSelectHueNew(src_image: imImage, hue_start, hue_end: number) -> new_image: imImage [in Lua 5]
```

void imProcessSelectHSI	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double	*hue_start,*	
		double	*hue_end,*	
		double	*sat_start,*	
		double	*sat_end,*	
		double	*int_start,*	
		double	*int_end*	
	)			

Uses a hue, saturation, intensity intervals to isolate where color predominates. Images must match. And must have color space RGB.

```
im.ProcessSelectHSI(src_image: imImage, dst_image: imImage, hue_start, hue_end, sat_start, sat_end, int_start, int_end: number) [in Lua 5]
```

```
im.ProcessSelectHSINew(src_image: imImage, hue_start, hue_end, sat_start, sat_end, int_start, int_end: number) -> new_image: imImage [in Lua 5]
```

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Functions

Histogram Based Operations
[Image Processing]

Collaboration diagram for Histogram Based Operations:

Functions

void	imProcessExpandHistogram (const imImage *src_image, imImage *dst_image, double percent)
void	imProcessEqualizeHistogram (const imImage *src_image, imImage *dst_image)

Detailed Description

See im_process_pnt.h

Function Documentation

void imProcessExpandHistogram	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double	*percent*	
	)			

Performs an histogram expansion based on a percentage of the number of pixels.
Percentage is used to obtain the amount of pixels of the lowest level and the highest level, relative to the total of pixels. The histogram is used an each level is summed while the result is less than the obtained amount from 0 (for the lowest level) and from the last level (for the highest). If it is zero, then only empty counts of the histogram will be considered.
Images must be (IM_BYTE, IM_SHORT or IM_USHORT)/(IM_RGB or IM_GRAY). Can be done in-place.
To expand the gamut without using the histogram, by just specifying the lowest and highest levels use the IM_GAMUT_EXPAND tone gamut operation (imProcessToneGamut).

```
im.ProcessExpandHistogram(src_image: imImage, dst_image: imImage, percent: number) [in Lua 5]
```

```
im.ProcessExpandHistogramNew(src_image: imImage, percent: number) -> new_image: imImage [in Lua 5]
```

void imProcessEqualizeHistogram	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Performs an histogram equalization.
Images must be (IM_BYTE, IM_SHORT or IM_USHORT)/(IM_RGB or IM_GRAY). Can be done in-place.

```
im.ProcessEqualizeHistogram(src_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessEqualizeHistogramNew(src_image: imImage) -> new_image: imImage [in Lua 5]
```

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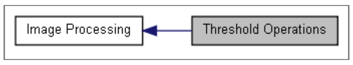
Functions

Threshold Operations

[Image Processing]

Collaboration diagram for Threshold Operations:



Functions

int	imProcessRangeContrastThreshold (const imImage *src_image, imImage *dst_image, int kernel_size, int min_range)
int	imProcessLocalMaxThreshold (const imImage *src_image, imImage *dst_image, int kernel_size, int min_level)
void	imProcessThreshold (const imImage *src_image, imImage *dst_image, double level, int value)
void	imProcessThresholdByDiff (const imImage *src_image1, const imImage *src_image2, imImage *dst_image)
void	imProcessHysteresisThreshold (const imImage *src_image, imImage *dst_image, int low_thres, int high_thres)
void	imProcessHysteresisThresEstimate (const imImage *image, int *low_level, int *high_level)
int	imProcessUniformErrThreshold (const imImage *src_image, imImage *dst_image)
void	imProcessDiffusionErrThreshold (const imImage *src_image, imImage *dst_image, int level)
int	imProcessPercentThreshold (const imImage *src_image, imImage *dst_image, double percent)
int	imProcessOtsuThreshold (const imImage *src_image, imImage *dst_image)
double	imProcessMinMaxThreshold (const imImage *src_image, imImage *dst_image)
void	imProcessLocalMaxThresEstimate (const imImage *image, int *level)
void	imProcessSliceThreshold (const imImage *src_image, imImage *dst_image, double start_level, double end_level)
void	imProcessThresholdColor (const imImage *src_image, imImage *dst_image, double *src_color, double tol)
void	imProcessThresholdSaturation (imImage *src_image, imImage *dst_image, double S_min)

Detailed Description

Operations that converts a usually IM_GRAY/IM_BYTE image into a IM_BINARY image using several threshold techniques.

See im_process_pnt.h

Function Documentation

int imProcessRangeContrastThreshold	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*kernel_size,*	
		int	*min_range*	
	)			

Threshold using a rank convolution with a range contrast function.
Supports all integer IM_GRAY images as source, and IM_BINARY as target.
Local variable threshold by the method of Bernsen.
Extracted from XITE, Copyright 1991, Blab, UiO
http://www.ifi.uio.no/~blab/Software/Xite/

```
  Reference:
    Bernsen, J: "Dynamic thresholding of grey-level images"
  Proc. of the 8th ICPR, Paris, Oct 1986, 1251-1255.
  Author:     Oivind Due Trier
```

Returns zero if the counter aborted.

```
im.ProcessRangeContrastThreshold(src_image: imImage, dst_image: imImage, kernel_size: number, min_range: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessRangeContrastThresholdNew(image: imImage, kernel_size: number, min_range: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessLocalMaxThreshold	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*kernel_size,*	
		int	*min_level*	
	)			

Threshold using a rank convolution with a local max function.
Returns zero if the counter aborted.

Supports all integer IM_GRAY images as source, and IM_BINARY as target.

```
im.ProcessLocalMaxThreshold(src_image: imImage, dst_image: imImage, kernel_size: number, min_level: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessLocalMaxThresholdNew(image: imImage, kernel_size: number, min_level: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

void imProcessThreshold	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double	*level,*	
		int	*value*	
	)			

Apply a manual threshold.
threshold = a <= level ? 0: value
Normal value is 1 but another common value is 255. Can be done in-place for IM_BYTE source.
Source color space must be IM_GRAY, and target color space must be IM_BINARY. complex is not supported.

```
im.ProcessThreshold(src_image: imImage, dst_image: imImage, level: number, value: number) [in Lua 5]
```

```
im.ProcessThresholdNew(src_image: imImage, level: number, value: number) -> new_image: imImage [in Lua 5]
```

void imProcessThresholdByDiff	(	const imImage *	*src_image1,*	
		const imImage *	*src_image2,*	
		imImage *	*dst_image*	
	)			

Apply a threshold by the difference of two images.
threshold = a1 <= a2 ? 0: 1
Source color space must be IM_GRAY, and target color space must be IM_BINARY. complex is not supported. Can be done in-place for IM_BYTE source.

```
im.ProcessThresholdByDiff(src_image1: imImage, src_image2: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessThresholdByDiffNew(src_image1: imImage, src_image2: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessHysteresisThreshold	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*low_thres,*	
		int	*high_thres*	
	)			

Apply a threshold by the Hysteresis method.
Hysteresis thersholding of edge pixels. Starting at pixels with a value greater than the HIGH threshold, trace a connected sequence of pixels that have a value greater than the LOW threhsold.
complex is not supported. Can be done in-place for IM_BYTE source.
Note: could not find the original source code author name.

```
im.ProcessHysteresisThreshold(src_image: imImage, dst_image: imImage, low_thres: number, high_thres: number) [in Lua 5]
```

```
im.ProcessHysteresisThresholdNew(src_image: imImage, low_thres: number, high_thres: number) -> new_image: imImage [in Lua 5]
```

void imProcessHysteresisThresEstimate	(	const imImage *	*image,*	
		int *	*low_level,*	
		int *	*high_level*	
	)			

Estimates hysteresis low and high threshold levels.
Image data type can be IM_BYTE, IM_SHORT or IM_USHORT.
Usefull for imProcessHysteresisThreshold.

```
im.ProcessHysteresisThresEstimate(image: imImage) -> low_level: number, high_level: number [in Lua 5]
```

int imProcessUniformErrThreshold	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Calculates the threshold level for manual threshold using an uniform error approach.
Supports only IM_BYTE images. Extracted from XITE, Copyright 1991, Blab, UiO
http://www.ifi.uio.no/~blab/Software/Xite/

```
  Reference:
    S. M. Dunn & D. Harwood & L. S. Davis:
    "Local Estimation of the Uniform Error Threshold"
    IEEE Trans. on PAMI, Vol PAMI-6, No 6, Nov 1984.
  Comments: It only works well on images whith large objects.
  Author: Olav Borgli, BLAB, ifi, UiO
  Image processing lab, Department of Informatics, University of Oslo
```

Returns the used level.

```
im.ProcessUniformErrThreshold(src_image: imImage, dst_image: imImage) -> level: number [in Lua 5]
```

```
im.ProcessUniformErrThresholdNew(src_image: imImage)  -> level: number, new_image: imImage [in Lua 5]
```

void imProcessDiffusionErrThreshold	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	

		int	*level*	
	)			

Apply a dithering on each image channel by using a diffusion error method.
It can be applied on any IM_BYTE images. It will "threshold" each channel indivudually, so source and target must be of the same depth. Not using OpenMP when enabled.

```
im.ProcessDiffusionErrThreshold(src_image: imImage, dst_image: imImage, level: number) [in Lua 5]
```

```
im.ProcessDiffusionErrThresholdNew(src_image: imImage, level: number) -> new_image: imImage [in Lua 5]
```

int imProcessPercentThreshold	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double	*percent*	
	)			

Calculates the threshold level for manual threshold using a percentage of pixels that should stay bellow the threshold.
Image data type can be IM_BYTE, IM_SHORT or IM_USHORT.
Source color space must be IM_GRAY, and target color space must be IM_BINARY. Returns the used level.

```
im.ProcessPercentThreshold(src_image: imImage, dst_image: imImage, percent: number) -> level: number [in Lua 5]
```

```
im.ProcessPercentThresholdNew(src_image: imImage, percent: number) -> level: number, new_image: imImage [in Lua 5]
```

int imProcessOtsuThreshold	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Calculates the threshold level for manual threshold using the Otsu approach.
Image can be IM_BYTE, IM_SHORT or IM_USHORT.
Source color space must be IM_GRAY, and target color space must be IM_BINARY. Returns the used level.
Original implementation by Flavio Szenberg.

```
im.ProcessOtsuThreshold(src_image: imImage, dst_image: imImage) -> level: number [in Lua 5]
```

```
im.ProcessOtsuThresholdNew(src_image: imImage) -> level: number, new_image: imImage [in Lua 5]
```

double imProcessMinMaxThreshold	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Calculates the threshold level for manual threshold using (max-min)/2.
Returns the used level.
Source color space must be IM_GRAY, and target color space must be IM_BINARY. complex is not supported. Can be done in-place for IM_BYTE source.

```
im.ProcessMinMaxThreshold(src_image: imImage, dst_image: imImage) -> level: number [in Lua 5]
```

```
im.ProcessMinMaxThresholdNew(src_image: imImage) -> level: number, new_image: imImage [in Lua 5]
```

void imProcessLocalMaxThresEstimate	(	const imImage *	*image,*	
		int *	*level*	
	)			

Estimates Local Max threshold level for images. Image can be IM_BYTE, IM_SHORT or IM_USHORT.

```
im.ProcessLocalMaxThresEstimate(image: imImage) -> level: number [in Lua 5]
```

void imProcessSliceThreshold	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double	*start_level,*	
		double	*end_level*	
	)			

Apply a manual threshold using an interval.
threshold = start_level <= a <= end_level ? 1: 0
Normal value is 1 but another common value is 255.
Source color space must be IM_GRAY, and target color space must be IM_BINARY. complex is not supported. Can be done in-place for IM_BYTE source.

```
im.ProcessSliceThreshold(src_image: imImage, dst_image: imImage, start_level: number, end_level: number) [in Lua 5]
```

```
im.ProcessSliceThresholdNew(src_image: imImage, start_level: number, end_level: number) -> new_image: imImage [in Lua 5]
```

void imProcessThresholdColor	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double *	*src_color,*	
		double	*tol*	
	)			

Threshold using a color and a tolerance value.
The color will be type casted to the image data type.
The color must have the same number of components of the images.
Supports all color spaces and all data types except complex.

```
im.ProcessThresholdColor(src_image: imImage, dst_image: imImage, src_color: table of numbers, tol: number) [in Lua 5]
im.ProcessThresholdColorNew(src_image: imImage, src_color: table of numbers, tol: number) -> new_image: imImage [in Lua 5]
```

void imProcessThresholdSaturation	(	imImage *	*src_image,*
		imImage *	*dst_image,*
		double	*S_min*
	)		

Threshold using a saturation minimum. (since 3.14)
Supports only IM_RGB+IM_BYTE as source.

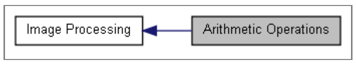
```
im.ProcessThresholdSaturation(src_image: imImage, dst_image: imImage, S_min: number) [in Lua 5]
```

```
im.ProcessThresholdSaturationNew(src_image: imImage, S_min: number) -> new_image: imImage [in Lua 5]
```

Enumerations | Functions

Arithmetic Operations
[Image Processing]

Collaboration diagram for Arithmetic Operations:



Enumerations

enum	imUnaryOp {
	IM_UN_EQL, IM_UN_ABS, IM_UN_LESS, IM_UN_INV,
	IM_UN_SQR, IM_UN_SQRT, IM_UN_LOG, IM_UN_EXP,
	IM_UN_SIN, IM_UN_COS, IM_UN_CONJ, IM_UN_CPXNORM,
	IM_UN_POSITIVES, IM_UN_NEGATIVES
	}

enum	imBinaryOp {
	IM_BIN_ADD, IM_BIN_SUB, IM_BIN_MUL, IM_BIN_DIV,
	IM_BIN_DIFF, IM_BIN_POW, IM_BIN_MIN, IM_BIN_MAX
	}

Functions

void	imProcessUnArithmeticOp (const imImage *src_image, imImage *dst_image, int op)
void	imProcessArithmeticOp (const imImage *src_image1, const imImage *src_image2, imImage *dst_image, int op)
void	imProcessArithmeticConstOp (const imImage *src_image, double src_const, imImage *dst_image, int op)
void	imProcessBlendConst (const imImage *src_image1, const imImage *src_image2, imImage *dst_image, double alpha)
void	imProcessBlend (const imImage *src_image1, const imImage *src_image2, const imImage *alpha_image, imImage *dst_image)
void	imProcessCompose (const imImage *src_image1, const imImage *src_image2, imImage *dst_image)
void	imProcessSplitComplex (const imImage *src_image, imImage *dst_image1, imImage *dst_image2, int polar)
void	imProcessMergeComplex (const imImage *src_image1, const imImage *src_image2, imImage *dst_image, int polar)
void	imProcessMultipleMean (const imImage **src_image_list, int src_image_count, imImage *dst_image)
void	imProcessMultipleStdDev (const imImage **src_image_list, int src_image_count, const imImage *mean_image, imImage *dst_image)
int	imProcessMultipleMedian (const imImage **src_image_list, int src_image_count, imImage *dst_image)
int	imProcessAutoCovariance (const imImage *src_image, const imImage *mean_image, imImage *dst_image)
void	imProcessMultiplyConj (const imImage *src_image1, const imImage *src_image2, imImage *dst_image)
void	imProcessBackSub (const imImage *src_image1, imImage *src_image2, imImage *dst_image, double tol, int show_diff)

Detailed Description

Simple math operations for images.

See im_process_pnt.h

Enumeration Type Documentation

enum imUnaryOp

Unary Arithmetic Operations.
(#) Inverse and log may lead to math exceptions.

Enumerator:

IM_UN_EQL	equal = a
IM_UN_ABS	absolute = |a|
IM_UN_LESS	less = -a
IM_UN_INV	invert (#) = 1/a
IM_UN_SQR	

	square = a*a
IM_UN_SQRT	square root = a^(1/2)
IM_UN_LOG	natural logarithm (#) = ln(a)
IM_UN_EXP	exponential = exp(a)
IM_UN_SIN	sine = sin(a)
IM_UN_COS	cosine = cos(a)
IM_UN_CONJ	complex conjugate = ar - ai*i
IM_UN_CPXNORM	complex normalization by magnitude = a / cpxmag(a)
IM_UN_POSITIVES	positives = if a<0 then a=0
IM_UN_NEGATIVES	negatives = if a>0 then a=0

enum imBinaryOp

Binary Arithmetic Operations.
Divide may lead to math exceptions.

Enumerator:

IM_BIN_ADD	add = a+b
IM_BIN_SUB	subtract = a-b
IM_BIN_MUL	multiply = a*b
IM_BIN_DIV	divide = a/b (#)
IM_BIN_DIFF	difference = |a-b|
IM_BIN_POW	power = a^b
IM_BIN_MIN	minimum = (a < b)? a: b
IM_BIN_MAX	maximum = (a > b)? a: b

Function Documentation

void imProcessUnArithmeticOp	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*op*	
	)			

Apply an arithmetic unary operation.
Can be done in-place, images must match color space and size.
Target image can be several types depending on source:

- any integer -> any integer or real
- real -> real
- complex -> complex If source is complex, target complex must be the same data type (imcfloat-imcfloat or imcdouble-imcdouble only).
  If target is byte, then the result is cropped to 0-255.

```
im.ProcessUnArithmeticOp(src_image: imImage, dst_image: imImage, op: number) [in Lua 5]
```

```
im.ProcessUnArithmeticOpNew(image: imImage, op: number) -> new_image: imImage [in Lua 5]
```

void imProcessArithmeticOp	(	const imImage *	*src_image1,*	
		const imImage *	*src_image2,*	
		imImage *	*dst_image,*	
		int	*op*	
	)			

Apply a binary arithmetic operation.
Can be done in-place, images must match color space and size.
Source images must match, target image can be several types depending on source:

- any integer -> any integer+ or real

- real -> real
- complex -> complex One exception is that you can use src1=complex src2=real resulting dst=complex.
  If source is complex, target complex must be the same data type (imcfloat-imcfloat or imcdouble-imcdouble only).
  If target is integer then it must have equal or more precision than the source.
  If target is byte, then the result is cropped to 0-255. Alpha channel is not included.

```
im.ProcessArithmeticOp(src_image1: imImage, src_image2: imImage, dst_image: imImage, op: number) [in Lua 5]
```

```
im.ProcessArithmeticOpNew(image1: imImage, image2: imImage, op: number) -> new_image: imImage [in Lua 5]
```

The New function will create a new image of the same type of the source images.

void imProcessArithmeticConstOp	(	const imImage *	*src_image,*	
		double	*src_const,*	
		imImage *	*dst_image,*	
		int	*op*	
	)			

Apply a binary arithmetic operation with a constant value.
Can be done in-place, images must match color space and size.
Target image can be several types depending on source:

- any integer -> any integer or real
- real -> real
- complex -> complex The constant value is type casted to an appropriate type before the operation.
  If source is complex, target complex must be the same data type (imcfloat-imcfloat or imcdouble-imcdouble only).
  If target is byte, then the result is cropped to 0-255.

```
im.ProcessArithmeticConstOp(src_image: imImage, src_const: number, dst_image: imImage, op: number) [in Lua 5]
```

```
im.ProcessArithmeticConstOpNew(image: imImage, src_const: number, op: number) -> new_image: imImage [in Lua 5]
```

void imProcessBlendConst	(	const imImage *	*src_image1,*	
		const imImage *	*src_image2,*	
		imImage *	*dst_image,*	
		double	*alpha*	
	)			

Blend two images using an alpha value = [a * alpha + b * (1 - alpha)].
Can be done in-place, images must match.
alpha value must be in the interval [0.0 - 1.0].

```
im.ProcessBlendConst(src_image1: imImage, src_image2: imImage, dst_image: imImage, alpha: number) [in Lua 5]
```

```
im.ProcessBlendConstNew(image1: imImage, image2: imImage, alpha: number) -> new_image: imImage [in Lua 5]
```

void imProcessBlend	(	const imImage *	*src_image1,*	
		const imImage *	*src_image2,*	
		const imImage *	*alpha_image,*	
		imImage *	*dst_image*	
	)			

Blend two images using an alpha channel = [a * alpha + b * (1 - alpha)].
Can be done in-place, images must match.
alpha_image must have the same data type except for complex images that must be real, and color_space must be IM_GRAY. Maximum alpha values are based in imColorMax. Minimum is always 0.

```
im.ProcessBlend(src_image1: imImage, src_image2: imImage, alpha_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessBlendNew(image1: imImage, image2: imImage, alpha_image: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessCompose	(	const imImage *	*src_image1,*	
		const imImage *	*src_image2,*	
		imImage *	*dst_image*	
	)			

Compose two images that have an alpha channel using the OVER operator.
Can be done in-place, images must match.
Maximum alpha values are baed in imColorMax. Minimum is always 0.

```
im.ProcessCompose(src_image1: imImage, src_image2: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessComposeNew(image1: imImage, image2: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessSplitComplex	(	const imImage *	*src_image,*	
		imImage *	*dst_image1,*	
		imImage *	*dst_image2,*	
		int	*polar*	
	)			

Split a complex image into two images with real and imaginary parts
or magnitude and phase parts (polar).
Source image must be complex, target images must be real.

```
im.ProcessSplitComplex(src_image: imImage, dst_image1: imImage, dst_image2: imImage, polar: boolean) [in Lua 5]
```

```
im.ProcessSplitComplexNew(image: imImage, polar: boolean) -> dst_image1: imImage, dst_image2: imImage [in Lua 5]
```

void imProcessMergeComplex	(	const imImage *	*src_image1,*
		const imImage *	*src_image2,*
		imImage *	*dst_image,*
		int	*polar*
	)		

Merges two images as the real and imaginary parts of a complex image,
or as magnitude and phase parts (polar = 1).
Source images must be real, target image must be complex.

```
im.ProcessMergeComplex(src_image1: imImage, src_image2: imImage, dst_image: imImage, polar: boolean) [in Lua 5]
```

```
im.ProcessMergeComplexNew(image1: imImage, image2: imImage, polar: boolean) -> new_image: imImage [in Lua 5]
```

void imProcessMultipleMean	(	const imImage **	*src_image_list,*
		int	*src_image_count,*
		imImage *	*dst_image*
	)		

Calculates the mean of multiple images.
Images must match size and type.

```
im.ProcessMultipleMean(src_image_list: table of imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessMultipleMeanNew(src_image_list: table of imImage) -> new_image: imImage [in Lua 5]
```

void imProcessMultipleStdDev	(	const imImage **	*src_image_list,*
		int	*src_image_count,*
		const imImage *	*mean_image,*
		imImage *	*dst_image*
	)		

Calculates the standard deviation of multiple images.
Images must match size and type. Use imProcessMultipleMean to calculate the mean_image.

```
im.ProcessMultipleStdDev(src_image_list: table of imImage, mean_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessMultipleStdDevNew(src_image_list: table of imImage, mean_image: imImage) -> new_image: imImage [in Lua 5]
```

int imProcessMultipleMedian	(	const imImage **	*src_image_list,*
		int	*src_image_count,*
		imImage *	*dst_image*
	)		

Calculates the median of multiple images.
Images must match size and type. Complex is not supported.
Uses imProcessMultiPointOp internally.

```
im.ProcessMultipleMedian(src_image_list: table of imImage, dst_image: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessMultipleMedianNew(src_image_list: table of imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessAutoCovariance	(	const imImage *	*src_image,*
		const imImage *	*mean_image,*
		imImage *	*dst_image*
	)		

Calculates the auto-covariance of an image with the mean of a set of images.
Images must match. Returns zero if the counter aborted.
Target is IM_FLOAT, except if source is IM_DOUBLE. Returns zero if the counter aborted.

```
im.ProcessAutoCovariance(src_image: imImage, mean_image: imImage, dst_image: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessAutoCovarianceNew(src_image: imImage, mean_image: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

void imProcessMultiplyConj	(	const imImage *	*src_image1,*
		const imImage *	*src_image2,*
		imImage *	*dst_image*
	)		

Multiplies the conjugate of one complex image with another complex image.
Images must match size. Conj(img1) * img2
Can be done in-place.

```
im.ProcessMultiplyConj(src_image1: imImage, src_image2: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessMultiplyConjNew(src_image1: imImage, src_image2: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessBackSub	(	const imImage *	*src_image1,*	
		imImage *	*src_image2,*	
		imImage *	*dst_image,*	
		double	*tol,*	
		int	*show_diff*	
	)			

Subtracts a background image using a tolerance.
If different is less than the tolerance background is detected and assigned to 0.\ Else keeps the original image or show the difference.

```
im.ProcessBackSub(src_image1: imImage, src_image2: imImage, dst_image: imImage, tol: number, show_diff: boolean) [in Lua 5]
```

```
im.ProcessBackSubNew(src_image1: imImage, src_image2: imImage, tol: number, show_diff: boolean) -> new_image: imImage [in Lua 5]
```

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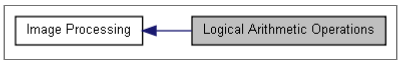
Enumerations | Functions

Logical Arithmetic Operations
[Image Processing]

Collaboration diagram for Logical Arithmetic Operations:



Enumerations

enum	imLogicOp { IM_BIT_AND, IM_BIT_OR, IM_BIT_XOR }

Functions

void	imProcessBitwiseOp (const imImage *src_image1, const imImage *src_image2, imImage *dst_image, int op)
void	imProcessBitwiseNot (const imImage *src_image, imImage *dst_image)
void	imProcessBitMask (const imImage *src_image, imImage *dst_image, unsigned char mask, int op)
void	imProcessBitPlane (const imImage *src_image, imImage *dst_image, int plane, int do_reset)

Detailed Description

Logical binary math operations for images.

See im_process_pnt.h

Enumeration Type Documentation

enum imLogicOp

Logical Operations.

Enumerator:

IM_BIT_AND	and = a & b
IM_BIT_OR	or = a | b
IM_BIT_XOR	xor = ~(a | b)

Function Documentation

void imProcessBitwiseOp	(	const imImage *	*src_image1,*	
		const imImage *	*src_image2,*	
		imImage *	*dst_image,*	
		int	*op*	
	)			

Apply a logical operation.
Images must have data type integer. Can be done in-place.

```
im.ProcessBitwiseOp(src_image1: imImage, src_image2: imImage, dst_image: imImage, op: number) [in Lua 5]
```

```
im.ProcessBitwiseOpNew(src_image1: imImage, src_image2: imImage, op: number) -> new_image: imImage [in Lua 5]
```

void imProcessBitwiseNot	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Apply a logical NOT operation.
Images must have data type integer. Can be done in-place.

```
im.ProcessBitwiseNot(src_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessBitwiseNotNew(src_image: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessBitMask	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		unsigned char	*mask,*
		int	*op*
	)		

Apply a bit mask.
The same as imProcessBitwiseOp but the second image is replaced by a fixed mask.
Images must have data type IM_BYTE. It is valid only for AND, OR and XOR. Can be done in-place.

```
im.ProcessBitMask(src_image: imImage, dst_image: imImage, mask: string, op: number) [in Lua 5]
```

```
im.ProcessBitMaskNew(src_image: imImage, mask: string, op: number) -> new_image: imImage [in Lua 5]
```

In Lua, mask is a string with 0s and 1s, for example: "11001111".

void imProcessBitPlane	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*plane,*
		int	*do_reset*
	)		

Extract or Reset a bit plane. For ex: 000X0000 or XXX0XXXX (plane=3).
Images must have data type IM_BYTE. Can be done in-place.

```
im.ProcessBitPlane(src_image: imImage, dst_image: imImage, plane: number, do_reset: boolean) [in Lua 5]
```

```
im.ProcessBitPlaneNew(src_image: imImage, plane: number, do_reset: boolean) -> new_image: imImage [in Lua 5]
```

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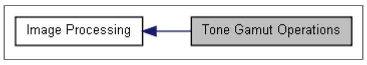
Enumerations | Functions

Tone Gamut Operations
[Image Processing]

Collaboration diagram for Tone Gamut Operations:



Enumerations	

enum	imToneGamut {
	IM_GAMUT_NORMALIZE, IM_GAMUT_POW, IM_GAMUT_LOG, IM_GAMUT_EXP,
	IM_GAMUT_INVERT, IM_GAMUT_ZEROSTART, IM_GAMUT_SOLARIZE, IM_GAMUT_SLICE,
	IM_GAMUT_EXPAND, IM_GAMUT_CROP, IM_GAMUT_BRIGHTCONT
	}

enum	imToneGamutFlags { IM_GAMUT_MINMAX = 0x0100 }
Functions	
void	imProcessToneGamut (const imImage *src_image, imImage *dst_image, int op, double *params)
void	imProcessUnNormalize (const imImage *src_image, imImage *dst_image)
void	imProcessDirectConv (const imImage *src_image, imImage *dst_image)
void	imProcessNegative (const imImage *src_image, imImage *dst_image)
double	imProcessCalcAutoGamma (const imImage *image)
void	imProcessShiftHSI (const imImage *src_image, imImage *dst_image, double h_shift, double s_shift, double i_shift)
void	imProcessShiftComponent (const imImage *src_image, imImage *dst_image, double c0_shift, double c1_shift, double c2_shift)

Detailed Description

Operations that try to preserve the min-max interval in the output (the dynamic range).

See im_process_pnt.h

Enumeration Type Documentation

enum imToneGamut

Tone Gamut Operations.

Enumerator:

IM_GAMUT_NORMALIZE	normalize = (a-min) / (max-min) (result is always real)
IM_GAMUT_POW	pow = ((a-min) / (max-min))^gamma * (max-min) + min

	params[0]=gamma

IM_GAMUT_LOG	log = log(K * (a-min) / (max-min) + 1))*(max-min)/log(K+1) + min
	params[0]=K (K>0)

IM_GAMUT_EXP	exp = (exp(K * (a-min) / (max-min)) - 1))*(max-min)/(exp(K)-1) + min
	params[0]=K

IM_GAMUT_INVERT	invert = max - (a-min)
IM_GAMUT_ZEROSTART	zerostart = a - min

IM_GAMUT_SOLARIZE	solarize = a < level ? a: (level * (max-min) - a * (level-min)) / (max-level)
	params[0]=level percentage (0-100) relative to min-max
	photography solarization effect.

IM_GAMUT_SLICE	slice = start < a || a > end ? min: binarize? max: a
	params[0]=start, params[1]=end, params[2]=binarize

IM_GAMUT_EXPAND	expand = a < start ? min: a > end ? max : (a-start)*(max-min)/(end-start) + min
	params[0]=start, params[1]=end

IM_GAMUT_CROP	crop = a < start ? start: a > end ? end : a
	params[0]=start, params[1]=end

IM_GAMUT_BRIGHTCONT	brightcont = a < min ? min: a > max ? max: a * tan(c_a) + b_s + (max-min)*(1 - tan(c_a))/2
	params[0]=bright_shift (-100%..+100%), params[1]=contrast_factor (-100%..+100%)
	change brightness and contrast simultaneously.

enum imToneGamutFlags

Tone Gamut Flags. Combine with imToneGamut values with bitwise or (|).

Enumerator:

IM_GAMUT_MINMAX	min and max are given in params (params[0]=min, params[1]=max), all other parameters shift 2 positions.

Function Documentation

void imProcessToneGamut	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*op,*
		double *	*params*
	)		

Apply a gamut operation with arguments.
Supports all data types except complex.
For IM_GAMUT_NORMALIZE when min > 0 and max < 1, it will just do a copy.
IM_BYTE images have min=0 and max=255 always.
To control min and max values use the IM_GAMUT_MINMAX flag. Can be done in-place. When there is no extra parameters, params can use NULL.
Alpha is not changed if present.

```
im.ProcessToneGamut(src_image: imImage, dst_image: imImage, op: number, params: table of number) [in Lua 5]
```

```
im.ProcessToneGamutNew(src_image: imImage, op: number, params: table of number) -> new_image: imImage [in Lua 5]
```

See also Image Enhance Utilities in Lua.

void imProcessUnNormalize	(	const imImage *	*src_image,*
		imImage *	*dst_image*
	)		

Converts from (0-1) to (0-255), crop out of bounds values.
Source image must be real, and target image must be IM_BYTE.

```
im.ProcessUnNormalize(src_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessUnNormalizeNew(src_image: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessDirectConv	(	const imImage *	*src_image,*
		imImage *	*dst_image*
	)		

Directly converts integer and real data types into IM_BYTE images.
This can also be done using imConvertDataType with IM_CAST_DIRECT flag.

```
im.ProcessDirectConv(src_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessDirectConvNew(src_image: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessNegative	(	const imImage *	*src_image*,	
		imImage *	*dst_image*	
	)			

A negative effect. Uses imProcessToneGamut with IM_GAMUT_INVERT for non MAP images.
Supports all color spaces and all data types except complex.
Can be done in-place.

```
im.ProcessNegative(src_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessNegativeNew(src_image: imImage) -> new_image: imImage [in Lua 5]
```

double imProcessCalcAutoGamma	(	const imImage *	*image*	)	

Calculates an automatic gamma factor.
gamma=log((mean-min)/(max-min))/log(0.5); Usefull for imProcessToneGamut when using IM_GAMUT_POW.

```
im.ProcessCalcAutoGamma(image: imImage) -> gamma: number [in Lua 5]
```

void imProcessShiftHSI	(	const imImage *	*src_image*,	
		imImage *	*dst_image*,	
		double	*h_shift*,	
		double	*s_shift*,	
		double	*i_shift*	
	)			

Apply a shift using HSI coordinates.
Supports all data types except complex.
shift is between -1.0 and 1.0, except for Hue where shift is in degrees.
Can be done in-place.

```
im.ProcessShiftHSI(src_image: imImage, dst_image: imImage, h_shift, s_shift, i_shift: number) [in Lua 5]
```

```
im.ProcessShiftHSI(src_image: imImage, h_shift, s_shift, i_shift: number) -> new_image: imImage [in Lua 5]
```

void imProcessShiftComponent	(	const imImage *	*src_image*,	
		imImage *	*dst_image*,	
		double	*c0_shift*,	
		double	*c1_shift*,	
		double	*c2_shift*	
	)			

Apply a shift to the components in normalized space 0-1.
Supports all data types except complex.
shift is between -1.0 and 1.0
Can be done in-place.

```
im.ProcessShiftComponent(src_image: imImage, dst_image: imImage, c0_shift, c1_shift, c2_shift: number) [in Lua 5]
```

```
im.ProcessShiftComponent(src_image: imImage, c0_shift, c1_shift, c2_shift: number) -> new_image: imImage [in Lua 5]
```

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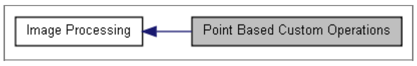
Typedefs | Functions

Point Based Custom Operations
[Image Processing]

Collaboration diagram for Point Based Custom Operations:



Typedefs

typedef int(*	imUnaryPointOpFunc)(double src_value, double *dst_value, double *params, void *userdata, int x, int y, int d)
typedef int(*	imUnaryPointColorOpFunc)(const double *src_value, double *dst_value, double *params, void *userdata, int x, int y)
typedef int(*	imMultiPointOpFunc)(const double *src_value, double *dst_value, double *params, void *userdata, int x, int y, int d, int src_image_count)
typedef int(*	imMultiPointColorOpFunc)(double *src_value, double *dst_value, double *params, void *userdata, int x, int y, int src_image_count, int src_depth, int dst_depth)

Functions

int	imProcessUnaryPointOp (const imImage *src_image, imImage *dst_image, imUnaryPointOpFunc func, double *params, void *userdata, const char *op_name)
int	imProcessUnaryPointColorOp (const imImage *src_image, imImage *dst_image, imUnaryPointColorOpFunc func, double *params, void *userdata, const char *op_name)
int	imProcessMultiPointOp (const imImage **src_image_list, int src_image_count, imImage *dst_image, imMultiPointOpFunc func, double *params, void *userdata, const char *op_name)
int	imProcessMultiPointColorOp (const imImage **src_image_list, int src_image_count, imImage *dst_image, imMultiPointColorOpFunc func, double *params, void *userdata, const char *op_name)

Detailed Description

See im_process_pnt.h

Typedef Documentation

typedef int(* imUnaryPointOpFunc)(double src_value, double *dst_value, double *params, void *userdata, int x, int y, int d)

Custom unary point function.
Data will be set only if the returned value is non zero.
It is called (width * height * depth).
*dst_value must contains the result (it is not an array)

```
func(src_value: number, params1, param2, ..., x: number, y: number, d: number) -> dst_value: number  [in Lua 5]
```

In Lua, the params table is unpacked. And the returned value contains only the target values to update, or nil (also no return value) to leave target intact.

typedef int(* imUnaryPointColorOpFunc)(const double *src_value, double *dst_value, double *params, void *userdata, int x, int y)

Custom unary point color function.
Data will be set only if the returned value is non zero. It is called (width * height).
src_value is an array with src_image->depth values.
dst_value is an array with dst_image->depth values.

```
func(src_value_plane0: number, src_value_plane1: number, ... , params1, param2, ..., x: number, y: number) -> dst_value_plane0: number, dst_value_plane1: number, ...  [in
```

In Lua, the params table is unpacked. Also each color plane is passed as a separate value, instead of inside an array. And the returned value contains only the target values to update, or nil (also no return value) to leave target intact.

typedef int(* imMultiPointOpFunc)(const double *src_value, double *dst_value, double *params, void *userdata, int x, int y, int d, int src_image_count)

Custom multiple point function.
Source values are copies, so they can be changed inside the function without affecting the original image.
Data will be set only if the returned value is non zero. It is called (width * height * depth).
src_value is an array with src_image_count values (one value from each image).
*dst_value must contains the result (it is not an array)

```
func(src_value1: number, src_value2: number, ... , params1, param2, ..., x: number, y: number, d: number) -> dst_value: number  [in Lua 5]
```

In Lua, the source images data and the params table are unpacked. And the returned value contains only the target values to update, or nil (also no return value) to leave target intact.

typedef int(* imMultiPointColorOpFunc)(double *src_value, double *dst_value, double *params, void *userdata, int x, int y, int src_image_count, int src_depth, int dst_depth)

Custom multiple point color function.
Source values are copies, so they can be changed inside the function without affecting the original image.
Data will be set only if the returned value is non zero. It is called (width * height).
src_value is an array with (src_image_count * src_image->depth) values (one value from each image times the depth).
dst_value is an array with dst_image->depth values.

```
func(src_value1_plane0: number, src_value1_plane1: number, ..., src_value2_plane0: number, src_value2_plane1: number, ... , params1, param2, ..., x: number, y: number) ->
```

In Lua, the source images data and the params table are unpacked. Also each color plane is passed as a separate value, instead of inside an array. And the returned value contains only the target values to update, or nil (also no return value) to leave target intact.

Function Documentation

int imProcessUnaryPointOp	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		imUnaryPointOpFunc	*func,*
		double *	*params,*
		void *	*userdata,*
		const char *	*op_name*
	)		

Apply an unary point operation using a custom function. One pixel from the source affects the same pixel on target.
Can be done in-place, images must match size and depth. Data type can be different, but complex is not supported.
op_name is used only by the counter and can be NULL. Returns zero if the counter aborted.

```
im.ProcessUnaryPointOp(src_image: imImage, dst_image: imImage, func: function, params: table, [op_name: string]) -> counter: boolean [in Lua 5]
```

```
im.ProcessUnaryPointOpNew(image: imImage, func: function, params: table, [op_name: string]) -> counter: boolean, new_image: imImage [in Lua 5]
```

In Lua, the params table is passed to the function by using the Lua stack, so its table can contain any type of objects, but they all must be unnamed.

int imProcessUnaryPointColorOp	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		imUnaryPointColorOpFunc	*func,*
		double *	*params,*
		void *	*userdata,*
		const char *	*op_name*
	)		

Apply an unary point color operation using a custom function. One pixel from the source affects the same pixel on target.
Can be done in-place, images must match size, depth can be different. Data type can be different, but complex is not supported.
op_name is used only by the counter and can be NULL. Returns zero if the counter aborted.

```
im.ProcessUnaryPointColorOp(src_image: imImage, dst_image: imImage, func: function, params: table, [op_name: string]) -> counter: boolean [in Lua 5]
```

```
im.ProcessUnaryPointColorOpNew(image: imImage, func: function, params: table, [op_name: string]) -> counter: boolean, new_image: imImage [in Lua 5]
```

In Lua, the params table is passed to the function by using the Lua stack, so its table can contain any type of objects, but they all must be unnamed.

int imProcessMultiPointOp	(	const imImage **	*src_image_list,*
		int	*src_image_count,*
		imImage *	*dst_image,*
		imMultiPointOpFunc	*func,*
		double *	*params,*
		void *	*userdata,*
		const char *	*op_name*
	)		

Apply an multiple point operation using a custom function. One pixel from each source affects the same pixel on target.
All source images must match in size, depth and data type. Can be done in-place, source and target must match size and depth. Data type can be different between sources and target, but complex is not supported.
op_name is used only by the counter and can be NULL. Returns zero if the counter aborted.

```
im.ProcessMultiPointOp(src_image: table of imImage, dst_image: imImage, func: function, params: table, [op_name: string]) -> counter: boolean [in Lua 5]
```

```
im.ProcessMultiPointOpNew(src_image: table of imImage, func: function, params: table, [op_name: string]) -> counter: boolean, new_image: imImage [in Lua 5]
```

In Lua, the params table is passed to the function by using the Lua stack, so its table can contain any type of objects, but they all must be unnamed.

int imProcessMultiPointColorOp	(	const imImage **	*src_image_list,*
		int	*src_image_count,*
		imImage *	*dst_image,*
		imMultiPointColorOpFunc	*func,*
		double *	*params,*
		void *	*userdata,*
		const char *	*op_name*
	)		

Apply an multiple point color operation using a custom function. One pixel from each source affects the same pixel on target.
All source images must match in size, depth and data type. Can be done in-place, source and target must match size, depth can be different. Data type can be different between sources and target, but complex is not supported.
op_name is used only by the counter and can be NULL. Returns zero if the counter aborted.

```
im.ProcessMultiPointColorOp(src_image: table of imImage, dst_image: imImage, func: function, params: table, [op_name: string]) -> counter: boolean [in Lua 5]
```

```
im.ProcessMultiPointColorOpNew(src_image: table of imImage, func: function, params: table, [op_name: string]) -> counter: boolean, new_image: imImage [in Lua 5]
```

In Lua, the params table is passed to the function by using the Lua stack, so its table can contain any type of objects, but they all must be unnamed.

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Defines

Image Enhance Utilities in Lua
[Image Processing]

Collaboration diagram for Image Enhance Utilities in Lua:

Defines

#define	imImageGamma(_image, _gamma) { double params[1]; params[0] = _gamma; imProcessToneGamut(_image, _image, IM_GAMUT_POW, params); }
#define	imImageBrightnessContrast(_image, _bright_shift, _contrast_factor) { double _params[2]; _params[0] = bright_shift; _params[1] = contrast_factor; imProcessToneGamut(_image, _image, IM_GAMUT_BRIGHTCONT, _params); }
#define	imImageLevel(_image, _start, _end) { double _params[2]; _params[0] = _start; _params[1] = _end; imProcessToneGamut(_image, _image, IM_GAMUT_EXPAND, _params); }
#define	imImageEqualize(_image) imProcessEqualizeHistogram(_image, _image)
#define	imImageNegative(_image) imProcessNegative(_image, _image)
#define	imImageAutoLevel(_image, _percent) imProcessExpandHistogram(_image, _image, _percent)

Detailed Description

Operations are done in-place. Limitations are the same of the original functions.

See im_process_pnt.h

Define Documentation

#define imImageGamma	(		_image,	
			_gamma	
	)			{ double params[1]; params[0] = _gamma; imProcessToneGamut(_image, _image, IM_GAMUT_POW, params); }

Same as imProcessToneGamut using IM_GAMUT_POW.

```
image:Gamma(gamma) [in Lua 5]
```

#define imImageBrightnessContrast	(		_image,	
			_bright_shift,	
			_contrast_factor	
	)			{ double _params[2]; _params[0] = bright_shift; _params[1] = contrast_factor; imProcessToneGamut(_image, _image, IM_GAMUT_BRIGHTCONT, _params); }

Same as imProcessToneGamut using IM_GAMUT_BRIGHTCONT.

```
image:BrightnessContrast(bright_shift, contrast_factor: number)   [in Lua 5]
```

#define imImageLevel	(		_image,	
			_start,	
			_end	
	)			{ double _params[2]; _params[0] = _start; _params[1] = _end; imProcessToneGamut(_image, _image, IM_GAMUT_EXPAND, _params); }

Same as imProcessToneGamut using IM_GAMUT_EXPAND.

```
image:Level(start, end)  [in Lua 5]
```

#define imImageEqualize	(		_image	)	imProcessEqualizeHistogram(_image, _image)

Same as imProcessEqualizeHistogram.

```
image:Equalize()  [in Lua 5]
```

#define imImageNegative	(		_image	)	imProcessNegative(_image, _image)

Same as imProcessNegative. Also same as imProcessToneGamut using IM_GAMUT_INVERT.

```
image:Negative()  [in Lua 5]
```

#define imImageAutoLevel	(		_image,	
			_percent	
	)			imProcessExpandHistogram(_image, _image, _percent)

Same as imProcessExpandHistogram.

```
image:AutoLevel(percent)  [in Lua 5]
```

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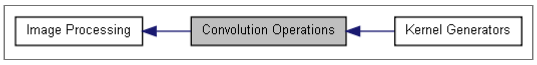
Modules | Functions

Convolution Operations
[Image Processing]

Collaboration diagram for Convolution Operations:



Modules

	Kernel Generators

Functions

int	imProcessConvolve (const imImage *src_image, imImage *dst_image, const imImage *kernel)
int	imProcessConvolveSep (const imImage *src_image, imImage *dst_image, const imImage *kernel)
int	imProcessConvolveDual (const imImage *src_image, imImage *dst_image, const imImage *kernel1, const imImage *kernel2)
int	imProcessConvolveRep (const imImage *src_image, imImage *dst_image, const imImage *kernel, int count)
int	imProcessCompassConvolve (const imImage *src_image, imImage *dst_image, imImage *kernel)
void	imProcessRotateKernel (imImage *kernel)
int	imProcessDiffOfGaussianConvolve (const imImage *src_image, imImage *dst_image, double stddev1, double stddev2)
int	imProcessLapOfGaussianConvolve (const imImage *src_image, imImage *dst_image, double stddev)
int	imProcessMeanConvolve (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessGaussianConvolve (const imImage *src_image, imImage *dst_image, double stddev)
int	imProcessBarlettConvolve (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessSobelConvolve (const imImage *src_image, imImage *dst_image)
int	imProcessPrewittConvolve (const imImage *src_image, imImage *dst_image)
int	imProcessSplineEdgeConvolve (const imImage *src_image, imImage *dst_image)
int	imProcessZeroCrossing (const imImage *src_image, imImage *dst_image)
int	imProcessCanny (const imImage *src_image, imImage *dst_image, double stddev)
int	imGaussianStdDev2KernelSize (double stddev)
double	imGaussianKernelSize2StdDev (int kernel_size)
int	imProcessUnsharp (const imImage *src_image, imImage *dst_image, double stddev, double amount, double threshold)

int	imProcessSharp (const imImage *src_image, imImage *dst_image, double amount, double threshold)
int	imProcessSharpKernel (const imImage *src_image, const imImage *kernel, imImage *dst_image, double amount, double threshold)

Detailed Description

See im_process_loc.h

Function Documentation

int imProcessConvolve	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		const imImage *	*kernel*	
	)			

Base Convolution with a kernel.
Kernel can be IM_INT or IM_FLOAT, but always IM_GRAY. Use kernel size odd for better results.
Supports all data types. The border is mirrored.
Returns zero if the counter aborted. Most of the convolutions use this function.

```
im.ProcessConvolve(src_image: imImage, dst_image: imImage, kernel: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessConvolveNew(image: imImage, kernel: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessConvolveSep	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		const imImage *	*kernel*	
	)			

Base convolution when the kernel is separable. Only the first line and the first column will be used.
Returns zero if the counter aborted.

```
im.ProcessConvolveSep(src_image: imImage, dst_image: imImage, kernel: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessConvolveSepNew(image: imImage, kernel: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessConvolveDual	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		const imImage *	*kernel1,*	
		const imImage *	*kernel2*	
	)			

Base Convolution with two kernels. The result is the magnitude of the result of each convolution.
Kernel can be IM_INT or IM_FLOAT, but always IM_GRAY. Use kernel size odd for better results.
Supports all data types. The border is mirrored.
Returns zero if the counter aborted. Most of the convolutions use this function.

```
im.ProcessConvolveDual(src_image: imImage, dst_image: imImage, kernel1, kernel2: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessConvolveDualNew(image: imImage, kernel1, kernel2: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessConvolveRep	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		const imImage *	*kernel,*	
		int	*count*	
	)			

Repeats the convolution a number of times.
Returns zero if the counter aborted.

```
im.ProcessConvolveRep(src_image: imImage, dst_image: imImage, kernel: imImage, count: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessConvolveRepNew(image: imImage, kernel: imImage, count: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessCompassConvolve	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		imImage *	*kernel*	
	)			

Convolve with a kernel rotating it 8 times and getting the absolute maximum value.
Kernel must be square.
The rotation is implemented only for kernel sizes 3x3, 5x5 and 7x7.
Supports all data types except complex. Returns zero if the counter aborted.

```
im.ProcessCompassConvolve(src_image: imImage, dst_image: imImage, kernel: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessCompassConvolveNew(image: imImage, kernel: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

void imProcessRotateKernel	(	imImage *	*kernel*	)	

Utility function to rotate a kernel one time.

```
im.ProcessRotateKernel(kernel: imImage) [in Lua 5]
```

int imProcessDiffOfGaussianConvolve	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double	*stddev1,*	
		double	*stddev2*	
	)			

Difference(Gaussian1, Gaussian2).
Supports all data types, but if source is IM_BYTE or IM_USHORT target image must be of type IM_INT. Returns zero if the counter aborted.

```
im.ProcessDiffOfGaussianConvolve(src_image: imImage, dst_image: imImage, stddev1: number, stddev2: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessDiffOfGaussianConvolveNew(image: imImage, stddev1: number, stddev2: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessLapOfGaussianConvolve	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double	*stddev*	
	)			

Convolution with a laplacian of a gaussian kernel.
Supports all data types, but if source is IM_BYTE or IM_USHORT target image must be of type IM_INT. Returns zero if the counter aborted.

```
im.ProcessLapOfGaussianConvolve(src_image: imImage, dst_image: imImage, stddev: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessLapOfGaussianConvolveNew(image: imImage, stddev: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessMeanConvolve	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*kernel_size*	
	)			

Convolution with a kernel full of "1"s inside a circle.
Supports all data types. Returns zero if the counter aborted.

```
im.ProcessMeanConvolve(src_image: imImage, dst_image: imImage, kernel_size: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessMeanConvolveNew(image: imImage, kernel_size: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessGaussianConvolve	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double	*stddev*	
	)			

Convolution with a gaussian kernel with floating point values.
If sdtdev is negative its magnitude will be used as the kernel size.
Supports all data types. Returns zero if the counter aborted.

```
im.ProcessGaussianConvolve(src_image: imImage, dst_image: imImage, stddev: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessGaussianConvolveNew(image: imImage, stddev: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessBarlettConvolve	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*kernel_size*	
	)			

Convolution with a barlett kernel.
Supports all data types. Returns zero if the counter aborted.

```
im.ProcessBarlettConvolve(src_image: imImage, dst_image: imImage, kernel_size: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessBarlettConvolveNew(image: imImage, kernel_size: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessSobelConvolve	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Magnitude of the sobel convolution.
Supports all data types. Returns zero if the counter aborted.

```
im.ProcessSobelConvolve(src_image: imImage, dst_image: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessSobelConvolveNew(image: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessPrewittConvolve	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Magnitude of the prewitt convolution.
Supports all data types. Returns zero if the counter aborted.

```
im.ProcessPrewittConvolve(src_image: imImage, dst_image: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessPrewittConvolveNew(image: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessSplineEdgeConvolve	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Spline edge dectection.
Supports all data types. Returns zero if the counter aborted.

```
im.ProcessSplineEdgeConvolve(src_image: imImage, dst_image: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessSplineEdgeConvolveNew(image: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessZeroCrossing	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Finds the zero crossings of IM_SHORT, IM_INT, IM_FLOAT and IM_DOUBLE images. Crossings are marked with non zero values indicating the intensity of the edge. It is usually used after a second derivative, laplace.
Extracted from XITE, Copyright 1991, Blab, UiO
http://www.ifi.uio.no/~blab/Software/Xite/ Returns zero if the counter aborted.

```
im.ProcessZeroCrossing(src_image: imImage, dst_image: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessZeroCrossingNew(image: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessCanny	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double	*stddev*	
	)			

First part of the Canny edge detector. Includes the gaussian filtering and the nonmax suppression.
After using this you could apply a Hysteresis Threshold, see imProcessHysteresisThreshold.
Image must be IM_BYTE/IM_GRAY.
Returns zero if the counter aborted. Implementation from the book:

```
    J. R. Parker
    "Algorithms for Image Processing and Computer Vision"
    WILEY
```

```
im.ProcessCanny(src_image: imImage, dst_image: imImage, stddev: number)-> counter: boolean [in Lua 5]
```

```
im.ProcessCannyNew(image: imImage, stddev: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imGaussianStdDev2KernelSize	(	double	*stddev*	)	

Calculates the kernel size given the standard deviation.
If sdtdev is negative its magnitude will be used as the kernel size.

```
im.GaussianStdDev2KernelSize(stddev: number) -> kernel_size: number [in Lua 5]
```

double imGaussianKernelSize2StdDev	(	int	*kernel_size*	)	

Calculates the standard deviation given the kernel size.

```
im.GaussianKernelSize2StdDev(kernel_size: number) -> stddev: number [in Lua 5]
```

int imProcessUnsharp	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double	*stddev,*	
		double	*amount,*	
		double	*threshold*	
	)			

Edge enhancement using Unsharp mask. stddev control the gaussian filter, amount controls how much the edges will enhance the image (0<amount<1), and threshold controls which edges will be considered, it compares to twice of the absolute size of the edge. Although very similar to imProcessSharp, produces better results.

```
im.ProcessUnsharp(src_image: imImage, dst_image: imImage, stddev: number, amount: number, threshold: number) [in Lua 5]
```

```
im.ProcessUnsharpNew(image: imImage, stddev: number, amount: number, threshold: number) -> new_image: imImage [in Lua 5]
```

int imProcessSharp	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		double	*amount,*	
		double	*threshold*	
	)			

Edge enhancement using Laplacian8 mask. amount controls how much the edges will enhance the image (0<amount<1), and threshold controls which edges will be considered, it compares to twice of the absolute size of the edge. Returns zero if the counter aborted.

```
im.ProcessSharp(src_image: imImage, dst_image: imImage, amount: number, threshold: number) [in Lua 5]
```

```
im.ProcessSharpNew(image: imImage, amount: number, threshold: number) -> new_image: imImage [in Lua 5]
```

int imProcessSharpKernel	(	const imImage *	*src_image,*
		const imImage *	*kernel,*
		imImage *	*dst_image,*
		double	*amount,*
		double	*threshold*
	)		

Edge enhancement using a given kernel. If kernel has all positive values, then the unsharp technique is used, else sharp is used. amount controls how much the edges will enhance the image (0<amount<1), and threshold controls which edges will be considered, it compares to twice of the absolute size of the edge. Returns zero if the counter aborted.

```
im.ProcessSharp(src_image: imImage, dst_image: imImage, amount: number, threshold: number) [in Lua 5]
```

```
im.ProcessSharpNew(image: imImage, amount: number, threshold: number) -> new_image: imImage [in Lua 5]
```

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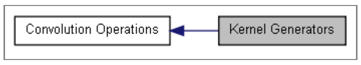
Functions

Kernel Generators
[Convolution Operations]

Collaboration diagram for Kernel Generators:



Functions

imImage *	imKernelSobel (void)
imImage *	imKernelPrewitt (void)
imImage *	imKernelKirsh (void)
imImage *	imKernelLaplacian4 (void)
imImage *	imKernelLaplacian8 (void)
imImage *	imKernelLaplacian5x5 (void)
imImage *	imKernelLaplacian7x7 (void)
imImage *	imKernelGradian3x3 (void)
imImage *	imKernelGradian7x7 (void)
imImage *	imKernelSculpt (void)
imImage *	imKernelMean3x3 (void)
imImage *	imKernelMean5x5 (void)
imImage *	imKernelCircularMean5x5 (void)
imImage *	imKernelMean7x7 (void)
imImage *	imKernelCircularMean7x7 (void)
imImage *	imKernelGaussian3x3 (void)
imImage *	imKernelGaussian5x5 (void)
imImage *	imKernelBarlett5x5 (void)
imImage *	imKernelTopHat5x5 (void)
imImage *	imKernelTopHat7x7 (void)
imImage *	imKernelEnhance (void)

Detailed Description

Creates several known kernels

See im_kernel.h

Function Documentation

imImage* imKernelSobel	(	void		)

Creates a kernel with the following values:

```
 1  2  1
 0  0  0
-1 -2 -1
```

```
im.KernelSobel() -> kernel: imImage [in Lua 5]
```

imImage* imKernelPrewitt	(	void		)

Creates a kernel with the following values:

```
 1  1  1
 0  0  0
-1 -1 -1
```

```
im.KernelPrewitt() -> kernel: imImage [in Lua 5]
```

imImage* imKernelKirsh (void)

Creates a kernel with the following values:

```
  5  5  5
 -3  0 -3
 -3 -3 -3
```

```
im.KernelKirsh() -> kernel: imImage [in Lua 5]
```

imImage* imKernelLaplacian4 (void)

Creates a kernel with the following values:

```
  0 -1  0
 -1  4 -1
  0 -1  0
```

```
im.KernelLaplacian4() -> kernel: imImage [in Lua 5]
```

imImage* imKernelLaplacian8 (void)

Creates a kernel with the following values:

```
 -1 -1 -1
 -1  8 -1
 -1 -1 -1
```

```
im.KernelLaplacian8() -> kernel: imImage [in Lua 5]
```

imImage* imKernelLaplacian5x5 (void)

Creates a kernel with the following values:

```
  0 -1 -1 -1  0
 -1  0  1  0 -1
 -1  1  8  1 -1
 -1  0  1  0 -1
  0 -1 -1 -1  0
```

```
im.KernelLaplacian5x5() -> kernel: imImage [in Lua 5]
```

imImage* imKernelLaplacian7x7 (void)

Creates a kernel with the following values:

```
 -1 -1 -1 -1 -1 -1 -1
 -1 -1 -1 -1 -1 -1 -1
 -1 -1 -1 -1 -1 -1 -1
 -1 -1 -1 48 -1 -1 -1
 -1 -1 -1 -1 -1 -1 -1
 -1 -1 -1 -1 -1 -1 -1
 -1 -1 -1 -1 -1 -1 -1
```

```
im.KernelLaplacian7x7() -> kernel: imImage [in Lua 5]
```

imImage* imKernelGradian3x3 (void)

Creates a kernel with the following values:

```
 0 -1 0
 0  1 0
 0  0 0
```

```
im.KernelGradian3x3() -> kernel: imImage [in Lua 5]
```

imImage* imKernelGradian7x7 (void)

Creates a kernel with the following values:

```
  0 -1 -1  0  1  1  0
 -1 -2 -2  0  2  2  1
 -1 -2 -3  0  3  2  1
 -1 -2 -3  0  3  2  1
 -1 -2 -3  0  3  2  1
 -1 -2 -2  0  2  2  1
  0 -1 -1  0  1  1  0
```

```
im.KernelGradian7x7() -> kernel: imImage [in Lua 5]
```

imImage* imKernelSculpt (void)

Creates a kernel with the following values:

```
 -1 0 0
  0 0 0
  0 0 1
```

```
im.KernelSculpt() -> kernel: imImage [in Lua 5]
```

imImage* imKernelMean3x3 (void)

Creates a kernel with the following values:

```
 1 1 1
 1 1 1
 1 1 1
```

```
im.KernelMean3x3() -> kernel: imImage [in Lua 5]
```

imImage* imKernelMean5x5 (void)

Creates a kernel with the following values:

```
 1 1 1 1 1
 1 1 1 1 1
 1 1 1 1 1
 1 1 1 1 1
 1 1 1 1 1
```

```
im.KernelMean5x5() -> kernel: imImage [in Lua 5]
```

imImage* imKernelCircularMean5x5 (void)

Creates a kernel with the following values:

```
 0 1 1 1 0
 1 1 1 1 1
 1 1 1 1 1
 1 1 1 1 1
 0 1 1 1 0
```

```
im.KernelMean5x5() -> kernel: imImage [in Lua 5]
```

imImage* imKernelMean7x7 (void)

Creates a kernel with the following values:

```
 1 1 1 1 1 1 1
 1 1 1 1 1 1 1
 1 1 1 1 1 1 1
 1 1 1 1 1 1 1
 1 1 1 1 1 1 1
 1 1 1 1 1 1 1
 1 1 1 1 1 1 1
```

```
im.KernelMean7x7() -> kernel: imImage [in Lua 5]
```

imImage* imKernelCircularMean7x7 (void)

Creates a kernel with the following values:

```
 0 0 1 1 1 0 0
 0 1 1 1 1 1 0
 1 1 1 1 1 1 1
 1 1 1 1 1 1 1
 1 1 1 1 1 1 1
 0 1 1 1 1 1 0
 0 0 1 1 1 0 0
```

```
im.KernelCircularMean7x7() -> kernel: imImage [in Lua 5]
```

imImage* imKernelGaussian3x3 (void)

Creates a kernel with the following values:

```
 1 2 1
 2 4 2
 1 2 1
```

```
im.KernelGaussian3x3() -> kernel: imImage [in Lua 5]
```

imImage* imKernelGaussian5x5 (void)

Creates a kernel with the following values:

```
 1  4  6  4 1
 4 16 24 16 4
 6 24 36 24 6
 4 16 24 16 4
 1  4  6  4 1
```

```
im.KernelGaussian5x5() -> kernel: imImage [in Lua 5]
```

imImage* imKernelBarlett5x5 (void)

Creates a kernel with the following values:

```
 1 2 3 2 1
 2 4 6 4 2
 3 6 9 6 3
 2 4 6 4 2
 1 2 3 2 1
```

```
im.KernelBarlett5x5() -> kernel: imImage [in Lua 5]
```

imImage* imKernelTopHat5x5	(	void		)	

Creates a kernel with the following values:

```
  0 -1 -1 -1  0
 -1 -1  3 -1 -1
 -1  3  4  3 -1
 -1 -1  3 -1 -1
  0 -1 -1 -1  0
```

```
im.KernelTopHat5x5() -> kernel: imImage [in Lua 5]
```

imImage* imKernelTopHat7x7	(	void		)	

Creates a kernel with the following values:

```
  0  0 -1 -1 -1  0  0
  0 -1 -1 -1 -1 -1  0
 -1 -1  3  3  3 -1 -1
 -1 -1  3  4  3 -1 -1
 -1 -1  3  3  3 -1 -1
  0 -1 -1 -1 -1 -1  0
  0  0 -1 -1 -1  0  0
```

```
im.KernelTopHat7x7() -> kernel: imImage [in Lua 5]
```

imImage* imKernelEnhance	(	void		)	

Creates a kernel with the following values:

```
  0 -1 -2 -1  0
 -1 -4  0 -4 -1
 -2  0 40  0 -2
 -1 -4  0 -4 -1
  0 -1 -2 -1  0
```

```
im.KernelEnhance() -> kernel: imImage [in Lua 5]
```

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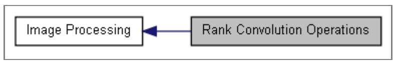
Functions

Rank Convolution Operations
[Image Processing]

Collaboration diagram for Rank Convolution Operations:



Functions

int	imProcessMedianConvolve (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessRangeConvolve (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessRankClosestConvolve (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessRankMaxConvolve (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessRankMinConvolve (const imImage *src_image, imImage *dst_image, int kernel_size)

Detailed Description

All the rank convolution use the same base function. Near the border the base function includes only the real image pixels in the rank. No border extensions are used.

See im_process_loc.h

Function Documentation

int imProcessMedianConvolve	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*kernel_size*
	)		

Rank convolution using the median value.
Returns zero if the counter aborted.
Supports all data types except complex. Can be applied on color images.

```
im.ProcessMedianConvolve(src_image: imImage, dst_image: imImage, kernel_size: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessMedianConvolveNew(image: imImage, kernel_size: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessRangeConvolve	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*kernel_size*
	)		

Rank convolution using (maximum-minimum) value.
Returns zero if the counter aborted.
Supports all data types except complex. Can be applied on color images.

```
im.ProcessRangeConvolve(src_image: imImage, dst_image: imImage, kernel_size: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessRangeConvolveNew(image: imImage, kernel_size: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessRankClosestConvolve	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*kernel_size*	
	)			

Rank convolution using the closest maximum or minimum value.
Returns zero if the counter aborted.
Supports all data types except complex. Can be applied on color images.

```
im.ProcessRankClosestConvolve(src_image: imImage, dst_image: imImage, kernel_size: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessRankClosestConvolveNew(image: imImage, kernel_size: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessRankMaxConvolve	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*kernel_size*	
	)			

Rank convolution using the maximum value.
Returns zero if the counter aborted.
Supports all data types except complex. Can be applied on color images.

```
im.ProcessRankMaxConvolve(src_image: imImage, dst_image: imImage, kernel_size: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessRankMaxConvolveNew(image: imImage, kernel_size: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessRankMinConvolve	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*kernel_size*	
	)			

Rank convolution using the minimum value.
Returns zero if the counter aborted.
Supports all data types except complex. Can be applied on color images.

```
im.ProcessRankMinConvolve(src_image: imImage, dst_image: imImage, kernel_size: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessRankMinConvolveNew(image: imImage, kernel_size: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

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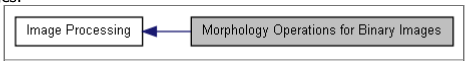
Functions

Morphology Operations for Binary Images
[Image Processing]

Collaboration diagram for Morphology Operations for Binary Images:



Functions

int	imProcessBinMorphConvolve (const imImage *src_image, imImage *dst_image, const imImage *kernel, int hit_white, int iter)
int	imProcessBinMorphErode (const imImage *src_image, imImage *dst_image, int kernel_size, int iter)
int	imProcessBinMorphDilate (const imImage *src_image, imImage *dst_image, int kernel_size, int iter)
int	imProcessBinMorphOpen (const imImage *src_image, imImage *dst_image, int kernel_size, int iter)
int	imProcessBinMorphClose (const imImage *src_image, imImage *dst_image, int kernel_size, int iter)
int	imProcessBinMorphOutline (const imImage *src_image, imImage *dst_image, int kernel_size, int iter)

Detailed Description

See im_process_loc.h

Function Documentation

int imProcessBinMorphConvolve	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		const imImage *	*kernel,*	
		int	*hit_white,*	
		int	*iter*	
	)			

Base binary morphology convolution.
Images are all IM_BINARY. Kernel is IM_INT, but values can be only 1, 0 or -1. Use kernel size odd for better results.
Hit white means hit=1 and miss=0, or else hit=0 and miss=1.
Use -1 for don't care positions in kernel. Kernel values are simply compared with image values.
The operation can be repeated by a number of iterations. The border is zero extended.
Almost all the binary morphology operations use this function.
Returns zero if the counter aborted.

```
im.ProcessBinMorphConvolve(src_image: imImage, dst_image: imImage, kernel: imImage, hit_white: boolean, iter: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessBinMorphConvolveNew(image: imImage, kernel: imImage, hit_white: boolean, iter: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessBinMorphErode	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*kernel_size,*	
		int	*iter*	
	)			

Binary morphology convolution with a kernel full of "1"s and hit white. Returns zero if the counter aborted.

```
im.ProcessBinMorphErode(src_image: imImage, dst_image: imImage, kernel_size: number, iter: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessBinMorphErodeNew(image: imImage, kernel_size: number, iter: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessBinMorphDilate	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*kernel_size,*	
		int	*iter*	
	)			

Binary morphology convolution with a kernel full of "0"s and hit black. Returns zero if the counter aborted.

```
im.ProcessBinMorphDilate(src_image: imImage, dst_image: imImage, kernel_size: number, iter: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessBinMorphDilateNew(image: imImage, kernel_size: number, iter: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessBinMorphOpen	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*kernel_size,*	
		int	*iter*	
	)			

Erode+Dilate. When iteration is more than one it means Erode+Erode+Erode+...+Dilate+Dilate+Dilate+... Returns zero if the counter aborted.

```
im.ProcessBinMorphOpen(src_image: imImage, dst_image: imImage, kernel_size: number, iter: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessBinMorphOpenNew(image: imImage, kernel_size: number, iter: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessBinMorphClose	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*kernel_size,*	
		int	*iter*	
	)			

Dilate+Erode. Returns zero if the counter aborted.

```
im.ProcessBinMorphClose(src_image: imImage, dst_image: imImage, kernel_size: number, iter: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessBinMorphCloseNew(image: imImage, kernel_size: number, iter: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessBinMorphOutline	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*kernel_size,*	
		int	*iter*	
	)			

Erode+Difference.
The difference from the source image is applied only once. Returns zero if the counter aborted.

```
im.ProcessBinMorphOutline(src_image: imImage, dst_image: imImage, kernel_size: number, iter: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessBinMorphOutlineNew(image: imImage, kernel_size: number, iter: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

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Functions

Morphology Operations for Gray Images
[Image Processing]

Collaboration diagram for Morphology Operations for Gray Images:

Functions

int	imProcessGrayMorphConvolve (const imImage *src_image, imImage *dst_image, const imImage *kernel, int ismax)
int	imProcessGrayMorphErode (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessGrayMorphDilate (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessGrayMorphOpen (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessGrayMorphClose (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessGrayMorphTopHat (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessGrayMorphWell (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessGrayMorphGradient (const imImage *src_image, imImage *dst_image, int kernel_size)

Detailed Description

See im_process_loc.h

Function Documentation

int imProcessGrayMorphConvolve	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		const imImage *	*kernel,*
		int	*ismax*
	)		

Base gray morphology convolution.
Supports all data types except complex. Can be applied on color images.
Kernel is always IM_INT. Use kernel size odd for better results.
Use -1 for don't care positions in kernel. Kernel values are added to image values, then you can use the maximum or the minimum within the kernel area.
No border extensions are used. All the gray morphology operations use this function.
Returns zero if the counter aborted.

```
im.ProcessGrayMorphConvolve(src_image: imImage, dst_image: imImage, kernel: imImage, ismax: boolean) -> counter: boolean [in Lua 5]
```

```
im.ProcessGrayMorphConvolveNew(image: imImage, kernel: imImage, ismax: boolean) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessGrayMorphErode	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*kernel_size*
	)		

Gray morphology convolution with a kernel full of "0"s and use minimum value.

```
im.ProcessGrayMorphErode(src_image: imImage, dst_image: imImage, kernel_size: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessGrayMorphErodeNew(image: imImage, kernel_size: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessGrayMorphDilate	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*kernel_size*
	)		

Gray morphology convolution with a kernel full of "0"s and use maximum value. Returns zero if the counter aborted.

```
im.ProcessGrayMorphDilate(src_image: imImage, dst_image: imImage, kernel_size: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessGrayMorphDilateNew(image: imImage, kernel_size: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessGrayMorphOpen	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*kernel_size*
	)		

Erode+Dilate. Returns zero if the counter aborted.

```
im.ProcessGrayMorphOpen(src_image: imImage, dst_image: imImage, kernel_size: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessGrayMorphOpenNew(image: imImage, kernel_size: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessGrayMorphClose	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*kernel_size*
	)		

Dilate+Erode. Returns zero if the counter aborted.

```
im.ProcessGrayMorphClose(src_image: imImage, dst_image: imImage, kernel_size: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessGrayMorphCloseNew(image: imImage, kernel_size: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessGrayMorphTopHat	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*kernel_size*
	)		

Open+Difference. Returns zero if the counter aborted.

```
im.ProcessGrayMorphTopHat(src_image: imImage, dst_image: imImage, kernel_size: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessGrayMorphTopHatNew(image: imImage, kernel_size: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessGrayMorphWell	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*kernel_size*
	)		

Close+Difference. Returns zero if the counter aborted.

```
im.ProcessGrayMorphWell(src_image: imImage, dst_image: imImage, kernel_size: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessGrayMorphWellNew(image: imImage, kernel_size: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessGrayMorphGradient	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*kernel_size*
	)		

Difference(Erode, Dilate). Returns zero if the counter aborted.

```
im.ProcessGrayMorphGradient(src_image: imImage, dst_image: imImage, kernel_size: number) -> counter: boolean [in Lua 5]
```

```
im.ProcessGrayMorphGradientNew(image: imImage, kernel_size: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

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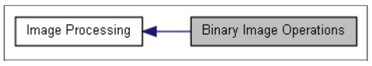
Functions

Binary Image Operations
[Image Processing]

Collaboration diagram for Binary Image Operations:



Functions

int	imProcessBinThinZhangSuen (imImage *src_image, imImage *dst_image)
int	imProcessBinThinNhMaps (const imImage *src_image, imImage *dst_image)

Detailed Description

Other binary image operations.

See im_process_loc.h

Function Documentation

int imProcessBinThinZhangSuen	(	imImage *	*src_image,*
		imImage *	*dst_image*
	)		

Thins the supplied binary image using Zhang-Suen thinning algorithm.
Reference:
Rosetta Code
https://rosettacode.org/wiki/Zhang-Suen_thinning_algorithm
Not using OpenMP when enabled.
Returns zero if the counter aborted (counter is approximate).
(since 3.14)

```
im.ProcessBinThinZhangSuen(src_image: imImage, dst_image: imImage)-> counter: boolean [in Lua 5]
```

```
im.ProcessBinThinZhangSuenNew(image: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessBinThinNhMaps	(	const imImage *	*src_image,*
		imImage *	*dst_image*
	)		

Thins the supplied binary image using Rosenfeld's parallel thinning algorithm.
Reference:
"Efficient Binary Image Thinning using Neighborhood Maps"
by Joseph M. Cychosz, 3ksnn64@ecn.purdue.edu
in "Graphics Gems IV", Academic Press, 1994
Not using OpenMP when enabled.
Returns zero if the counter aborted (counter is approximate).
(renamed in 3.14)

```
im.ProcessBinThinNhMaps(src_image: imImage, dst_image: imImage)-> counter: boolean [in Lua 5]
```

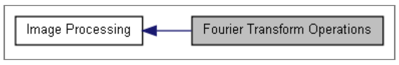
```
im.ProcessBinThinNhMapsNew(image: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

Functions

Fourier Transform Operations

[Image Processing]

Collaboration diagram for Fourier Transform Operations:



Functions

void	imProcessFFT (const imImage *src_image, imImage *dst_image)
void	imProcessIFFT (const imImage *src_image, imImage *dst_image)
void	imProcessFFTraw (imImage *image, int inverse, int center, int normalize)
void	imProcessSwapQuadrants (imImage *image, int center2origin)

Detailed Description

All Fourier transforms use FFTW 3.x library.
The pre-compiled binaries depend on an external library. For Windows the FFTW DLLs are included in the package. For Linux you must use the libfftw3 included with your sysytem.

FFTW Copyright Matteo Frigo, Steven G. Johnson and the MIT.
http://www.fftw.org
See "fftw.h"

Must link with "im_fftw3" library.

IMPORTANT: The FFTW lib has a GPL license. The license of the "im_fftw3" library is automatically the GPL. So you cannot use it for commercial applications without contacting the authors.

FFTW 3.x have float and double support.

See im_process_glo.h

Function Documentation

void imProcessFFT	(	const imImage *	*src_image*,	
		imImage *	*dst_image*	
	)			

Forward FFT.
The result has its lowest frequency at the center of the image.
This is an unnormalized fft.
Images must be of the same size. Target image must be of type complex.

```
im.ProcessFFT(src_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessFFTNew(image: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessIFFT	(	const imImage *	*src_image*,	
		imImage *	*dst_image*	
	)			

Inverse FFT.
The image has its lowest frequency restored to the origin before the transform.
The result is normalized by (width*height).
Images must be of the same size and both must be of type complex.

```
im.ProcessIFFT(src_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessIFFTNew(image: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessFFTraw	(	imImage *	*image*,	
		int	*inverse*,	
		int	*center*,	
		int	*normalize*	
	)			

Raw in-place FFT (forward or inverse).
The lowest frequency can be centered after forward, or can be restored to the origin before inverse.
The result can be normalized after the transform by sqrt(w*h) [1] or by (w*h) [2], or left unnormalized [0].

Images must be of the same size and both must be of type complex.

```
im.ProcessFFTraw(image: imImage, inverse: number, center: number, normalize: number) [in Lua 5]
```

void imProcessSwapQuadrants	(	imImage *	*image,*	
		int	*center2origin*	
	)			

Auxiliary function for the raw FFT.
This is the function used internally to change the lowest frequency position in the image.
If the image size has even dimensions the flag "center2origin" is useless. But if it is odd, you must specify if its from center to origin (usually used before inverse) or from origin to center (usually used after forward).
Notice that this function is used for images in the the frequency domain.
Image type must be complex.

```
im.ProcessSwapQuadrants(image: imImage, center2origin: number) [in Lua 5]
```

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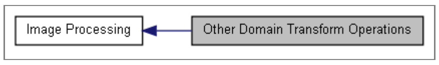
Functions

Other Domain Transform Operations
[Image Processing]

Collaboration diagram for Other Domain Transform Operations:



Functions

int	imProcessHoughLines (const imImage *src_image, imImage *dst_image)
int	imProcessHoughLinesDraw (const imImage *src_image, const imImage *hough, const imImage *hough_points, imImage *dst_image)
void	imProcessCrossCorrelation (const imImage *src_image1, const imImage *src_image2, imImage *dst_image)
void	imProcessAutoCorrelation (const imImage *src_image, imImage *dst_image)
void	imProcessDistanceTransform (const imImage *src_image, imImage *dst_image)
void	imProcessRegionalMaximum (const imImage *src_image, imImage *dst_image)

Detailed Description

Hough, Distance.

See im_process_glo.h

Function Documentation

int imProcessHoughLines	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Hough Lines Transform.
It will detect white lines in a black background. So the source image must be a IM_BINARY image with the white lines of interest enhanced. The better the threshold with the white lines the better the line detection.
The target image must have IM_GRAY, IM_INT, hg_width=180, hg_height=2*rmax+1, where rmax is the image diagonal/2 (rmax = srqrt(width*width + height*height)).
The hough transform defines "cos(theta) * X + sin(theta) * Y = rho" and the parameters are in the interval:
theta = "0 .. 179", rho = "-hg_height/2 .. hg_height/2" .
Where rho is the perpendicular distance from the center of the image and theta the angle with the normal. So do not confuse theta with the line angle, they are perpendicular.
Returns zero if the counter aborted.
Inspired from ideas in XITE, Copyright 1991, Blab, UiO
http://www.ifi.uio.no/~blab/Software/Xite/
Not using OpenMP when enabled.

```
im.ProcessHoughLines(src_image: imImage, dst_image: imImage) -> counter: boolean [in Lua 5]
```

```
im.ProcessHoughLinesNew(image: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessHoughLinesDraw	(	const imImage *	*src_image,*	
		const imImage *	*hough,*	
		const imImage *	*hough_points,*	
		imImage *	*dst_image*	
	)			

Draw detected hough lines.
The source and target images can be IM_MAP, IM_GRAY or IM_RGB, with data type IM_BYTE.
Can be done in-place.
If the hough transform is not NULL, then the hough points are filtered to include only lines that are significally different from each other.
The hough image is the hough transform image, but it is optional and can be NULL. If not NULL then it will be used to filter lines that are very similar.
The hough points image is a hough transform image that was thresholded to a IM_BINARY image, usually using a Local Max threshold operation (see imProcessLocalMaxThreshold). Again the better the threshold the better the results.
The detected lines will be drawn using a red color. If the target image is IM_GRAY, it will be changed to IM_MAP.
If the target image is IM_RGB, then only the red plane will be changed. Returns the number of detected lines.
Not using OpenMP when enabled.

```
im.ProcessHoughLinesDraw(src_image: imImage, hough: imImage, hough_points: imImage, dst_image: imImage) -> lines: number [in Lua 5]
im.ProcessHoughLinesDrawNew(image: imImage, hough: imImage, hough_points: imImage) -> lines: number, new_image: imImage [in Lua 5]
```

void imProcessCrossCorrelation	(	const imImage *	*src_image1*,	
		const imImage *	*src_image2*,	
		imImage *	*dst_image*	
	)			

Calculates the Cross Correlation in the frequency domain.
CrossCorr(a,b) = IFFT(Conj(FFT(a))*FFT(b))
Images must be of the same size and only target image must be of type complex.

```
im.ProcessCrossCorrelation(src_image1: imImage, src_image2: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessCrossCorrelationNew(image1: imImage, image2: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessAutoCorrelation	(	const imImage *	*src_image*,	
		imImage *	*dst_image*	
	)			

Calculates the Auto Correlation in the frequency domain.
Uses the cross correlation. Images must be of the same size and only target image must be of type complex.

```
im.ProcessAutoCorrelation(src_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessAutoCorrelationNew(image: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessDistanceTransform	(	const imImage *	*src_image*,	
		imImage *	*dst_image*	
	)			

Calculates the Distance Transform of a binary image using an aproximation of the euclidian distance.
Each white pixel in the binary image is assigned a value equal to its distance from the nearest black pixel.
Uses a two-pass algorithm incrementally calculating the distance.
Source image must be IM_BINARY, target must be IM_FLOAT or IM_DOUBLE.

```
im.ProcessDistanceTransform(src_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessDistanceTransformNew(image: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessRegionalMaximum	(	const imImage *	*src_image*,	
		imImage *	*dst_image*	
	)			

Marks all the regional maximum of the distance transform.
source must be IM_GRAY+IM_FLOAT/IM_DOUBLE, target must be IM_BINARY.
We consider maximum all connected pixel values that have smaller pixel values around it.

```
im.ProcessRegionalMaximum(src_image: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessRegionalMaximumNew(image: imImage) -> new_image: imImage [in Lua 5]
```

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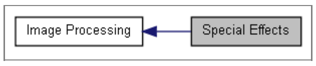
Functions

Special Effects

[Image Processing]

Collaboration diagram for Special Effects:



Functions

void	imProcessPixelate (const imImage *src_image, imImage *dst_image, int box_size)
void	imProcessPosterize (const imImage *src_image, imImage *dst_image, int level)
void	imProcessBinaryMask (const imImage *src_image, imImage *dst_image, const imImage *mask_image)

Detailed Description

Operations to change image appearance.

See im_process_pnt.h

Function Documentation

void imProcessPixelate	(	const imImage *	*src_image*,	
		imImage *	*dst_image*,	
		int	*box_size*	
	)			

Generates a zoom in effect averaging colors inside a square region.
Operates only on IM_BYTE images.

```
im.ProcessPixelate(src_image: imImage, dst_image: imImage, box_size: number) [in Lua 5]
```

```
im.ProcessPixelateNew(src_image: imImage, box_size: number) -> new_image: imImage [in Lua 5]
```

void imProcessPosterize	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*level*	
	)			

A simple Posterize effect. It reduces the number of colors in the image eliminating less significant bit planes. Can have 1 to 7 levels. See imProcessBitMask.
Images must have data type IM_BYTE.

```
im.ProcessPosterize(src_image: imImage, dst_image: imImage, level: number) [in Lua 5]
```

```
im.ProcessPosterizeNew(src_image: imImage, level: number) -> new_image: imImage [in Lua 5]
```

void imProcessBinaryMask	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		const imImage *	*mask_image*	
	)			

Applies a binary mask to an image. The mask must be a IM_BINARY image. Where the mask is 1, the original image is preserved. Where it is 0, the value is replaced by the minimum (0 for imbyte images).
Can be done in-place.

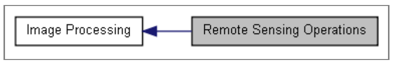
```
im.ProcessBinaryMask(src_image: imImage, dst_image, mask_image: imImage) [in Lua 5]
```

```
im.ProcessBinaryMaskNew(src_image, mask_image: imImage) -> new_image: imImage [in Lua 5]
```

Generated on Thu Jul 30 2020 20:43:37 for IM by doxygen *1.7.1*
Functions

Remote Sensing Operations
[Image Processing]

Collaboration diagram for Remote Sensing Operations:



Functions

void	imProcessNormDiffRatio (const imImage *image1, const imImage *image2, imImage *dst_image)
void	imProcessAbnormalHyperionCorrection (const imImage *src_image, imImage *dst_image, int threshold_consecutive, int threshold_percent, imImage *image_abnormal)

Detailed Description

Operations used in Remote Sensing.

See im_process_pnt.h

Function Documentation

void imProcessNormDiffRatio	(	const imImage *	*image1,*	
		const imImage *	*image2,*	
		imImage *	*dst_image*	
	)			

Calculates the Normalized Difference Ratio.
Uses the formula NormDiffRatio = (a-b)/(a+b),
The result image has [-1,1] interval.
Images must be IM_GRAY, and the target image must be IM_FLOAT, except if source is IM_DOUBLE.

```
im.ProcessNormDiffRatio(image1: imImage, image2: imImage, dst_image: imImage) [in Lua 5]
```

```
im.ProcessNormDiffRatioNew(image1: imImage, image2: imImage) -> new_image: imImage [in Lua 5]
```

void imProcessAbnormalHyperionCorrection	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*threshold_consecutive,*	
		int	*threshold_percent,*	
		imImage *	*image_abnormal*	
	)			

Applies the abnormal pixel correction as described in the article. (Since 3.8)
Images must be IM_GRAY. Source and Target must have the same datatype, and complex is not supported.
image_abnormal is optional, can be NULL. If not NULL, must be IM_BINARY and it will store the abnormal pixels distribution.

Can be done in-place.
threshold_percent is the percentage of the height that must have abnormal pixels candidates.
threshold_consecutive is the minimum number of consecutive abnormal pixels candidates to be considered an abnormal range. (usually the longest vertical ground feature in pixels)

Based on "Detection and Correction of Abnormal Pixels in Hyperion Images" from T. Han, D. G. Goodenough, A. Dyk, and J. Love

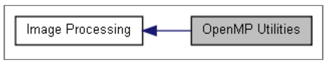
```
im.AbnormalHyperionCorrection(src_image: imImage, dst_image: imImage, threshold_consecutive, threshold_percent: number[, image_abnormal: imImage]) [in Lua 5]
```

```
im.AbnormalHyperionCorrectionNew(src_image: imImage, threshold_consecutive, threshold_percent: number[, image_abnormal: imImage]) -> new_image: imImage [in Lua 5]
```

Functions

OpenMP Utilities
[Image Processing]

Collaboration diagram for OpenMP Utilities:



Functions

int	imProcessOpenMPSetMinCount (int min_count)
int	imProcessOpenMPSetNumThreads (int count)

Detailed Description

Used inside im_process_omp only. But also exported to Lua. These functions do not use OpenMP, they are used when OpenMP is enabled in im_process. See im_util.h

Function Documentation

int imProcessOpenMPSetMinCount (int *min_count*)

Sets the minimum number of iterations to split into threads.
Default value is 250000, or an image with 500x500.
Returns the previous value.

```
im.ProcessOpenMPSetMinCount(min_count: number) -> old_min_count: number [in Lua 5]
```

int imProcessOpenMPSetNumThreads (int *count*)

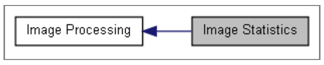
Sets the number of threads.
Does nothing if OpenMP is not enabled.
Returns the previous value.

```
im.ProcessOpenMPSetNumThreads(min_count: number) -> old_min_count: number [in Lua 5]
```

Data Structures | Typedefs | Functions

Image Statistics
[Image Processing]

Collaboration diagram for Image Statistics:



Data Structures

struct	_imStats
	Numerical Statistics Structure. More...

Typedefs

typedef struct _imStats	imStats

Functions

int	imCalcRMSError (const imImage *image1, const imImage *image2, double *rmserror)
int	imCalcSNR (const imImage *src_image, const imImage *noise_image, double *snr)
int	imCalcCountColors (const imImage *image, unsigned long *count)
int	imCalcGrayHistogram (const imImage *image, unsigned long *histo, int cumulative)
int	imCalcHistogram (const imImage *image, unsigned long *histo, int plane, int cumulative)
void	imCalcByteHistogram (const unsigned char *data, int count, unsigned long *histo, int cumulative)
void	imCalcUShortHistogram (const unsigned short *data, int count, unsigned long *histo, int cumulative)
void	imCalcShortHistogram (const short *data, int count, unsigned long *histo, int cumulative)
unsigned long *	imHistogramNew (int data_type, int *hcount)
void	imHistogramRelease (unsigned long *histo)

int	imHistogramShift (int data_type)
int	imHistogramCount (int data_type)
int	imCalcImageStatistics (const imImage *image, imStats *stats)
int	imCalcHistogramStatistics (const imImage *image, imStats *stats)
int	imCalcHistoImageStatistics (const imImage *image, int *median, int *mode)
int	imCalcPercentMinMax (const imImage *image, double percent, int ignore_zero, int *min, int *max)

Detailed Description

Operations to calculate some statistics over images.

See im_process_ana.h

Function Documentation

int imCalcRMSError	(	const imImage *	*image1,*
		const imImage *	*image2,*
		double *	*rmserror*
	)		

Calculates the RMS error between two images (Root Mean Square Error). Returns zero if the counter aborted.

```
im.CalcRMSError(image1: imImage, image2: imImage) -> counter: boolean, rms: number [in Lua 5]
```

int imCalcSNR	(	const imImage *	*src_image,*
		const imImage *	*noise_image,*
		double *	*snr*
	)		

Calculates the SNR of an image and its noise (Signal Noise Ratio). Returns zero if the counter aborted.

```
im.CalcSNR(src_image: imImage, noise_image: imImage) -> counter: boolean, snr: number [in Lua 5]
```

int imCalcCountColors	(	const imImage *	*image,*
		unsigned long *	*count*
	)		

Count the number of different colors in an image.
Image must be IM_BYTE, but can has all color spaces except IM_CMYK. Data type can be also IM_SHORT or IM_USHORT if color space is IM_GRAY, IM_BINARY or IM_MAP. Not using OpenMP when enabled, when color space depth is greater than 1. Returns zero if the counter aborted.

```
im.CalcCountColors(image: imImage) -> counter: boolean, count: number [in Lua 5]
```

int imCalcGrayHistogram	(	const imImage *	*image,*
		unsigned long *	*histo,*
		int	*cumulative*
	)		

Calculates the gray histogram of an image.
Image must be (IM_BYTE, IM_SHORT or IM_USHORT)/(IM_RGB, IM_GRAY, IM_BINARY or IM_MAP).
If the image is IM_RGB then the histogram of the luma component is calculated.
Histogram is always 256 or 65536 positions long.
When cumulative is different from zero it calculates the cumulative histogram. Returns zero if the counter aborted.

```
im.CalcGrayHistogram(image: imImage, cumulative: boolean) -> counter: boolean, histo: table of numbers [in Lua 5]
```

int imCalcHistogram	(	const imImage *	*image,*
		unsigned long *	*histo,*
		int	*plane,*
		int	*cumulative*
	)		

Calculates the histogram of an image plane.
Image can be IM_BYTE, IM_SHORT or IM_USHORT.
Histogram is always 256 or 65536 positions long.
Where plane is the depth plane to calculate the histogram.
When cumulative is different from zero it calculates the cumulative histogram. Returns zero if the counter aborted.

```
im.CalcHistogram(image: imImage, plane: number, cumulative: boolean) -> counter: boolean, histo: table of numbers [in Lua 5]
```

The returned table is zero indexed.

void imCalcByteHistogram	(	const unsigned char *	*data,*
		int	*count,*
		unsigned long *	*histo,*
		int	*cumulative*
	)		

Calculates the histogram of a IM_BYTE data.
Histogram is always 256 positions long.
When cumulative is different from zero it calculates the cumulative histogram. Not available in Lua.

void imCalcUShortHistogram	(	const unsigned short *	*data,*	
		int	*count,*	
		unsigned long *	*histo,*	
		int	*cumulative*	
	)			

Calculates the histogram of a IM_USHORT data.
Histogram is always 65536 positions long.
When cumulative is different from zero it calculates the cumulative histogram.
Not available in Lua.

void imCalcShortHistogram	(	const short *	*data,*	
		int	*count,*	
		unsigned long *	*histo,*	
		int	*cumulative*	
	)			

Calculates the histogram of a IM_SHORT data.
Histogram is always 65536 positions long.
Zero is located at 32768 index.
When cumulative is different from zero it calculates the cumulative histogram.
Not available in Lua.

unsigned long* imHistogramNew	(	int	*data_type,*	
		int *	*hcount*	
	)			

Allocates an histogram data based on the image data type.
Data type can be IM_BYTE, IM_SHORT or IM_USHORT.
Not available in Lua.

void imHistogramRelease	(	unsigned long *	*histo*	)	

Releases the histogram data.
Not available in Lua.

int imHistogramShift	(	int	*data_type*	)	

Short data type stores the histogram values of negative indexes starting at 0. So the real level is obtained by shifting the zero based index.
Not available in Lua.

int imHistogramCount	(	int	*data_type*	)	

Returns the histogram size based on the image data type.
For IM_IM_USHORT and IM_SHORT returns 65536 for others returns 256.
Not available in Lua.

int imCalcImageStatistics	(	const imImage *	*image,*	
		imStats *	*stats*	
	)			

Calculates the statistics about the image data.
There is one stats for each depth plane. For ex: stats[0]=red stats, stats[0]=green stats, ...
Supports all data types except complex.
Returns zero if the counter aborted.

```
im.CalcImageStatistics(image: imImage) -> counter: boolean, stats: table [in Lua 5]
```

Table contains the following fields: max, min, positive, negative, zeros, mean, stddev. If image depth > 1 then table contains several tables with the previous fields, one for each plane, starting at 0. The same as the imStats structure.

int imCalcHistogramStatistics	(	const imImage *	*image,*	
		imStats *	*stats*	
	)			

Calculates the statistics about the image histogram data.
There is one stats for each depth plane. For ex: stats[0]=red stats, stats[0]=green stats, ...
Only IM_BYTE, IM_SHORT and IM_USHORT images are supported. Returns zero if the counter aborted.

```
im.CalcHistogramStatistics(image: imImage) -> counter: boolean, stats: table [in Lua 5]
```

int imCalcHistoImageStatistics	(	const imImage *	*image,*	
		int *	*median,*	
		int *	*mode*	
	)			

Calculates some extra statistics about the image histogram data.
There is one stats for each depth plane.
Only IM_BYTE, IM_SHORT and IM_USHORT images are supported.
mode will be -1 if more than one max is found. Returns zero if the counter aborted.

```
im.CalcHistoImageStatistics(image: imImage) -> counter: boolean, median: number, mode: number [in Lua 5]
```

int imCalcPercentMinMax	(	const imImage *	*image,*	
		double	*percent,*	
		int	*ignore_zero,*	
		int *	*min,*	

		int *	*max*
	)		

Calculates the minimum and maximum levels ignoring a given percentage of the histogram count.
Used by imProcessExpandHistogram.
Only IM_BYTE, IM_SHORT and IM_USHORT images are supported.
Returns zero if the counter aborted.

```
im.CalcPercentMinMax(image: imImage, percent: number, ignore_zero: boolean) -> counter: boolean, min, max: number [in Lua 5]
```

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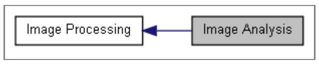
Functions

Image Analysis
[Image Processing]

Collaboration diagram for Image Analysis:



Functions

int	imAnalyzeFindRegions (const imImage *src_image, imImage *dst_image, int connect, int touch_border, int *region_count)
int	imAnalyzeMeasureArea (const imImage *image, int *area, int region_count)
int	imAnalyzeMeasurePerimArea (const imImage *image, double *perimarea, int region_count)
int	imAnalyzeMeasureCentroid (const imImage *image, const int *area, int region_count, double *cx, double *cy)
int	imAnalyzeMeasurePrincipalAxis (const imImage *image, const int *area, const double *cx, const double *cy, const int region_count, double *major_slope, double *major_length, double *minor_slope, double *minor_length)
int	imAnalyzeMeasureHoles (const imImage *image, int connect, int region_count, int *holes_count, int *holes_area, double *holes_perim)
int	imAnalyzeMeasurePerimeter (const imImage *image, double *perim, int region_count)
int	imProcessPerimeterLine (const imImage *src_image, imImage *dst_image)
int	imProcessRemoveByArea (const imImage *src_image, imImage *dst_image, int connect, int start_size, int end_size, int inside)
int	imProcessFillHoles (const imImage *src_image, imImage *dst_image, int connect)

Detailed Description

See im_process_ana.h

Function Documentation

int imAnalyzeFindRegions	(	const imImage *	*src_image,*
		imImage *	*dst_image,*
		int	*connect,*
		int	*touch_border,*
		int *	*region_count*
	)		

Find white regions in binary image.
Result is IM_GRAY/IM_USHORT type. Regions can be 4 connected or 8 connected.
The number of regions found is returned in region_count. Background is marked as 0.
Regions touching the border are considered only if touch_border=1. Not using OpenMP when enabled. Returns zero if the counter aborted.

```
im.AnalyzeFindRegions(src_image: imImage, dst_image: imImage, connect: number, touch_border: boolean) -> counter: boolean, region_count: number [in Lua 5]
```

```
im.AnalyzeFindRegionsNew(image: imImage, connect: number, touch_border: boolean) -> counter: boolean, region_count: number, new_image: imImage [in Lua 5]
```

int imAnalyzeMeasureArea	(	const imImage *	*image,*
		int *	*area,*
		int	*region_count*
	)		

Measure the actual area of all regions. Holes are not included.
This is the number of pixels of each region.
Source image is IM_GRAY/IM_USHORT type (the result of imAnalyzeFindRegions).
area has size the number of regions. Returns zero if the counter aborted.

```
im.AnalyzeMeasureArea(image: imImage, [region_count: number]) -> counter: boolean, area: table of numbers [in Lua 5]
```

The returned table is zero indexed.

int imAnalyzeMeasurePerimArea	(	const imImage *	*image,*
		double *	*perimarea,*
		int	*region_count*
	)		

Measure the polygonal area limited by the perimeter line of all regions. Holes are not included.
Notice that some regions may have polygonal area zero.
Source image is IM_GRAY/IM_USHORT type (the result of imAnalyzeFindRegions).
perimarea has size the number of regions. Returns zero if the counter aborted.

```
im.AnalyzeMeasurePerimArea(image: imImage, [region_count: number]) -> counter: boolean, perimarea: table of numbers [in Lua 5]
```

The returned table is zero indexed.

int imAnalyzeMeasureCentroid	(	const imImage *	*image,*	
		const int *	*area,*	
		int	*region_count,*	
		double *	*cx,*	
		double *	*cy*	
	)			

Calculate the centroid position of all regions. Holes are not included.
Source image is IM_GRAY/IM_USHORT type (the result of imAnalyzeFindRegions).
area, cx and cy have size the number of regions. If area is NULL will be internally calculated. Returns zero if the counter aborted.

```
im.AnalyzeMeasureCentroid(image: imImage, [area: table of numbers], [region_count: number]) -> counter: boolean, cx: table of numbers, cy: table of numbers [in Lua 5]
```

The returned tables are zero indexed.

int imAnalyzeMeasurePrincipalAxis	(	const imImage *	*image,*	
		const int *	*area,*	
		const double *	*cx,*	
		const double *	*cy,*	
		const int	*region_count,*	
		double *	*major_slope,*	
		double *	*major_length,*	
		double *	*minor_slope,*	
		double *	*minor_length*	
	)			

Calculate the principal major axis slope of all regions.
Source image is IM_GRAY/IM_USHORT type (the result of imAnalyzeFindRegions).
data has size the number of regions. If area or centroid are NULL will be internally calculated.
Principal (major and minor) axes are defined to be those axes that pass through the centroid, about which the moment of inertia of the region is, respectively maximal or minimal. Partially using OpenMP when enabled. Returns zero if the counter aborted.

```
im.AnalyzeMeasurePrincipalAxis(image: imImage, counter: boolean, [area: table of numbers], [cx: table of numbers], [cy: table of numbers], [region_count: number])
                                 -> major_slope: table of numbers, major_length: table of numbers, minor_slope: table of numbers, minor_length: table of numbers [in Lua 5]
```

The returned tables are zero indexed.

int imAnalyzeMeasureHoles	(	const imImage *	*image,*	
		int	*connect,*	
		int	*region_count,*	
		int *	*holes_count,*	
		int *	*holes_area,*	
		double *	*holes_perim*	
	)			

Measure the number of holes of all regions. Optionally computes the holes area and holes perimeter of all regions.
Source image is IM_GRAY/IM_USHORT type (the result of imAnalyzeFindRegions).
count, area and perim has size the number of regions, if some is NULL it will be not calculated. Not using OpenMP when enabled. Returns zero if the counter aborted.

```
im.AnalyzeMeasureHoles(image: imImage, connect: number, [region_count: number])-> counter: boolean, holes_count: number, holes_area: table of numbers, holes_perim: table
```

The returned tables are zero indexed.

int imAnalyzeMeasurePerimeter	(	const imImage *	*image,*	
		double *	*perim,*	
		int	*region_count*	
	)			

Measure the total perimeter of all regions (external and internal).
Source image is IM_GRAY/IM_USHORT type (the result of imAnalyzeFindRegions).
It uses a half-pixel inter distance for 8 neighbors in a perimeter of a 4 connected region.
This function can also be used to measure line length.
perim has size the number of regions. Returns zero if the counter aborted.

```
im.AnalyzeMeasurePerimeter(image: imImage)-> counter: boolean, perim: table of numbers [in Lua 5]
```

int imProcessPerimeterLine	(	const imImage *	*src_image,*	
		imImage *	*dst_image*	
	)			

Isolates the perimeter line of gray integer images. Background is defined as being black (0).
It just checks if at least one of the 4 connected neighbors is non zero. Image borders are extended with zeros. Returns zero if the counter aborted.

```
im.ProcessPerimeterLine(src_image: imImage, dst_image: imImage)-> counter: boolean [in Lua 5]
```

```
im.ProcessPerimeterLineNew(image: imImage) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessRemoveByArea	(	const imImage *	*src_image,*
		imImage *	*dst_image,*

		int	*connect,*	
		int	*start_size,*	
		int	*end_size,*	
		int	*inside*	
	)			

Eliminates regions that have area size outside or inside the given interval.
Source and target are a binary images. Regions can be 4 connected or 8 connected.
Can be done in-place. end_size can be zero to indicate no upper limit or an area with width*height size.
When searching inside the region the limits are inclusive (<= size >=), when searching outside the limits are exclusive (> size <).

```
im.ProcessRemoveByArea(src_image: imImage, dst_image: imImage, connect: number, start_size: number, end_size: number, inside: boolean)-> counter: boolean [in Lua 5]
```

```
im.ProcessRemoveByAreaNew(image: imImage, connect: number, start_size: number, end_size: number, inside: boolean) -> counter: boolean, new_image: imImage [in Lua 5]
```

int imProcessFillHoles	(	const imImage *	*src_image,*	
		imImage *	*dst_image,*	
		int	*connect*	
	)			

Fill holes inside white regions.
Source and target are a binary images. Regions can be 4 connected or 8 connected.
Can be done in-place. Returns zero if the counter aborted.

```
im.ProcessFillHoles(src_image: imImage, dst_image: imImage, connect: number)-> counter: boolean [in Lua 5]
```

```
im.ProcessFillHolesNew(image: imImage, connect: number) -> counter: boolean, new_image: imImage [in Lua 5]
```

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Additional Reference

Here is a list of all modules:

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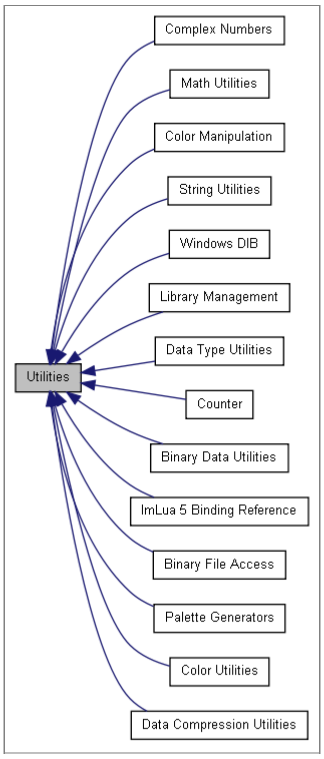
Utilities

Collaboration diagram for Utilities:



Data Structures

class	imAttribTable
	Attributes Table Class. More...
class	imAttribArray
	Attributes Array Class. More...

Modules

	Binary File Access
	Color Manipulation
	Complex Numbers
	Counter
	Windows DIB
	Library Management
	Math Utilities
	Palette Generators
	String Utilities
	Color Utilities
	Data Type Utilities
	Binary Data Utilities
	Data Compression Utilities
	ImLua 5 Binding Reference

Defines

#define	**IM_MIN**(_a, _b) (_a < _b? _a: _b)
#define	**IM_MAX**(_a, _b) (_a > _b? _a: _b)

Detailed Description

See im_util.h

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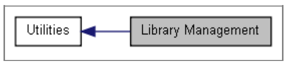
Defines | Functions

Library Management
[Utilities]

Collaboration diagram for Library Management:



Defines

#define	**IM_NAME** "IM - An Imaging Toolkit"
#define	**IM_DESCRIPTION** "Toolkit for Image Representation, Storage, Capture and Processing"
#define	**IM_COPYRIGHT** "Copyright (C) 1994-2020 Tecgraf/PUC-Rio"
#define	**IM_AUTHOR** "Antonio Scuri"
#define	**IM_VERSION** "3.15"
#define	**IM_VERSION_NUMBER** 315000
#define	**IM_VERSION_DATE** "2020/07/30"

Functions

const char *	imVersion (void)
const char *	imVersionDate (void)
int	imVersionNumber (void)

Detailed Description

Usefull definitions for about dialogs and for comparing the compiled version with the linked version of the library.

```
im._AUTHOR [in Lua 5]
```

```
im._COPYRIGHT [in Lua 5]
```

```
im._VERSION [in Lua 5]
```

```
im._VERSION_DATE [in Lua 5]
```

```
im._VERSION_NUMBER [in Lua 5]
```

```
im._DESCRIPTION [in Lua 5]
```

```
im._NAME [in Lua 5]
```

See im_lib.h

Function Documentation

const char* imVersion (void)

Returns the library current version. Returns the definition IM_VERSION plus the bug fix number.

```
im.Version() -> version: string [in Lua 5]
```

const char* imVersionDate (void)

Returns the library current version release date. Returns the definition IM_VERSION_DATE.

```
im.VersionDate() -> date: string [in Lua 5]
```

int imVersionNumber (void)

Returns the library current version number. Returns the definition IM_VERSION_NUMBER plus the bug fix number.
Can be compared in run time with IM_VERSION_NUMBER to compare compiled and linked versions of the library.

```
im.VersionNumber() -> version: number [in Lua 5]
```

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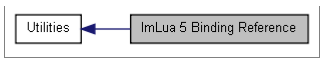
Functions

ImLua 5 Binding Reference
[Utilities]

Collaboration diagram for ImLua 5 Binding Reference:



Functions

int	imlua_open (lua_State *L)
int	imlua_close (lua_State *L)
int	imlua_open_capture (lua_State *L)
int	imlua_open_process (lua_State *L)
int	imlua_open_fftw (lua_State *L)

Detailed Description

Binding for the Lua 5 scripting language.
Lua 5.1 Copyright (C) 1994-2005 Lua.org, PUC-Rio
R. Ierusalimschy, L. H. de Figueiredo & W. Celes
http://www.lua.org

See imlua.h

Function Documentation

int imlua_open	(	lua_State *	*L*	)	

Initializes the Lua binding of the main IM library.
Returns 1 (leaves the im table on the top of the stack). You must link the application with the "imlua51" library.

int imlua_close	(	lua_State *	*L*	)	

Calls imFormatRemoveAll to release internal memory. Also available in Lua as "im.Close()".

int imlua_open_capture	(	lua_State *	*L*	)	

Initializes the Lua binding of the capture library.
Returns 1 (leaves the im table on the top of the stack). You must link the application with the "imlua_capture51" library.

int imlua_open_process	(	lua_State *	*L*	)	

Initializes the Lua binding of the process library.
Returns 1 (leaves the im table on the top of the stack). You must link the application with the "imlua_process51" library.

int imlua_open_fftw	(	lua_State *	*L*	)	

Initializes the Lua binding of the fourier transform library.
Returns 1 (leaves the im table on the top of the stack). You must link the application with the "imlua_fftw51" library.

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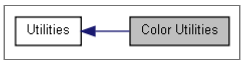
Functions

Color Utilities
[Utilities]

Collaboration diagram for Color Utilities:



Functions

long	imColorEncode (unsigned char red, unsigned char green, unsigned char blue)
void	imColorDecode (unsigned char *red, unsigned char *green, unsigned char *blue, long color)

Detailed Description

See im_util.h

Function Documentation

long imColorEncode	(	unsigned char	*red,*	
		unsigned char	*green,*	
		unsigned char	*blue*	
	)			

Encode RGB components in a long for palette usage.
"long" definition is compatible with the CD library definition.

```
im.ColorEncode(red: number, green: number, blue: number) -> color: lightuserdata [in Lua 5]
```

void imColorDecode	(	unsigned char *	*red,*	
		unsigned char *	*green,*	
		unsigned char *	*blue,*	
		long	*color*	

)

Decode RGB components from a long for palette usage.
"long" definition is compatible with the CD library definition.

```
im.ColorDecode(color: lightuserdata) -> red: number, green: number, blue: number [in Lua 5]
```

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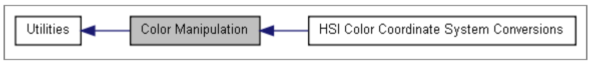
Modules | Functions

Color Manipulation

[Utilities]

Collaboration diagram for Color Manipulation:



Modules

	HSI Color Coordinate System Conversions

Functions

double	imColorZeroShift (int data_type)
int	imColorMax (int data_type)
int	imColorMin (int data_type)
template<class T , class R >	
T	imColorQuantize (const R &value, const T &min, const T &max)
template<class T >	
double	imColorReconstruct (const T &value, const T &min, const T &max)
template<class T >	
void	imColorYCbCr2RGB (const T Y, const T Cb, const T Cr, T &R, T &G, T &B, const T &zero, const T &min, const T &max)
template<class T >	
void	imColorRGB2YCbCr (const T R, const T G, const T B, T &Y, T &Cb, T &Cr, const T &zero)
template<class T >	
void	imColorCMYK2RGB (const T C, const T M, const T Y, const T K, T &R, T &G, T &B, const T &max)
template<class T >	
void	imColorXYZ2RGB (const T X, const T Y, const T Z, T &R, T &G, T &B)
template<class T >	
void	imColorRGB2XYZ (const T R, const T G, const T B, T &X, T &Y, T &Z)
void	imColorXYZ2Lab (const double X, const double Y, const double Z, double &L, double &a, double &b)
void	imColorLab2XYZ (const double L, const double a, const double b, double &X, double &Y, double &Z)
void	imColorXYZ2Luv (const double X, const double Y, const double Z, double &L, double &u, double &v)
void	imColorLuv2XYZ (const double L, const double u, const double v, double &X, double &Y, double &Z)
double	imColorTransfer2Linear (const double &nonlinear_value)
double	imColorTransfer2Nonlinear (const double &value)
void	imColorRGB2RGBNonlinear (const double RL, const double GL, const double BL, double &R, double &G, double &B)
template<class T >	
T	imColorRGB2Luma (const T R, const T G, const T B)
double	imColorLuminance2Lightness (const double &Y)
double	imColorLightness2Luminance (const double &L)

Detailed Description

Functions to convert from one color space to another, and color gamut utilities.

See im_color.h

Some Color Science

Y is luminance, a linear-light quantity. It is directly proportional to physical intensity weighted by the spectral sensitivity of human vision.

L* is lightness, a nonlinear luminance that approximates the perception of brightness. It is nearly perceptual uniform. It has a range of 0 to 100.

Y' is luma, a nonlinear luminance that approximates lightness.

Brightness is a visual sensation according to which an area appears to exhibit more or less light. It is a subjective quantity and can not be measured.

One unit of Euclidian distance in CIE L*u*v* or CIE L*a*b* corresponds roughly to a just-noticeable difference (JND) of color.

```
ChromaUV = sqrt(u*u + v*v)
HueUV = atan2(v, u)
SaturationUV = ChromaUV / L      (called psychometric saturation)
(the same can be calculated for Lab)
```

IEC 61966-2.1 Default RGB color space - sRGB

- ITU-R Recommendation BT.709 (D65 white point).
- D65 White Point (X,Y,Z) = (0.9505 1.0000 1.0890)

Documentation extracted from Charles Poynton - Digital Video and HDTV - Morgan Kaufmann - 2003.

Links

- www.color.org - ICC
- www.srgb.com - sRGB
- www.poynton.com - Charles Poynton
- www.littlecms.com - A free Color Management System (use this if you need precise color conversions)

Color Component Intervals

When minimum and maximum values must be pre-defined values, the following values are used:

```
byte   [0,255]             (1 byte)
short  [-32768,32767]      (2 bytes)
ushort [0,65535]           (2 bytes)
int    [-8388608,+8388607] (3 bytes of 4 possible)
float  [0,1]               (4 bytes)
double [0,1]               (8 bytes)
```

Usually this intervals are used when converting from real to integer, and when demoting an integer data type.

Function Documentation

double imColorZeroShift	(	int	*data_type*	)	[inline]

Returns the zero value for YCbCr color conversion.
When data type is unsigned Cb and Cr are shifted to 0-max. So before they can be used in conversion equations Cb and Cr values must be shifted back to fix the zero position.

int imColorMax	(	int	*data_type*	)	[inline]

Returns the maximum value for pre-defined color conversion purposes.
See Color Component Intervals.

int imColorMin	(	int	*data_type*	)	[inline]

Returns the minimum value for pre-defined color conversion purposes.
See Color Component Intervals.

template<class T , class R >

T imColorQuantize	(	const R &	*value,*	
		const T &	*min,*	
		const T &	*max*	
	)			[inline]

Quantize 0-1 values into min-max.
Value are usually integers, but the dummy quantizer uses real values. See also Math Utilities.

References imRound().

template<class T >

double imColorReconstruct	(	const T &	*value,*	
		const T &	*min,*	
		const T &	*max*	
	)			[inline]

Reconstruct min-max values into 0-1.
Values are usually integers, but the dummy re-constructor uses real values. See also Math Utilities.

template<class T >

void imColorYCbCr2RGB	(	const T	*Y,*	
		const T	*Cb,*	
		const T	*Cr,*	
		T &	*R,*	
		T &	*G,*	
		T &	*B,*	
		const T &	*zero,*	
		const T &	*min,*	
		const T &	*max*	
	)			[inline]

Converts Y'CbCr to R'G'B' (all nonlinear).
ITU-R Recommendation 601-1 with no headroom/footroom.

```
0 <= Y <= 1 ; -0.5 <= CbCr <= 0.5 ; 0 <= RGB <= 1

R'= Y' + 0.000 *Cb + 1.402 *Cr
G'= Y' - 0.344 *Cb - 0.714 *Cr
B'= Y' + 1.772 *Cb + 0.000 *Cr
```

template<class T >

void imColorRGB2YCbCr	(	const T	*R,*
		const T	*G,*
		const T	*B,*
		T &	*Y,*
		T &	*Cb,*
		T &	*Cr,*

		const T &	*zero*	
	)			[inline]

Converts R'G'B' to Y'CbCr (all nonlinear).
ITU-R Recommendation 601-1 with no headroom/footroom.

```
0 <= Y <= 1 ; -0.5 <= CbCr <= 0.5 ; 0 <= RGB <= 1

Y' =  0.299 *R' + 0.587 *G' + 0.114 *B'
Cb = -0.169 *R' - 0.331 *G' + 0.500 *B'
Cr =  0.500 *R' - 0.419 *G' - 0.081 *B'
```

template<class T >

void imColorCMYK2RGB	(	const T	*C,*	
		const T	*M,*	
		const T	*Y,*	
		const T	*K,*	
		T &	*R,*	
		T &	*G,*	
		T &	*B,*	
		const T &	*max*	
	)			[inline]

Converts C'M'Y'K' to R'G'B' (all nonlinear).
This is a poor conversion that works for a simple visualization.

```
0 <= CMYK <= 1 ; 0 <= RGB <= 1

R = (1 - K) * (1 - C)
G = (1 - K) * (1 - M)
B = (1 - K) * (1 - Y)
```

template<class T >

void imColorXYZ2RGB	(	const T	*X,*	
		const T	*Y,*	
		const T	*Z,*	
		T &	*R,*	
		T &	*G,*	
		T &	*B*	
	)			[inline]

Converts CIE XYZ to Rec 709 RGB (all linear).
ITU-R Recommendation BT.709 (D65 white point).

```
0 <= XYZ <= 1 ; 0 <= RGB <= 1

R =  3.2406 *X - 1.5372 *Y - 0.4986 *Z
G = -0.9689 *X + 1.8758 *Y + 0.0415 *Z
B =  0.0557 *X - 0.2040 *Y + 1.0570 *Z
```

template<class T >

void imColorRGB2XYZ	(	const T	*R,*	
		const T	*G,*	
		const T	*B,*	
		T &	*X,*	
		T &	*Y,*	
		T &	*Z*	
	)			[inline]

Converts Rec 709 RGB to CIE XYZ (all linear).
ITU-R Recommendation BT.709 (D65 white point).

```
0 <= XYZ <= 1 ; 0 <= RGB <= 1

X = 0.4124 *R + 0.3576 *G + 0.1805 *B
Y = 0.2126 *R + 0.7152 *G + 0.0722 *B
Z = 0.0193 *R + 0.1192 *G + 0.9505 *B
```

void imColorXYZ2Lab	(	const double	*X,*	
		const double	*Y,*	
		const double	*Z,*	
		double &	*L,*	
		double &	*a,*	
		double &	*b*	
	)			[inline]

Converts CIE XYZ (linear) to CIE L*a*b* (nonlinear).
The white point is D65.

```
0 <= L <= 1 ; -0.5 <= ab <= +0.5 ; 0 <= XYZ <= 1

if (t > 0.008856)
  f(t) = pow(t, 1/3)
else
  f(t) = 7.787*t + 16/116

fX = f(X / Xn)      fY = f(Y / Yn)      fZ = f(Z / Zn)
```

```
L = 1.16 * fY - 0.16
a = 2.5 * (fX - fY)
b = (fY - fZ)
```

void imColorLab2XYZ	(	const double	*L*,	
		const double	*a*,	
		const double	*b*,	
		double &	*X*,	
		double &	*Y*,	
		double &	*Z*	
	)			[inline]

Converts CIE L*a*b* (nonlinear) to CIE XYZ (linear).
The white point is D65.
0 <= L <= 1 ; -0.5 <= ab <= +0.5 ; 0 <= XYZ <= 1

void imColorXYZ2Luv	(	const double	*X*,	
		const double	*Y*,	
		const double	*Z*,	
		double &	*L*,	
		double &	*u*,	
		double &	*v*	
	)			[inline]

Converts CIE XYZ (linear) to CIE L*u*v* (nonlinear).
The white point is D65.

```
0 <= L <= 1 ; -1 <= uv <= +1 ; 0 <= XYZ <= 1

Y = Y / 1.0      (for D65)
if (Y > 0.008856)
  fY = pow(Y, 1/3)
else
  fY = 7.787 * Y + 0.16/1.16
L = 1.16 * fY - 0.16

U(x, y, z) = (4 * x)/(x + 15 * y + 3 * z)
V(x, y, z) = (9 * x)/(x + 15 * y + 3 * z)
un = U(Xn, Yn, Zn) = 0.1978      (for D65)
vn = V(Xn, Yn, Zn) = 0.4683      (for D65)
fu = U(X, Y, Z)
fv = V(X, Y, Z)

u = 13 * L * (fu - un)
v = 13 * L * (fv - vn)
```

void imColorLuv2XYZ	(	const double	*L*,	
		const double	*u*,	
		const double	*v*,	
		double &	*X*,	
		double &	*Y*,	
		double &	*Z*	
	)			[inline]

Converts CIE L*u*v* (nonlinear) to CIE XYZ (linear).
The white point is D65. 0 <= L <= 1 ; -0.5 <= uv <= +0.5 ; 0 <= XYZ <= 1

double imColorTransfer2Linear	(	const double &	*nonlinear_value*	)	[inline]

Converts nonlinear values to linear values.
We use the sRGB transfer function. sRGB uses ITU-R 709 primaries and D65 white point.

```
0 <= l <= 1 ; 0 <= v <= 1

if (v < 0.03928)
  l = v / 12.92
else
  l = pow((v + 0.055) / 1.055, 2.4)
```

double imColorTransfer2Nonlinear	(	const double &	*value*	)	[inline]

Converts linear values to nonlinear values.
We use the sRGB transfer function. sRGB uses ITU-R 709 primaries and D65 white point.

```
0 <= l <= 1 ; 0 <= v <= 1

if (l < 0.0031308)
  v = 12.92 * l
else
  v = 1.055 * pow(l, 1/2.4) - 0.055
```

Referenced by imColorRGB2RGBNonlinear().

void imColorRGB2RGBNonlinear	(	const double	*RL*,	
		const double	*GL*,	
		const double	*BL*,	
		double &	*R*,	
		double &	*G*,	

		double &	*B*
	)		[inline]

Converts RGB (linear) to R'G'B' (nonlinear).

References imColorTransfer2Nonlinear().

template<class T >

T imColorRGB2Luma	(	const T	*R*,	
		const T	*G*,	
		const T	*B*	
	)			[inline]

Converts R'G'B' to Y' (all nonlinear).

```
Y'  =  0.299 *R' + 0.587 *G' + 0.114 *B'
```

double imColorLuminance2Lightness	(	const double &	*Y*	)	[inline]

Converts Luminance (CIE Y) to Lightness (CIE L*) (all linear).
The white point is D65.

```
 0 <= Y <= 1 ; 0 <= L* <= 1

 Y = Y / 1.0      (for D65)
 if (Y > 0.008856)
   fY = pow(Y, 1/3)
 else
   fY = 7.787 * Y + 0.16/1.16
 L = 1.16 * fY - 0.16
```

double imColorLightness2Luminance	(	const double &	*L*	)	[inline]

Converts Lightness (CIE L*) to Luminance (CIE Y) (all linear).
The white point is D65.

```
 0 <= Y <= 1 ; 0 <= L* <= 1

 fY = (L + 0.16)/1.16
 if (fY > 0.20689)
   Y = pow(fY, 3)
 else
   Y = 0.1284 * (fY - 0.16/1.16)
 Y = Y * 1.0      (for D65)
```

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Functions

HSI Color Coordinate System Conversions

[Color Manipulation]

Collaboration diagram for HSI Color Coordinate System Conversions:

Functions

void	imColorRGB2HSI (double r, double g, double b, double *h, double *s, double *i)
void	imColorRGB2HSIbyte (unsigned char r, unsigned char g, unsigned char b, double *h, double *s, double *i)
void	imColorHSI2RGB (double h, double s, double i, double *r, double *g, double *b)
void	imColorHSI2RGBbyte (double h, double s, double i, unsigned char *r, unsigned char *g, unsigned char *b)
double	imColorHue (double R, double G, double B)
double	imColorHueByte (unsigned char r, unsigned char g, unsigned char b)
double	imColorIntensity (double R, double G, double B)
double	imColorIntensityByte (unsigned char r, unsigned char g, unsigned char b)
double	imColorSaturation (double R, double G, double B)
double	imColorSaturationByte (unsigned char r, unsigned char g, unsigned char b)
double	imColorHSI_ImaxS (double h, double cosH, double sinH)
double	imColorHSI_Smax (double h, double cosH, double sinH, double i)

Detailed Description

HSI is just the RGB color space written in a different coordinate system.

"I" is defined along the cube diagonal. It ranges from 0 (black) to 1 (white).
HS are the polar coordinates of a plane normal to "I".
"S" is the normal distance from the diagonal of the RGB cube. It ranges from 0 to 1.
"H" is the angle starting from the red vector, given in degrees. It ranges from 0 to 360.
R,G,B when double must be normalized between 0-1.

This is not a new color space, this is exactly the same gamut as RGB.

See im_colorhsi.h

Function Documentation

void imColorRGB2HSI	(	double	*r*,	
		double	*g*,	
		double	*b*,	
		double *	*h*,	
		double *	*s*,	
		double *	*i*	
	)			

Converts from RGB to HSI.

void imColorRGB2HSIbyte	(	unsigned char	*r*,	
		unsigned char	*g*,	
		unsigned char	*b*,	
		double *	*h*,	
		double *	*s*,	
		double *	*i*	
	)			

Converts from RGB (byte) to HSI.

void imColorHSI2RGB	(	double	*h*,	
		double	*s*,	
		double	*i*,	
		double *	*r*,	
		double *	*g*,	
		double *	*b*	
	)			

Converts from HSI to RGB.

void imColorHSI2RGBbyte	(	double	*h*,	
		double	*s*,	
		double	*i*,	
		unsigned char *	*r*,	
		unsigned char *	*g*,	
		unsigned char *	*b*	
	)			

Converts from HSI to RGB (byte).

double imColorHue	(	double	*R*,	
		double	*G*,	
		double	*B*	
	)			

Returns just the hue of the color RGB.

double imColorHueByte	(	unsigned char	*r*,	
		unsigned char	*g*,	
		unsigned char	*b*	
	)			

Returns just the hue of the color RGB (byte).

double imColorIntensity	(	double	*R*,	
		double	*G*,	
		double	*B*	
	)			

Returns just the intensity of the color RGB.

double imColorIntensityByte	(	unsigned char	*r*,	
		unsigned char	*g*,	
		unsigned char	*b*	
	)			

Returns just the intensity of the color RGB (byte).

double imColorSaturation	(	double	*R*,	
		double	*G*,	
		double	*B*	
	)			

Returns just the saturation of the color RGB.
Here S is not normalized by Smax.

double imColorSaturationByte	(	unsigned char	*r*,	
		unsigned char	*g*,	
		unsigned char	*b*	

	)			

Returns just the saturation of the color RGB (byte).

double imColorHSI_ImaxS	(	double	*h*,
		double	*cosH*,
		double	*sinH*
	)		

Returns I where S is maximum given H (here in radians).

double imColorHSI_Smax	(	double	*h*,
		double	*cosH*,
		double	*sinH*,
		double	*i*
	)		

Returns maximum S (unnormalized) given I and H (here in radians).

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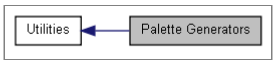
Functions

Palette Generators

[Utilities]

Collaboration diagram for Palette Generators:



Functions

long *	imPaletteNew (int count)
void	imPaletteRelease (long *palette)
long *	imPaletteDuplicate (const long *palette, int count)
int	imPaletteFindNearest (const long *palette, int palette_count, long color)
int	imPaletteFindColor (const long *palette, int palette_count, long color, unsigned char tol)
long *	imPaletteGray (void)
long *	imPaletteRed (void)
long *	imPaletteGreen (void)
long *	imPaletteBlue (void)
long *	imPaletteYellow (void)
long *	imPaletteMagenta (void)
long *	imPaletteCyan (void)
long *	imPaletteRainbow (void)
long *	imPaletteHues (void)
long *	imPaletteBlueIce (void)
long *	imPaletteHotIron (void)
long *	imPaletteBlackBody (void)
long *	imPaletteHighContrast (void)
long *	imPaletteLinear (void)
long *	imPaletteUniform (void)
int	imPaletteUniformIndex (long color)
int	imPaletteUniformIndexHalftoned (long color, int x, int y)

Detailed Description

Creates several standard palettes. The palette is just an array of encoded color values. See also Color Utilities.

In Lua, to create a palette you can call im.PaletteCreate.

```
im.PaletteCreate([count: number]) -> pal: imPalette [in Lua 5]
```

Default count is 256. IMLua and CDLua palettes are 100% compatible. The IM palette metatable name is "imPalette".
When converted to a string will return "imPalete(%p)" where p is replaced by the userdata address. If the palette is already destroyed by im.PaletteDestroy, then it will return also the suffix "-destroyed".

In Lua, to destroy a palette you can call im.PaletteDestroy. If this function is not called, the palette is destroyed by the garbage collector.

```
im.PaletteDestroy(pal: imPalette) [in Lua 5]
```

In Lua, array access is enabled so you can do:.

```
color = pal[index]
```

```
pal[index] = color
```

```
count = #pal
```

See im_palette.h

Function Documentation

long* imPaletteNew	(	int	*count*	)

Allocates memory for the palette data. This ensures allocation and release in the same module by the correct functions.

void imPaletteRelease	(	long *	*palette*	)

Releases memory for the palette data. This ensures allocation and release in the same module by the correct functions.

long* imPaletteDuplicate	(	const long *	*palette,*
		int	*count*
	)		

Duplicate a palette data using imPaletteNew.

int imPaletteFindNearest	(	const long *	*palette,*
		int	*palette_count,*
		long	*color*
	)		

Searches for the nearest color on the table and returns the color index if successful. It looks in all palette entries and finds the minimum euclidian square distance. If the color matches the given color it returns immediately. See also Color Utilities.

```
im.PaletteFindNearest(pal: imPalette, color: lightuserdata) -> index: number [in Lua 5]
```

int imPaletteFindColor	(	const long *	*palette,*
		int	*palette_count,*
		long	*color,*
		unsigned char	*tol*
	)		

Searches for the color on the table and returns the color index if successful. If the tolerance is 0 search for the exact match in the palette else search for the first color that fits in the tolerance range. See also Color Utilities.

```
im.PaletteFindColor(pal: imPalette, color: lightuserdata, tol: number) -> index: number [in Lua 5]
```

long* imPaletteGray	(	void		)

Creates a palette of gray scale values. The colors are arranged from black to white.

```
im.PaletteGray() -> pal: imPalette [in Lua 5]
```

long* imPaletteRed	(	void		)

Creates a palette of a gradient of red colors. The colors are arranged from black to pure red.

```
im.PaletteRed() -> pal: imPalette [in Lua 5]
```

long* imPaletteGreen	(	void		)

Creates a palette of a gradient of green colors. The colors are arranged from black to pure green.

```
im.PaletteGreen() -> pal: imPalette [in Lua 5]
```

long* imPaletteBlue	(	void		)

Creates a palette of a gradient of blue colors. The colors are arranged from black to pure blue.

```
im.PaletteBlue() -> pal: imPalette [in Lua 5]
```

long* imPaletteYellow	(	void		)

Creates a palette of a gradient of yellow colors. The colors are arranged from black to pure yellow.

```
im.PaletteYellow() -> pal: imPalette [in Lua 5]
```

long* imPaletteMagenta	(	void		)

Creates a palette of a gradient of magenta colors. The colors are arranged from black to pure magenta.

```
im.PaletteMagenta() -> pal: imPalette [in Lua 5]
```

long* imPaletteCyan	(	void		)

Creates a palette of a gradient of cyan colors. The colors are arranged from black to pure cyan.

```
im.PaletteCyan() -> pal: imPalette [in Lua 5]
```

long* imPaletteRainbow	(	void		)

Creates a palette of rainbow colors. The colors are arranged in the light wave length spectrum order (starting from purple).

```
im.PaletteRainbow() -> pal: imPalette [in Lua 5]
```

long* imPaletteHues	(	void		)	

Creates a palette of hues with maximum saturation.

```
im.PaletteHues() -> pal: imPalette [in Lua 5]
```

long* imPaletteBlueIce	(	void		)	

Creates a palette of a gradient of blue colors. The colors are arranged from pure blue to white.

```
im.PaletteBlueIce() -> pal: imPalette [in Lua 5]
```

long* imPaletteHotIron	(	void		)	

Creates a palette of a gradient from black to white passing trough red and orange.

```
im.PaletteHotIron() -> pal: imPalette [in Lua 5]
```

long* imPaletteBlackBody	(	void		)	

Creates a palette of a gradient from black to white passing trough red and yellow.

```
im.PaletteBlackBody() -> pal: imPalette [in Lua 5]
```

long* imPaletteHighContrast	(	void		)	

Creates a palette with high contrast colors.

```
im.PaletteHighContrast() -> pal: imPalette [in Lua 5]
```

long* imPaletteLinear	(	void		)	

Creates a palette of a sequence of colors from black to white with 32 linear intensity values combined with 8 hue variations.

```
im.PaletteLinear() -> pal: imPalette [in Lua 5]
```

long* imPaletteUniform	(	void		)	

Creates a palette of an uniform sub-division of colors from black to white. This is a 2^(2.6) bits per pixel palette.

```
im.PaletteUniform() -> pal: imPalette [in Lua 5]
```

int imPaletteUniformIndex	(	long	*color*	)	

Returns the index of the correspondent RGB color of an uniform palette.

```
im.PaletteUniformIndex(color: lightuserdata) -> index: number [in Lua 5]
```

int imPaletteUniformIndexHalftoned	(	long	*color,*	
		int	*x,*	
		int	*y*	
	)			

Returns the index of the correspondent RGB color of an uniform palette. Uses an 8x8 ordered dither to lookup the index in a halftone matrix. The spatial position used by the halftone method.

```
im.PaletteUniformIndexHalftoned(color: lightuserdata, x: number, y: number) -> index: number [in Lua 5]
```

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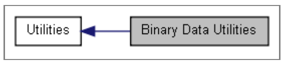
Enumerations | Functions

Binary Data Utilities
[Utilities]

Collaboration diagram for Binary Data Utilities:



Enumerations

enum	imByteOrder { IM_LITTLEENDIAN, IM_BIGENDIAN }

Functions

int	imBinCPUByteOrder (void)
void	imBinSwapBytes (void *data, int count, int size)
void	imBinSwapBytes2 (void *data, int count)
void	imBinSwapBytes4 (void *data, int count)
void	imBinSwapBytes8 (void *data, int count)

Detailed Description

See im_util.h

Enumeration Type Documentation

enum imByteOrder

CPU Byte Orders.

Enumerator:

IM_LITTLEENDIAN	Little Endian - The most significant byte is on the right end of a word. Used by Intel processors.
IM_BIGENDIAN	Big Endian - The most significant byte is on the left end of a word. Used by Motorola processors, also is the network standard byte order.

Function Documentation

```
int imBinCPUByteOrder ( void )
```

Returns the current CPU byte order.

```
void imBinSwapBytes ( void * data,
                      int    count,
                      int    size
                    )
```

Changes the byte order of an array of 2, 4 or 8 byte values.

```
void imBinSwapBytes2 ( void * data,
                       int    count
                     )
```

Changes the byte order of an array of 2 byte values.

```
void imBinSwapBytes4 ( void * data,
                       int    count
                     )
```

Inverts the byte order of the 4 byte values

```
void imBinSwapBytes8 ( void * data,
                       int    count
                     )
```

Inverts the byte order of the 8 byte values

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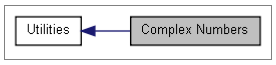
Data Structures | Typedefs | Functions

Complex Numbers
[Utilities]

Collaboration diagram for Complex Numbers:



Data Structures

class	imComplex< T >
	Complex Float Data Type Class. More...

Typedefs

typedef imComplex< float >	imcfloat
typedef imComplex< double >	imcdouble

Functions

template<class T >	
int	**operator<=** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
int	**operator<=** (const imComplex< T > &C, const float &R)
template<class T >	
int	**operator<=** (const imComplex< T > &C, const double &R)
template<class T >	
int	**operator<** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
int	**operator<** (const imComplex< T > &C, const T &R)
template<class T >	

int	**operator>** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
int	**operator>** (const imComplex< T > &C, const T &R)
template<class T >	
imComplex< T >	**operator+** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
imComplex< T >	**operator+** (const imComplex< T > &C, const T &R)
template<class T >	
imComplex< T >	**operator+=** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
imComplex< T >	**operator-** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
imComplex< T >	**operator-** (const imComplex< T > &C, const T &R)
template<class T >	
imComplex< T >	**operator*** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
imComplex< T >	**operator/** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
imComplex< T >	**operator/** (const imComplex< T > &C, const float &R)
template<class T >	
imComplex< T >	**operator/** (const imComplex< T > &C, const double &R)
template<class T >	
imComplex< T >	**operator/=** (const imComplex< T > &C, const float &R)
template<class T >	
imComplex< T >	**operator/=** (const imComplex< T > &C, const double &R)
template<class T >	
imComplex< T >	**operator*** (const imComplex< T > &C, const float &R)
template<class T >	
imComplex< T >	**operator*** (const imComplex< T > &C, const double &R)
template<class T >	
int	**operator==** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
T	**cpxreal** (const imComplex< T > &C)
template<class T >	
T	**cpximag** (const imComplex< T > &C)
template<class T >	
T	**cpxmag** (const imComplex< T > &C)
template<class T >	
T	**cpxphase** (const imComplex< T > &C)
template<class T >	
imComplex< T >	**cpxconj** (const imComplex< T > &C)
template<class T >	
imComplex< T >	**cpxpolar** (const T &mag, const T &phase)
template<class T >	
imComplex< T >	**log** (const imComplex< T > &C)
template<class T >	
imComplex< T >	**exp** (const imComplex< T > &C)
template<class T >	
imComplex< T >	**pow** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
imComplex< T >	**pow** (const imComplex< T > &C1, const T &R)
template<class T >	
imComplex< T >	**sqrt** (const imComplex< T > &C)

Detailed Description

See im_complex.h

Complex numbers operators.

Typedef Documentation

typedef imComplex<float> imcfloat

complex numbers usign 2 floats

typedef imComplex<double> imcdouble

complex numbers usign 2 doubles

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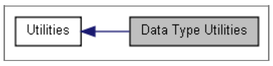
Data Type Utilities
[Utilities]

Collaboration diagram for Data Type Utilities:



Defines	
#define	**IM_BYTECROP**(_v) (_v < 0? 0: _v > 255? 255: _v)
#define	**IM_FLOATCROP**(_v) (_v < 0? 0: _v > 1.0f? 1.0f: _v)
#define	**IM_CROPMAX**(_v, _max) (_v < 0? 0: _v > _max? _max: _v)
#define	**IM_CROPMINMAX**(_v, _min, _max) (_v < _min? _min: _v > _max? _max: _v)
Typedefs	
typedef unsigned char	**imbyte**
typedef unsigned short	**imushort**
Functions	
int	imDataTypeSize (int data_type)
const char *	imDataTypeName (int data_type)
unsigned long	imDataTypeIntMax (int data_type)
long	imDataTypeIntMin (int data_type)

Detailed Description

See im_util.h

Function Documentation

int imDataTypeSize (int *data_type*)

Returns the size in bytes of a specified numeric data type.

```
im.DataTypeSize(data_type: number) -> size: number [in Lua 5]
```

const char* imDataTypeName (int *data_type*)

Returns the numeric data type name given its identifier.

```
im.DataTypeName(data_type: number) -> name: string [in Lua 5]
```

unsigned long imDataTypeIntMax (int *data_type*)

Returns the maximum value of an integer data type. For floating point returns 0.

```
im.DataTypeIntMax(data_type: number) -> int_max: number [in Lua 5]
```

long imDataTypeIntMin (int *data_type*)

Returns the minimum value of an integer data type. For floating point returns 0.

```
im.DataTypeIntMin(data_type: number) -> int_min: number [in Lua 5]
```

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Math Utilities
[Utilities]

Collaboration diagram for Math Utilities:

Functions	
int	imRound (float x)
int	imResampleInt (int x, double factor)
template<class T , class TU >	
T	imZeroOrderDecimation (int width, int height, T *map, double xl, double yl, double box_width, double box_height, TU Dummy)
template<class T , class TU >	
T	imBilinearDecimation (int width, int height, T *map, double xl, double yl, double box_width, double box_height, TU Dummy)
template<class T >	

T	imZeroOrderInterpolation (int width, int height, T *map, double xl, double yl)
template<class T >	
T	imBilinearInterpolation (int width, int height, T *map, double xl, double yl)
template<class T , class TU >	
T	imBicubicInterpolation (int width, int height, T *map, double xl, double yl, TU Dummy)
template<class T >	
void	imMinMax (const T *map, int count, T &min, T &max, int absolute=0)
template<class T >	
void	imMinMaxType (const T *map, int count, T &min, T &max, int absolute=0)

Detailed Description

When converting between continuous and discrete use:
Continuous = Discrete + 0.5 [Reconstruction/Interpolation]
Discrete = Round(Continuous - 0.5) [Sampling/Quantization]

Notice that must check min-max limits when converting from Continuous to Discrete.

When converting between discrete and discrete use:
integer src_size, dst_len, src_i, dst_i
real factor = (real)(dst_size)/(real)(src_size)
dst_i = Round(factor*(src_i + 0.5) - 0.5)

See im_math.h

Function Documentation

int imRound	(	float	*x*	)	[inline]

Round a real to the nearest integer.

Referenced by imColorQuantize(), and imZeroOrderInterpolation().

int imResampleInt	(	int	*x,*	
		double	*factor*	
	)			[inline]

Converts between two discrete grids. factor is "dst_size/src_size".

template<class T , class TU >

T imZeroOrderDecimation	(	int	*width,*	
		int	*height,*	
		T *	*map,*	
		double	*xl,*	
		double	*yl,*	
		double	*box_width,*	
		double	*box_height,*	
		TU	*Dummy*	
	)			[inline]

Does Zero Order Decimation (Mean).

template<class T , class TU >

T imBilinearDecimation	(	int	*width,*	
		int	*height,*	
		T *	*map,*	
		double	*xl,*	
		double	*yl,*	
		double	*box_width,*	
		double	*box_height,*	
		TU	*Dummy*	
	)			[inline]

Does Bilinear Decimation.

template<class T >

T imZeroOrderInterpolation	(	int	*width,*	
		int	*height,*	
		T *	*map,*	
		double	*xl,*	
		double	*yl*	
	)			[inline]

Does Zero Order Interpolation (Nearest Neighborhood).

References imRound().

template<class T >

T imBilinearInterpolation	(	int	*width,*
		int	*height,*
		T *	*map,*

		double	*xl,*	
		double	*yl*	
	)			[inline]

Does Bilinear Interpolation.

template<class T , class TU >

T imBicubicInterpolation	(	int	*width,*	
		int	*height,*	
		T *	*map,*	
		double	*xl,*	
		double	*yl,*	
		TU	*Dummy*	
	)			[inline]

Does Bicubic Interpolation.

template<class T >

void imMinMax	(	const T *	*map,*	
		int	*count,*	
		T &	*min,*	
		T &	*max,*	
		int	*absolute* = 0	
	)			[inline]

Calculates minimum and maximum values.

Referenced by imMinMaxType().

template<class T >

void imMinMaxType	(	const T *	*map,*	
		int	*count,*	
		T &	*min,*	
		T &	*max,*	
		int	*absolute* = 0	
	)			[inline]

Calculates minimum and maximum values with additional considerations for data type conversion and normalized operations.

References imMinMax().

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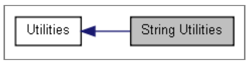
Functions

String Utilities
[Utilities]

Collaboration diagram for String Utilities:



Functions

int	imStrEqual (const char *str1, const char *str2)
int	imStrNLen (const char *str, int max_len)
int	imStrCheck (const void *data, int count)

Detailed Description

See im_util.h

Function Documentation

int imStrEqual	(	const char *	*str1,*	
		const char *	*str2*	
	)			

Check if the two strings are equal.

int imStrNLen	(	const char *	*str,*	
		int	*max_len*	
	)			

Calculate the size of the string but limited to max_len.

int imStrCheck	(	const void *	*data,*	
		int	*count*	
	)			

Check if the data is a string.

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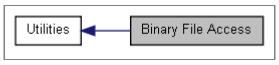
Binary File Access
[Utilities]

Collaboration diagram for Binary File Access:



Data Structures

struct	_imBinMemoryFileName
	Memory File Filename Parameter Structure. More...
class	imBinFileBase
	Binary File I/O Base Class. More...

Typedefs

typedef struct _imBinFile	imBinFile
typedef struct _imBinMemoryFileName	imBinMemoryFileName
typedef imBinFileBase *(*	imBinFileNewFunc)()

Enumerations

enum	imBinFileModule {
	IM_RAWFILE, IM_STREAM, IM_MEMFILE, IM_SUBFILE,
	IM_FILEHANDLE, IM_IOCUSTOM0
	}

Functions

imBinFile *	imBinFileOpen (const char *pFileName)
imBinFile *	imBinFileNew (const char *pFileName)
void	imBinFileClose (imBinFile *bfile)
int	imBinFileError (imBinFile *bfile)
unsigned long	imBinFileSize (imBinFile *bfile)
int	imBinFileByteOrder (imBinFile *bfile, int pByteOrder)
unsigned long	imBinFileRead (imBinFile *bfile, void *pValues, unsigned long pCount, int pSizeOf)
unsigned long	imBinFileWrite (imBinFile *bfile, void *pValues, unsigned long pCount, int pSizeOf)
unsigned long	imBinFilePrintf (imBinFile *bfile, const char *format,...)
int	imBinFileReadLine (imBinFile *handle, char *comment, int *size)
int	imBinFileSkipLine (imBinFile *handle)
int	imBinFileReadInteger (imBinFile *handle, int *value)
int	imBinFileReadReal (imBinFile *handle, double *value)
void	imBinFileSeekTo (imBinFile *bfile, unsigned long pOffset)
void	imBinFileSeekOffset (imBinFile *bfile, long pOffset)
void	imBinFileSeekFrom (imBinFile *bfile, long pOffset)
unsigned long	imBinFileTell (imBinFile *bfile)
int	imBinFileEndOfFile (imBinFile *bfile)
int	imBinFileSetCurrentModule (int pModule)
void	imBinMemoryRelease (unsigned char *buffer)
int	imBinFileRegisterModule (imBinFileNewFunc pNewFunc)

Detailed Description

These functions are very useful for reading/writing binary files that have headers or data that have to be converted depending on the current CPU byte order. It can invert 2, 4 or 8 bytes numbers to/from little/big-endian orders.

It will process the data only if the file format is different from the current CPU.

Can read from disk or memory. In case of a memory buffer, the file name must be the imBinMemoryFileName structure.

See im_binfile.h

Typedef Documentation

typedef struct _imBinMemoryFileName imBinMemoryFileName

Memory File Filename Parameter Structure.

Fake file name for the memory I/O module.

typedef imBinFileBase*(* imBinFileNewFunc)()

File I/O module creation callback.

Enumeration Type Documentation

enum imBinFileModule

Predefined I/O Modules.

Enumerator:

IM_RAWFILE	System dependent file I/O Routines.
IM_STREAM	Standard Ansi C Stream I/O Routines.
IM_MEMFILE	Uses a memory buffer (see imBinMemoryFileName).
IM_SUBFILE	It is a sub file. FileName is a imBinFile* pointer from any other module.
IM_FILEHANDLE	System dependent file I/O Routines, but FileName is a system file handle ("int" in UNIX and "HANDLE" in Windows).
IM_IOCUSTOM0	Other registered modules starts from here.

Function Documentation

imBinFile* imBinFileOpen	(	const char *	*pFileName*	)

Opens an existant binary file for reading. The default file byte order is the CPU byte order. Returns NULL if failed.

imBinFile* imBinFileNew	(	const char *	*pFileName*	)

Creates a new binary file for writing. The default file byte order is the CPU byte order. Returns NULL if failed.

void imBinFileClose	(	imBinFile *	*bfile*	)

Closes the file.

int imBinFileError	(	imBinFile *	*bfile*	)

Indicates that was an error on the last operation.

unsigned long imBinFileSize	(	imBinFile *	*bfile*	)

Returns the file size in bytes.

int imBinFileByteOrder	(	imBinFile *	*bfile,*
		int	*pByteOrder*
	)		

Changes the file byte order. Returns the old one.

unsigned long imBinFileRead	(	imBinFile *	*bfile,*
		void *	*pValues,*
		unsigned long	*pCount,*
		int	*pSizeOf*
	)		

Reads an array of count values with byte sizes: 1, 2, 4, or 8. And invert the byte order if necessary after read.
Returns the actual count of values read.

unsigned long imBinFileWrite	(	imBinFile *	*bfile,*
		void *	*pValues,*
		unsigned long	*pCount,*
		int	*pSizeOf*
	)		

Writes an array of values with sizes: 1, 2, 4, or 8. And invert the byte order if necessary before write.
ATENTION: The function will not make a temporary copy of the values to invert the byte order.
So after the call the values will be invalid, if the file byte order is different from the CPU byte order.
Returns the actual count of values written.

unsigned long imBinFilePrintf	(	imBinFile *	*bfile,*
		const char *	*format,*
			...
	)		

Writes a string without the NULL terminator. The function uses sprintf to compose the string.
The internal buffer is fixed at 10240 bytes.
Returns the actual count of values written.

int imBinFileReadLine	(	imBinFile *	*handle,*
		char *	*comment,*
		int *	*size*
	)		

Reads a line until line break.
Returns the line in array, must have room enough. Line break is discarded.
Use *size to inform buffer size. *size return the actual number os characters read.

int imBinFileSkipLine	(	imBinFile *	*handle*	)	

Skips a line, including line break.

int imBinFileReadInteger	(	imBinFile *	*handle,*	
		int *	*value*	
	)			

Reads an integer number from the current position until found a non integer character. Returns a non zero value if successful.

int imBinFileReadReal	(	imBinFile *	*handle,*	
		double *	*value*	
	)			

Reads an floating point number from the current position until found a non number character. Returns a non zero value if successful.

void imBinFileSeekTo	(	imBinFile *	*bfile,*	
		unsigned long	*pOffset*	
	)			

Moves the file pointer from the beginning of the file.
When writing to a file seeking can go beyond the end of the file.

void imBinFileSeekOffset	(	imBinFile *	*bfile,*	
		long	*pOffset*	
	)			

Moves the file pointer from current position.
If the offset is a negative value the pointer moves backwards.

void imBinFileSeekFrom	(	imBinFile *	*bfile,*	
		long	*pOffset*	
	)			

Moves the file pointer from the end of the file.
The offset is usually a negative value.

unsigned long imBinFileTell	(	imBinFile *	*bfile*	)	

Returns the current offset position.

int imBinFileEndOfFile	(	imBinFile *	*bfile*	)	

Indicates that the file pointer is at the end of the file.

int imBinFileSetCurrentModule	(	int	*pModule*	)	

Sets the current I/O module.

Returns:
the previous function set, or -1 if failed. See also imBinFileModule.

void imBinMemoryRelease	(	unsigned char *	*buffer*	)	

Release the internal memory allocated when writing a Memory File (see imBinMemoryFileName).

int imBinFileRegisterModule	(	imBinFileNewFunc	*pNewFunc*	)	

Register a user I/O module.
Returns the new function set id.
Accepts up to 10 modules.

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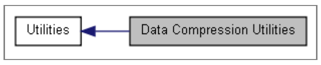
Functions

Data Compression Utilities
[Utilities]

Collaboration diagram for Data Compression Utilities:



Functions

int	imCompressDataZ (const void *src_data, int src_size, void *dst_data, int dst_size, int zip_quality)
int	imCompressDataUnZ (const void *src_data, int src_size, void *dst_data, int dst_size)
int	imCompressDataLZF (const void *src_data, int src_size, void *dst_data, int dst_size)
int	imCompressDataUnLZF (const void *src_data, int src_size, void *dst_data, int dst_size)
int	imCompressDataLZ4 (const void *src_data, int src_size, void *dst_data, int dst_size)
int	imCompressDataUnLZ4 (const void *src_data, int src_size, void *dst_data, int dst_size)

Detailed Description

Deflate compression support uses zlib version 1.2.8.
http://www.zlib.org/
Copyright (C) 1995-2013 Jean-loup Gailly and Mark Adler

LZF compression support uses libLZF version 3.5.
http://software.schmorp.de/pkg/liblzf
Copyright (C) 2000-2009 Marc Alexander Lehmann

LZ4 compression support uses LZ4 version 1.9.3.
https://lz4.github.io/lz4/
Copyright (c) 2011-2016, Yann Collet

See im_util.h

Function Documentation

int imCompressDataZ	(	const void *	*src_data,*	
		int	*src_size,*	
		void *	*dst_data,*	
		int	*dst_size,*	
		int	*zip_quality*	
	)			

Compresses the data using the ZLIB Deflate compression.
The destination buffer must be at least 0.1% larger than source_size plus 12 bytes.
It compresses raw byte data. zip_quality can be 1 to 9.
Returns the size of the compressed buffer or zero if failed.

int imCompressDataUnZ	(	const void *	*src_data,*	
		int	*src_size,*	
		void *	*dst_data,*	
		int	*dst_size*	
	)			

Uncompresses the data compressed with the ZLIB Deflate compression.
Returns zero if failed.

int imCompressDataLZF	(	const void *	*src_data,*	
		int	*src_size,*	
		void *	*dst_data,*	
		int	*dst_size*	
	)			

Compresses the data using the libLZF compression.
Returns the size of the compressed buffer or zero if failed.

int imCompressDataUnLZF	(	const void *	*src_data,*	
		int	*src_size,*	
		void *	*dst_data,*	
		int	*dst_size*	
	)			

Uncompresses the data compressed with the libLZF compression.
Returns zero if failed.

int imCompressDataLZ4	(	const void *	*src_data,*	
		int	*src_size,*	
		void *	*dst_data,*	
		int	*dst_size*	
	)			

Compresses the data using the libLZ4 compression. (Since 3.15)
Returns the size of the compressed buffer or zero if failed.
Available in a separate library called "im_lz4".

int imCompressDataUnLZ4	(	const void *	*src_data,*	
		int	*src_size,*	
		void *	*dst_data,*	
		int	*dst_size*	
	)			

Uncompresses the data compressed with the libLZ4 compression. (Since 3.15)
Returns zero if failed.
Available in a separate library called "im_lz4".

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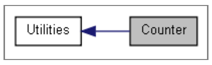
Typedefs | Functions

Counter
[Utilities]

Collaboration diagram for Counter:



Typedefs

typedef int(*	imCounterCallback)(int counter, void *cb_user_data, const char *text, int progress)

Functions

imCounterCallback	imCounterSetCallback (void *cb_user_data, imCounterCallback counter_func)
int	imCounterHasCallback (void)
int	imCounterBegin (const char *title)
void	imCounterEnd (int counter)
int	imCounterInc (int counter)
int	imCounterIncTo (int counter, int count)
void	imCounterTotal (int counter, int total, const char *message)
void *	imCounterGetUserData (int counter)
void	imCounterSetUserData (int counter, void *userdata)

Detailed Description

Used to notify the application that a step in the loading, saving or processing operation has been performed.

See im_counter.h

Typedef Documentation

typedef int(* imCounterCallback)(int counter, void *cb_user_data, const char *text, int progress)

Counter callback, informs the progress of the operation to the client.
Counter id identifies different counters.
Progress in a count reports a value from 0 to 1000 always, proportional to total value and increment. If -1 indicates that Begin was called, 1001 indicates that End was called.
If returns 0 the client should abort the operation.
Noticed that if the counter is aborted, the callback will still be called one last time at 1001. Text is NULL most of the time, but contains a title in Begin (progress==-1) and a message in the start of a count (progress==0).

Function Documentation

imCounterCallback imCounterSetCallback	(	void *	*cb_user_data,*
		imCounterCallback	*counter_func*
	)		

Changes the counter callback. Returns old callback.
User data is changed only if not NULL.

int imCounterHasCallback	(	void	)

Returns true if the counter callback is set. When the callback is NULL the counter is inactive and all functions do nothing.

int imCounterBegin	(	const char *	*title*	)

Begins a new count.
Calls the callback with "-1" and text=title.
This is to be used by the operations. Returns a new counter Id.
Several counters can coexist at the same time, as part of a sequence with sub-counter or simultaneous counter in multi-thread applications.

void imCounterEnd	(	int	*counter*	)

Ends a count.
Calls the callback with "1001", text=null, and releases the counter.

int imCounterInc	(	int	*counter*	)

Increments a count. Must set the total first.
Calls the callback, text=message if it is the first increment for the count.
Returns 0 if the callback aborted, 1 if returns normally.

int imCounterIncTo	(	int	*counter,*
		int	*count*
	)		

Set a specific count. Must set the total first.
Calls the callback, text=message if it is the first increment for the count.
Returns 0 if the callback aborted, 1 if returns normally.

void imCounterTotal	(	int	*counter,*
		int	*total,*
		const char *	*message*
	)		

Sets the total increments of a count.
Must be set at least one time.
Notice that if total is set more than one time counter should simply restart.

void* imCounterGetUserData	(	int	*counter*	)

Sets an additional user data in the counter. Used to save the lock in multi-threaded configurations.

void imCounterSetUserData	(	int	*counter*,	
		void *	*userdata*	
	)			

Returns the additional user data in the counter.

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Windows DIB

[Utilities]

Collaboration diagram for Windows DIB:

Data Structures

struct	_imDib
	Windows DIB Structure. More...

Typedefs

typedef struct _imDib	imDib
typedef unsigned int(*	imDibLineGetPixel)(unsigned char *line, int col)
typedef void(*	imDibLineSetPixel)(unsigned char *line, int col, unsigned int pixel)

Functions

imDib *	imDibCreate (int width, int height, int bpp)
imDib *	imDibCreateCopy (const imDib *dib)
imDib *	imDibCreateReference (BYTE *bmi, BYTE *bits)
imDib *	imDibCreateSection (HDC hDC, HBITMAP *bitmap, int width, int height, int bpp)
void	imDibDestroy (imDib *dib)
imDibLineGetPixel	imDibLineGetPixelFunc (int bpp)
imDibLineSetPixel	imDibLineSetPixelFunc (int bpp)
imDib *	imDibFromHBitmap (const HBITMAP image, const HPALETTE hPalette)
HBITMAP	imDibToHBitmap (const imDib *dib)
HPALETTE	imDibLogicalPalette (const imDib *dib)
imDib *	imDibCaptureScreen (int x, int y, int width, int height)
void	imDibCopyClipboard (imDib *dib)
imDib *	imDibPasteClipboard (void)
int	imDibIsClipboardAvailable (void)
int	imDibSaveFile (const imDib *dib, const char *filename)
imDib *	imDibLoadFile (const char *filename)
void	imDibDecodeToRGBA (const imDib *dib, unsigned char *red, unsigned char *green, unsigned char *blue, unsigned char *alpha)
void	imDibDecodeToMap (const imDib *dib, unsigned char *map, long *palette)
void	imDibEncodeFromRGBA (imDib *dib, const unsigned char *red, const unsigned char *green, const unsigned char *blue, const unsigned char *alpha)
void	imDibEncodeFromMap (imDib *dib, const unsigned char *map, const long *palette, int palette_count)
void	imDibEncodeFromBitmap (imDib *dib, const unsigned char *data)
void	imDibDecodeToBitmap (const imDib *dib, unsigned char *data)

Detailed Description

Windows DIBs in memory are handled just like a BMP file without the file header.
These functions will work only in Windows. They are useful for interchanging data with the clipboard, with capture drivers, with the AVI and WMF file formats and others.

Supported DIB aspects:

- bpp must be 1, 4, 8, 16, 24, or 32.
- BITMAPV4HEADER or BITMAPV5HEADER are handled but ignored.
- BITMAPCOREHEADER is not handled .
- BI_JPEG and BI_PNG compressions are not handled.
- biHeight can be negative, compression can be RLE only if created from imDibCreateReference, imDibPasteClipboard, imDibLoadFile.
- can not encode/decode Images to/from RLE compressed Dibs.
- if working with RLE Dibs bits_size is greater than used.
- the resolution of a new Dib is taken from the screen.
- SetDIBitsToDevice(start_scan is 0, scan_lines is dib->bmih->biHeight).
- StretchDIBits(use always DIB_RGB_COLORS).
- CreateDIBPatternBrushPt(packed_dib is dib->dib).

Must include <windows.h> before using these functions.
Check <wingdi.h> for structures and definitions.

See im_dib.h

Typedef Documentation

typedef struct _imDib imDib

Windows DIB Structure.

Handles a DIB in memory.
The DIB is stored in only one buffer. The secondary members are pointers to the main buffer.

typedef unsigned int(* imDibLineGetPixel)(unsigned char *line, int col)

DIB GetPixel function definition.
the DWORD is a raw copy of the bits, use (unsigned char*)&pixel

typedef void(* imDibLineSetPixel)(unsigned char *line, int col, unsigned int pixel)

DIB SetPixel function definition

Function Documentation

imDib* imDibCreate	(	int	*width,*	
		int	*height,*	
		int	*bpp*	
	)			

Creates a new DIB.
use bpp=-16/-32 to allocate space for BITFLIEDS.
Allocates all fields.

imDib* imDibCreateCopy	(	const imDib *	*dib*	)	

Duplicates the DIB contents in a new DIB.
A Reference DIB will be copied into a full DIB structure.

imDib* imDibCreateReference	(	BYTE *	*bmi,*	
		BYTE *	*bits*	
	)			

Creates a DIB using an already allocated memory.
"bmi" must be a pointer to BITMAPINFOHEADER.
"bits" can be NULL if it is inside "bmi" after the palette.
"handle" is not allocated. buffer will point to bmi.

imDib* imDibCreateSection	(	HDC	*hDC,*	
		HBITMAP *	*bitmap,*	
		int	*width,*	
		int	*height,*	
		int	*bpp*	
	)			

Creates a DIB section for drawing purposes.
Returns the bitmap that is also created.
"handle" is not allocated.
You cannot paste a DIB section from one application into another application.

void imDibDestroy	(	imDib *	*dib*	)	

Destroy the DIB

imDibLineGetPixel imDibLineGetPixelFunc	(	int	*bpp*	)	

Returns a function to read pixels from a DIB line.

imDibLineSetPixel imDibLineSetPixelFunc	(	int	*bpp*	)	

Returns a function to write pixels into a DIB line.

imDib* imDibFromHBitmap	(	const HBITMAP	*image,*	
		const HPALETTE	*hPalette*	
	)			

Creates a DIB from a image handle and a palette handle.

HBITMAP imDibToHBitmap	(	const imDib *	*dib*	)	

Creates a image handle from a DIB.

HPALETTE imDibLogicalPalette	(	const imDib *	*dib*	)	

Returns a Logical palette from the DIB palette.
DIB bpp must be <=8.

imDib* imDibCaptureScreen	(	int	*x,*	
		int	*y,*	
		int	*width,*	
		int	*height*	
	)			

Captures the screen into a DIB.

void imDibCopyClipboard	(	imDib *	*dib*	)	

Transfer the DIB to the clipboard.
"dib" pointer can not be used after, or use imDibCopyClipboard(imDibCreateCopy(dib)).
You cannot paste a DIB section from one application into another application.
Warning: Clipboard functions in C++ can fail with Visual C++ /EHsc (Enable C++ Exceptions)

imDib* imDibPasteClipboard	(	void		)

Creates a reference for the DIB in the clipboard if any. Returns NULL otherwise. Warning: Clipboard functions in C++ can fail with Visual C++ /EHsc (Enable C++ Exceptions)

int imDibIsClipboardAvailable	(	void		)

Checks if there is a dib at the clipboard.

int imDibSaveFile	(	const imDib *	*dib,*
		const char *	*filename*
	)		

Saves the DIB into a file ".bmp".

imDib* imDibLoadFile	(	const char *	*filename*	)

Creates a DIB from a file ".bmp".

void imDibDecodeToRGBA	(	const imDib *	*dib,*
		unsigned char *	*red,*
		unsigned char *	*green,*
		unsigned char *	*blue,*
		unsigned char *	*alpha*
	)		

Converts a DIB into an RGBA image. alpha is optional. bpp must be >8.
alpha is used only when bpp=32.

void imDibDecodeToMap	(	const imDib *	*dib,*
		unsigned char *	*map,*
		long *	*palette*
	)		

Converts a DIB into an indexed image. bpp must be <=8. colors must have room for at least 256 colors. colors is rgb packed (RGBRGBRGB...)

void imDibEncodeFromRGBA	(	imDib *	*dib,*
		const unsigned char *	*red,*
		const unsigned char *	*green,*
		const unsigned char *	*blue,*
		const unsigned char *	*alpha*
	)		

Converts an RGBA image into a DIB. alpha is optional. bpp must be >8.
alpha is used only when bpp=32.

void imDibEncodeFromMap	(	imDib *	*dib,*
		const unsigned char *	*map,*
		const long *	*palette,*
		int	*palette_count*
	)		

Converts an indexed image into a DIB. bpp must be <=8.
colors is rgb packed (RGBRGBRGB...)

void imDibEncodeFromBitmap	(	imDib *	*dib,*
		const unsigned char *	*data*
	)		

Converts a IM_RGB packed image, with or without alpha, into a DIB.

void imDibDecodeToBitmap	(	const imDib *	*dib,*
		unsigned char *	*data*
	)		

Converts a DIB into IM_RGB packed image, with or without alpha.

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Data Structures

Here are the data structures with brief descriptions:

_imBinMemoryFileName	Memory File Filename Parameter Structure
_imDib	Windows DIB Structure
_imFile	Image File Structure (SDK Use Only)
_imImage	Image Representation Structure
_imStats	Numerical Statistics Structure
imAttribArray	Attributes Array Class
imAttribTable	Attributes Table Class

imBinFileBase	Binary File I/O Base Class
imCapture	Video Capture Wrapper Class
imComplex< T >	Complex Float Data Type Class
imFileFormatBase	Image File Format Virtual Base Class (SDK Use Only)
imFormat	Image File Format Descriptor Class (SDK Use Only)

Data Fields

_imBinMemoryFileName Struct Reference
[Binary File Access]

Memory File Filename Parameter Structure. More...

Data Fields

unsigned char *	buffer
int	size
float	reallocate

Detailed Description

Fake file name for the memory I/O module.

Field Documentation

unsigned char* _imBinMemoryFileName::buffer

The memory buffer. If you are reading the buffer must exists. If you are writing the buffer can be internally allocated to the given size. The buffer is never free. The buffer is allocated using "malloc", and reallocated using "realloc". Use "free" to release it. To avoid RTL conflicts use the function imBinMemoryRelease.

int _imBinMemoryFileName::size

Size of the buffer.

float _imBinMemoryFileName::reallocate

Reallocate factor for the memory buffer when writing (size += reallocate*size). Set reallocate to 0 to disable reallocation, in this case buffer must not be NULL.

Data Fields

_imDib Struct Reference
[Windows DIB]

Windows DIB Structure. More...

Data Fields

HGLOBAL	handle
BYTE *	buffer
int	free_buffer
int	size
BITMAPINFO *	bmi
BITMAPINFOHEADER *	bmih
RGBQUAD *	bmic
BYTE *	bits
int	palette_count
int	bits_size
int	line_size
int	pad_size

Detailed Description

Handles a DIB in memory.
The DIB is stored in only one buffer. The secondary members are pointers to the main buffer.

Field Documentation

HGLOBAL _imDib::handle

The windows memory handle

BYTE* _imDib::buffer

The DIB as it is defined in memory

int _imDib::free_buffer

Free the memory buffer, used only for DIB section

int _imDib::size

Full size in memory

BITMAPINFO* _imDib::bmi

Bitmap Info = Bitmap Info Header + Palette

BITMAPINFOHEADER* _imDib::bmih

Bitmap Info Header

RGBQUAD* _imDib::bmic

Bitmap Info Colors = Palette

BYTE* _imDib::bits

Bitmap Bits

int _imDib::palette_count

number of colors in the palette

int _imDib::bits_size

size in bytes of the Bitmap Bits

int _imDib::line_size

size in bytes of one line, includes padding

int _imDib::pad_size

number of bytes remaining in the line, lines are in a word boundary

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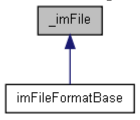
Data Fields

_imFile Struct Reference
[File Format SDK]

Image File Structure (SDK Use Only). More...

Inheritance diagram for _imFile:



[legend]

Data Fields

int	**is_new**
void *	attributes_table
void *	line_buffer
int	**line_buffer_size**
int	line_buffer_extra
int	line_buffer_alloc
int	**counter**
int	convert_bpp
int	switch_type
long	**palette** [256]
int	**palette_count**
int	**user_color_mode**
int	**user_data_type**
int	**file_color_mode**
int	**file_data_type**
char	**compression** [10]
int	**image_count**
int	**image_index**
int	**width**
int	**height**

Detailed Description

Base container to hold format independent state variables.

Field Documentation

void* _imFile::attributes_table

in fact is a imAttribTable, but we hide this here

void* _imFile::line_buffer

used for line conversion, contains all components if packed, or only one if not

int _imFile::line_buffer_extra

extra bytes to be allocated

int _imFile::line_buffer_alloc

total allocated so far

int _imFile::convert_bpp

number of bpp to unpack/pack to/from 1 byte. When reading converts n packed bits to 1 byte (unpack). If n>1 will also expand to 0-255. When writing converts 1 byte to 1 bit (pack). If negative will only expand to 0-255 (no unpack or pack).

int _imFile::switch_type

flag to switch the original data type: char-byte, short-ushort, uint-int, double-float

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Data Fields

_imImage Struct Reference
[imImage]

Image Representation Structure. More...

Data Fields

int	width
int	height
int	color_space
int	data_type
int	has_alpha
int	depth
int	line_size
int	plane_size
int	size
int	count
void **	data
long *	palette
int	palette_count
void *	attributes_table

Detailed Description

An image representation than supports all the color spaces, but planes are always unpacked and the orientation is always bottom up.

Field Documentation

int _imImage::width

Number of columns. image:Width() -> width: number [in Lua 5].

int _imImage::height

Number of lines. image:Height() -> height: number [in Lua 5].

int _imImage::color_space

Color space descriptor. See also imColorSpace. image:ColorSpace() -> color_space: number [in Lua 5].

int _imImage::data_type

Data type descriptor. See also imDataType. image:DataType() -> data_type: number [in Lua 5].

int _imImage::has_alpha

Indicates that there is an extra channel with alpha. image:HasAlpha() -> has_alpha: boolean [in Lua 5].
It will not affect the secondary parameters, i.e. the number of planes will be in fact depth+1.
It is always 0 unless imImageAddAlpha is called. Alpha is automatically added in image loading functions.

int _imImage::depth

Number of planes (ColorSpaceDepth) image:Depth() -> depth: number [in Lua 5].

int _imImage::line_size

Number of bytes per line in one plane (width * DataTypeSize) int _imImage::plane_size

Number of bytes per plane. (line_size * height)

int _imImage::size

Number of bytes occupied by the image (plane_size * depth)

int _imImage::count

Number of pixels per plane (width * height)

void** _imImage::data

Image data organized as a 2D matrix with several planes.
But plane 0 is also a pointer to the full data.
The remaining planes are: "data[i] = data[0] + i*plane_size".
In Lua, data indexing is possible using: "image[plane][line][column]".
Also in Lua, is possible to set all pixels using a table calling "image:SetPixels(table)" and get all pixels using "table = image:GetPixels()" (Since 3.9).

long* _imImage::palette

Color palette. image:GetPalette() -> palette: imPalette [in Lua 5].
Used only when depth=1. Otherwise is NULL.

int _imImage::palette_count

The palette is always 256 colors allocated, but can have less colors used.

void* _imImage::attributes_table

in fact is an imAttribTable, but we hide this here

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Data Fields

_imStats Struct Reference
[Image Statistics]

Numerical Statistics Structure.

Data Fields

double	max
double	min
unsigned long	positive
unsigned long	negative
unsigned long	zeros
double	mean
double	stddev

Field Documentation

double _imStats::max

Maximum value

double _imStats::min

Minimum value

unsigned long _imStats::positive

Number of Positive Values

unsigned long _imStats::negative

Number of Negative Values

unsigned long _imStats::zeros

Number of Zeros

double _imStats::mean

Mean

double _imStats::stddev

Standard Deviation

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Public Member Functions

imAttribArray Class Reference
[Utilities]

Attributes Array Class. More...

Public Member Functions

	imAttribArray (int count)
	~imAttribArray ()
int	Count () const
void	RemoveAll ()
void	CopyFrom (const imAttribArray &table)
void	Set (int index, const char *name, int data_type, int count, const void *data)
const void *	Get (int index, char *name=0, int *data_type=0, int *count=0) const
void	ForEach (void *user_data, imAttribTableCallback attrib_func) const

Detailed Description

Same as imAttribTable, but uses an array of fixed size.

Constructor & Destructor Documentation

imAttribArray::imAttribArray	(	int	*count*	)	[inline]

Creates an empty array.

imAttribArray::~imAttribArray	(		)	[inline]

Destroys the array and all the attributes.

Member Function Documentation

int imAttribArray::Count	(		)	const [inline]

Returns the number of elements in the array.

void imAttribArray::RemoveAll	(		)	[inline]

Removes all the attributes in the array

void imAttribArray::CopyFrom	(	const imAttribArray &	*table*	)	[inline]

Copies the contents of the given table into this table.

void imAttribArray::Set	(	int	*index,*	
		const char *	*name,*	
		int	*data_type,*	
		int	*count,*	
		const void *	*data*	
	)			[inline]

Inserts one attribute into the array. The attribute data is a simple array of data_type elements of count length.
Data is duplicated if not NULL, else data is initialized with zeros. When NULL is specified use the Get method to retrieve a pointer to the data so you can initialize it with other values. See also imDataType.

const void* imAttribArray::Get	(	int	*index,*	
		char *	*name* = 0,	
		int *	*data_type* = 0,	
		int *	*count* = 0	
	)			const [inline]

Finds one attribute in the array. Returns the attribute if found, NULL otherwise. See also imDataType.

void imAttribArray::ForEach	(	void *	*user_data,*	
		imAttribTableCallback	*attrib_func*	
	)			const [inline]

For each attribute calls the user callback. If the callback returns 0 the function returns.

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Public Member Functions

imAttribTable Class Reference

[Utilities]

Attributes Table Class. More...

Public Member Functions

	imAttribTable (int hash_size)
	~imAttribTable ()
int	Count () const
void	RemoveAll ()

void	CopyFrom (const imAttribTable &table)
void	MergeFrom (const imAttribTable &table)
void	Set (const char *name, int data_type, int count, const void *data)
void	SetInteger (const char *name, int data_type, int value)
void	SetReal (const char *name, int data_type, double value)
void	SetString (const char *name, const char *value)
void	UnSet (const char *name)
const void *	Get (const char *name, int *data_type=0, int *count=0) const
int	GetInteger (const char *name, int index=0) const
double	GetReal (const char *name, int index=0) const
const char *	GetString (const char *name) const
void	ForEach (void *user_data, imAttribTableCallback attrib_func) const

Detailed Description

All the attributes have a name, a type, a count and the data.
Names are usually strings with less that 30 chars.

Attributes are stored in a hash table for fast access.
We use the hash function described in "The Practice of Programming" of Kernighan & Pike.

Constructor & Destructor Documentation

imAttribTable::imAttribTable	(	int	*hash_size*	)	[inline]

Creates an empty table. If size is zero the default size of 101 is used. Size must be a prime number. Other common values are 67, 599 and 1499.

imAttribTable::~imAttribTable	(		)	[inline]

Destroys the table and all the attributes.

Member Function Documentation

int imAttribTable::Count	(		)	const [inline]

Returns the number of elements in the table.

void imAttribTable::RemoveAll	(		)	[inline]

Removes all the attributes in the table

void imAttribTable::CopyFrom	(	const imAttribTable &	*table*	)	[inline]

Copies the contents of the given table into this table.

void imAttribTable::MergeFrom	(	const imAttribTable &	*table*	)	[inline]

Merges the contents of the given table into this table.

void imAttribTable::Set	(	const char *	*name,*	
		int	*data_type,*	
		int	*count,*	
		const void *	*data*	
	)			[inline]

Inserts an attribute into the table.
If data_type is BYTE then count can be -1 to indicate a NULL terminated string. Data is duplicated if not NULL, else data is initialized with zeros. See also imDataType.

void imAttribTable::SetInteger	(	const char *	*name,*	
		int	*data_type,*	
		int	*value*	
	)			[inline]

Inserts a single integer attribute into the table.

void imAttribTable::SetReal	(	const char *	*name,*	
		int	*data_type,*	
		double	*value*	
	)			[inline]

Inserts a single real attribute into the table.

void imAttribTable::SetString	(	const char *	*name,*	
		const char *	*value*	
	)			[inline]

Inserts a string attribute into the table. data_type=IM_BYTE and is zero terminated.

void imAttribTable::UnSet	(	const char *	*name*	)	[inline]

Removes an attribute from the table given its name.

const void* imAttribTable::Get	(	const char *	*name,*

		int *	*data_type* = 0,	
		int *	*count* = 0	
	)			const [inline]

Returns an attribute from the table. Returns the attribute if found, NULL otherwise. See also imDataType.

int imAttribTable::GetInteger	(	const char *	*name*,	
		int	*index* = 0	
	)			const [inline]

Returns the attribute value at given index as an integer. If not found or complex returns 0.

double imAttribTable::GetReal	(	const char *	*name*,	
		int	*index* = 0	
	)			const [inline]

Returns the attribute value at given index as a real. If not found or complex returns 0.

const char* imAttribTable::GetString	(	const char *	*name*	)	const [inline]

Returns the attribute value as a string. If not found or not a zero terminated string returns 0.

void imAttribTable::ForEach	(	void *	*user_data*,	
		imAttribTableCallback	*attrib_func*	
	)			const [inline]

For each attribute calls the user callback. If the callback returns 0 the function returns.

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Public Member Functions | Protected Member Functions | Protected Attributes | Friends

imBinFileBase Class Reference

[Binary File Access]

Binary File I/O Base Class. More...

Public Member Functions

int	**InitByteOrder** (int ByteOrder)
unsigned long	**Read** (void *pValues, unsigned long pCount, int pSizeOf)
unsigned long	**Write** (void *pValues, unsigned long pCount, int pSizeOf)
virtual void	**Open** (const char *pFileName)=0
virtual void	**New** (const char *pFileName)=0
virtual void	**Close** ()=0
virtual unsigned long	**FileSize** ()=0
virtual int	**HasError** () const =0
virtual void	**SeekTo** (unsigned long pOffset)=0
virtual void	**SeekOffset** (long pOffset)=0
virtual void	**SeekFrom** (long pOffset)=0
virtual unsigned long	**Tell** () const =0
virtual int	**EndOfFile** () const =0

Protected Member Functions

virtual unsigned long	**ReadBuf** (void *pValues, unsigned long pSize)=0
virtual unsigned long	**WriteBuf** (void *pValues, unsigned long pSize)=0
void	**SetByteOrder** (int ByteOrder)

Protected Attributes

int	**IsNew**
int	**FileByteOrder**
int	**DoByteOrder**

Friends

class	**imBinSubFile**

Detailed Description

Base class to help the creation of new modules.
It handles the read/write operations with byte order correction if necessary.

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Public Member Functions | Protected Attributes

imCapture Class Reference

imCapture Class Reference
[Image Capture]

Video Capture Wrapper Class. More...

Public Member Functions	
int	**Failed** ()
int	**Connect** (int device)
void	**Disconnect** ()
int	**DialogCount** ()
int	**ShowDialog** (int dialog, void *parent)
const char *	**DialogDescription** (int dialog)
int	**FormatCount** ()
int	**GetFormat** (int format, int *width, int *height, char *desc)
int	**SetFormat** (int format)
void	**GetImageSize** (int *width, int *height)
int	**SetImageSize** (int width, int height)
int	**GetFrame** (unsigned char *data, int color_mode, int timeout)
int	**GetOneFrame** (unsigned char *data, int color_mode)
int	**Live** (int live)
int	**ResetAttribute** (const char *attrib, int fauto)
int	**GetAttribute** (const char *attrib, double *percent)
int	**SetAttribute** (const char *attrib, double percent)
const char **	**GetAttributeList** (int *num_attrib)
Protected Attributes	
imVideoCapture *	**vc**

Detailed Description

DEPRECATED API. USE NAMESPACE BASED CLASSES.

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Public Member Functions | Data Fields

imComplex< T > Class Template Reference
[Complex Numbers]

Complex Float Data Type Class. More...

Public Member Functions	
	imComplex ()
	imComplex (const T &r, const T &i)
	imComplex (const T &r)
Data Fields	
T	real
T	imag

Detailed Description

template<class T>
class imComplex< T >

Complex class using two floats, one for real part, one for the imaginary part.

It is not a complete complex class, we just implement constructors inside the class. All the other operators and functions are external to the class.

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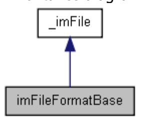
Public Member Functions | Data Fields

imFileFormatBase Class Reference
[File Format SDK]

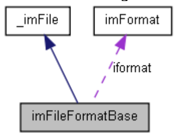
Image File Format Virtual Base Class (SDK Use Only). More...

Inheritance diagram for imFileFormatBase:



[legend]

Collaboration diagram for imFileFormatBase:



[legend]

Public Member Functions

	imFileFormatBase (const imFormat *_iformat)
imAttribTable *	**AttribTable** ()
virtual int	**Open** (const char *file_name)=0
virtual int	**New** (const char *file_name)=0
virtual void	**Close** ()=0
virtual void *	**Handle** (int index)=0
virtual int	**ReadImageInfo** (int index)=0
virtual int	**ReadImageData** (void *data)=0
virtual int	**WriteImageInfo** ()=0
virtual int	**WriteImageData** (void *data)=0

Data Fields

const imFormat *	**iformat**

Detailed Description

Virtual Base class for file formats. All file formats inherit from this class.

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Public Member Functions | Data Fields

imFormat Class Reference
[File Format SDK]

Image File Format Descriptor Class (SDK Use Only). More...

Public Member Functions

virtual imFileFormatBase *	**Create** () const =0
virtual int	**CanWrite** (const char *compression, int color_mode, int data_type) const =0
	imFormat (const char *_format, const char *_desc, const char *_ext, const char **_comp, int _comp_count, int _can_sequence)

Data Fields

const char *	**format**
const char *	**desc**
const char *	**ext**
const char **	**comp**
const char *	**extra**
int	**comp_count**
int	**can_sequence**

Detailed Description

All file formats must define these informations. They are stored by imFormatRegister.

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File List

Here is a list of all documented files with brief descriptions:

im.h	Main API
im_attrib.h	Attributes Table
im_attrib_flat.h	Attributes Table Flat API. This will simplify the DLL export, and can be used for C aplications
im_binfile.h	Binary File Access
im_capture.h	Video Capture
im_color.h	Color Manipulation
im_colorhsi.h	HSI Color Manipulation
im_complex.h	Complex Data Type
im_convert.h	Image Conversion
im_counter.h	Processing Counter

im_dib.h	Windows DIB (Device Independent Bitmap)
im_file.h	File Access
im_format.h	File Format Access
im_format_all.h	All the Internal File Formats. They are all automatically registered by the library. The signatures are in C, but the functions are C++. Header for internal use only
im_format_avi.h	Register the AVI Format
im_format_ecw.h	Register the ECW Format
im_format_jp2.h	Register the JP2 Format
im_format_raw.h	Initialize the RAW Format Driver Header for internal use only
im_format_wmv.h	Register the WMF Format
im_image.h	Image Manipulation
im_kernel.h	Kernel Generators Creates several known kernels
im_lib.h	Library Management and Main Documentation
im_math.h	Math Utilities
im_math_op.h	Math Operations
im_old.h	Old API
im_palette.h	Palette Generators
im_plus.h	Name space for C++ high level API
im_process.h	Image Processing
im_process_ana.h	Image Statistics and Analysis
im_process_glo.h	Image Processing - Global Operations
im_process_loc.h	Image Processing - Local Operations
im_process_pnt.h	Image Processing - Point Operations
im_raw.h	RAW File Format
im_util.h	Utilities
imlua.h	IM Lua 5 Binding

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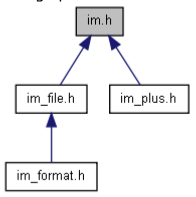
Typedefs | Enumerations | Functions

im.h File Reference

Main API. More...

This graph shows which files directly or indirectly include this file:



Typedefs

typedef struct _imFile	imFile

Enumerations

enum	imDataType {
	IM_BYTE, IM_SHORT, IM_USHORT, IM_INT,
	IM_FLOAT, IM_DOUBLE, IM_CFLOAT, IM_CDOUBLE
	}

enum	imColorSpace {
	IM_RGB, IM_MAP, IM_GRAY, IM_BINARY,
	IM_CMYK, IM_YCBCR, IM_LAB, IM_LUV,
	IM_XYZ
	}

enum	imColorModeConfig { IM_ALPHA = 0x100, IM_PACKED = 0x200, IM_TOPDOWN = 0x400 }

enum	imErrorCodes {
	IM_ERR_NONE, IM_ERR_OPEN, IM_ERR_ACCESS, IM_ERR_FORMAT,
	IM_ERR_DATA, IM_ERR_COMPRESS, IM_ERR_MEM, IM_ERR_COUNTER
	}

Functions

imFile *	imFileOpen (const char *file_name, int *error)
imFile *	imFileOpenAs (const char *file_name, const char *format, int *error)
imFile *	imFileNew (const char *file_name, const char *format, int *error)
void	imFileClose (imFile *ifile)
void *	imFileHandle (imFile *ifile, int index)
void	imFileGetInfo (imFile *ifile, char *format, char *compression, int *image_count)
void	imFileSetInfo (imFile *ifile, const char *compression)
void	imFileSetAttribute (imFile *ifile, const char *attrib, int data_type, int count, const void *data)
void	imFileSetAttribInteger (const imFile *ifile, const char *attrib, int data_type, int value)
void	imFileSetAttribReal (const imFile *ifile, const char *attrib, int data_type, double value)

void	imFileSetAttribString (const imFile *ifile, const char *attrib, const char *value)
const void *	imFileGetAttribute (imFile *ifile, const char *attrib, int *data_type, int *count)
int	imFileGetAttribInteger (const imFile *ifile, const char *attrib, int index)
double	imFileGetAttribReal (const imFile *ifile, const char *attrib, int index)
const char *	imFileGetAttribString (const imFile *ifile, const char *attrib)
void	imFileGetAttributeList (imFile *ifile, char **attrib, int *attrib_count)
void	imFileGetPalette (imFile *ifile, long *palette, int *palette_count)
void	imFileSetPalette (imFile *ifile, long *palette, int palette_count)
int	imFileReadImageInfo (imFile *ifile, int index, int *width, int *height, int *file_color_mode, int *file_data_type)
int	imFileWriteImageInfo (imFile *ifile, int width, int height, int user_color_mode, int user_data_type)
int	imFileReadImageData (imFile *ifile, void *data, int convert2bitmap, int color_mode_flags)
int	imFileWriteImageData (imFile *ifile, void *data)
void	imFormatRegisterInternal (void)
void	imFormatRemoveAll (void)
void	imFormatList (char **format_list, int *format_count)
int	imFormatInfo (const char *format, char *desc, char *ext, int *can_sequence)
int	imFormatInfoExtra (const char *format, char *extra)
int	imFormatCompressions (const char *format, char **comp, int *comp_count, int color_mode, int data_type)
int	imFormatCanWriteImage (const char *format, const char *compression, int color_mode, int data_type)

Detailed Description

See Copyright Notice in im_lib.h

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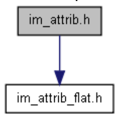
Data Structures

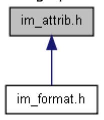
im_attrib.h File Reference

Attributes Table. More...

Include dependency graph for im_attrib.h:



This graph shows which files directly or indirectly include this file:



Data Structures

class	imAttribTable
	Attributes Table Class. More...
class	imAttribArray
	Attributes Array Class. More...

Detailed Description

See Copyright Notice in im_lib.h

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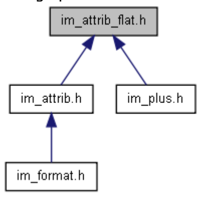
Typedefs | Functions

im_attrib_flat.h File Reference

Attributes Table Flat API. This will simplify the DLL export, and can be used for C aplications. More...

This graph shows which files directly or indirectly include this file:



Typedefs

typedef int(*	imAttribTableCallback)(void *user_data, int index, const char *name, int data_type, int count, const void *data)

Functions

imAttribTablePrivate *	**imAttribTableCreate** (int hash_size)
void	**imAttribTableDestroy** (imAttribTablePrivate *ptable)
int	**imAttribTableCount** (imAttribTablePrivate *ptable)
void	**imAttribTableRemoveAll** (imAttribTablePrivate *ptable)
const void *	**imAttribTableGet** (const imAttribTablePrivate *ptable, const char *name, int *data_type, int *count)
int	**imAttribTableGetInteger** (imAttribTablePrivate *ptable, const char *name, int index)
double	**imAttribTableGetReal** (imAttribTablePrivate *ptable, const char *name, int index)
const char *	**imAttribTableGetString** (imAttribTablePrivate *ptable, const char *name)
void	**imAttribTableSet** (imAttribTablePrivate *ptable, const char *name, int data_type, int count, const void *data)
void	**imAttribTableSetInteger** (imAttribTablePrivate *ptable, const char *name, int data_type, int value)
void	**imAttribTableSetReal** (imAttribTablePrivate *ptable, const char *name, int data_type, double value)
void	**imAttribTableSetString** (imAttribTablePrivate *ptable, const char *name, const char *value)
void	**imAttribTableUnSet** (imAttribTablePrivate *ptable, const char *name)
void	**imAttribTableCopyFrom** (imAttribTablePrivate *ptable_dst, const imAttribTablePrivate *ptable_src)
void	**imAttribTableMergeFrom** (imAttribTablePrivate *ptable_dst, const imAttribTablePrivate *ptable_src)
void	**imAttribTableForEach** (const imAttribTablePrivate *ptable, void *user_data, imAttribTableCallback attrib_func)
imAttribTablePrivate *	**imAttribArrayCreate** (int hash_size)
const void *	**imAttribArrayGet** (const imAttribTablePrivate *ptable, int index, char *name, int *data_type, int *count)
void	**imAttribArraySet** (imAttribTablePrivate *ptable, int index, const char *name, int data_type, int count, const void *data)
void	**imAttribArrayCopyFrom** (imAttribTablePrivate *ptable_dst, const imAttribTablePrivate *ptable_src)

Detailed Description

See Copyright Notice in im_lib.h

Typedef Documentation

typedef int(* imAttribTableCallback)(void *user_data, int index, const char *name, int data_type, int count, const void *data)

Definition of the callback used in ForEach function.

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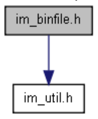
Data Structures | Defines | Typedefs | Enumerations | Functions

im_binfile.h File Reference

Binary File Access. More...

Include dependency graph for im_binfile.h:



Data Structures

struct	_imBinMemoryFileName
	Memory File Filename Parameter Structure. More...
class	imBinFileBase
	Binary File I/O Base Class. More...

Typedefs

typedef struct _imBinFile	imBinFile
typedef struct _imBinMemoryFileName	imBinMemoryFileName
typedef imBinFileBase *(*	imBinFileNewFunc)()

Enumerations

enum	imBinFileModule {
	IM_RAWFILE, IM_STREAM, IM_MEMFILE, IM_SUBFILE,
	IM_FILEHANDLE, IM_IOCUSTOM0
	}

Functions

imBinFile *	imBinFileOpen (const char *pFileName)
imBinFile *	imBinFileNew (const char *pFileName)
void	imBinFileClose (imBinFile *bfile)
int	imBinFileError (imBinFile *bfile)
unsigned long	imBinFileSize (imBinFile *bfile)
int	imBinFileByteOrder (imBinFile *bfile, int pByteOrder)
unsigned long	imBinFileRead (imBinFile *bfile, void *pValues, unsigned long pCount, int pSizeOf)

unsigned long	imBinFileWrite (imBinFile *bfile, void *pValues, unsigned long pCount, int pSizeOf)
unsigned long	imBinFilePrintf (imBinFile *bfile, const char *format,...)
int	imBinFileReadLine (imBinFile *handle, char *comment, int *size)
int	imBinFileSkipLine (imBinFile *handle)
int	imBinFileReadInteger (imBinFile *handle, int *value)
int	imBinFileReadReal (imBinFile *handle, double *value)
void	imBinFileSeekTo (imBinFile *bfile, unsigned long pOffset)
void	imBinFileSeekOffset (imBinFile *bfile, long pOffset)
void	imBinFileSeekFrom (imBinFile *bfile, long pOffset)
unsigned long	imBinFileTell (imBinFile *bfile)
int	imBinFileEndOfFile (imBinFile *bfile)
int	imBinFileSetCurrentModule (int pModule)
void	imBinMemoryRelease (unsigned char *buffer)
int	imBinFileRegisterModule (imBinFileNewFunc pNewFunc)

Detailed Description

See Copyright Notice in im_lib.h

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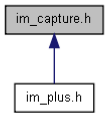
Data Structures | Defines | Typedefs | Functions

im_capture.h File Reference

Video Capture. More...

This graph shows which files directly or indirectly include this file:



Data Structures

class	imCapture
	Video Capture Wrapper Class. More...

Typedefs

typedef struct _imVideoCapture	imVideoCapture

Functions

int IM_DECL	imVideoCaptureDeviceCount (void)
const char *IM_DECL	imVideoCaptureDeviceDesc (int device)
const char *IM_DECL	imVideoCaptureDeviceExDesc (int device)
const char *IM_DECL	imVideoCaptureDevicePath (int device)
const char *IM_DECL	imVideoCaptureDeviceVendorInfo (int device)
int IM_DECL	imVideoCaptureReloadDevices (void)
void IM_DECL	imVideoCaptureReleaseDevices (void)
imVideoCapture *IM_DECL	imVideoCaptureCreate (void)
void IM_DECL	imVideoCaptureDestroy (imVideoCapture *vc)
int IM_DECL	imVideoCaptureConnect (imVideoCapture *vc, int device)
void IM_DECL	imVideoCaptureDisconnect (imVideoCapture *vc)
int IM_DECL	imVideoCaptureDialogCount (imVideoCapture *vc)
int IM_DECL	imVideoCaptureShowDialog (imVideoCapture *vc, int dialog, void *parent)
const char *IM_DECL	imVideoCaptureDialogDesc (imVideoCapture *vc, int dialog)
int IM_DECL	imVideoCaptureSetInOut (imVideoCapture *vc, int input, int output, int cross)
int IM_DECL	imVideoCaptureFormatCount (imVideoCapture *vc)
int IM_DECL	imVideoCaptureGetFormat (imVideoCapture *vc, int format, int *width, int *height, char *desc)
int IM_DECL	imVideoCaptureSetFormat (imVideoCapture *vc, int format)
void IM_DECL	imVideoCaptureGetImageSize (imVideoCapture *vc, int *width, int *height)
int IM_DECL	imVideoCaptureSetImageSize (imVideoCapture *vc, int width, int height)
int IM_DECL	imVideoCaptureFrame (imVideoCapture *vc, unsigned char *data, int color_mode, int timeout)
int IM_DECL	imVideoCaptureOneFrame (imVideoCapture *vc, unsigned char *data, int color_mode)
int IM_DECL	imVideoCaptureLive (imVideoCapture *vc, int live)
int IM_DECL	imVideoCaptureResetAttribute (imVideoCapture *vc, const char *attrib, int fauto)
int IM_DECL	imVideoCaptureGetAttribute (imVideoCapture *vc, const char *attrib, double *percent)
int IM_DECL	imVideoCaptureSetAttribute (imVideoCapture *vc, const char *attrib, double percent)
const char **IM_DECL	imVideoCaptureGetAttributeList (imVideoCapture *vc, int *num_attrib)

Detailed Description

See Copyright Notice in im.h

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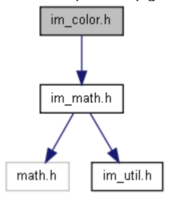
Defines | Functions

im_color.h File Reference

Color Manipulation. More...

Include dependency graph for im_color.h:



Defines

#define	**IM_FWLAB**(_w)
#define	**IM_GWLAB**(_w)

Functions

double	imColorZeroShift (int data_type)
int	imColorMax (int data_type)
int	imColorMin (int data_type)
template<class T , class R >	
T	imColorQuantize (const R &value, const T &min, const T &max)
template<class T >	
double	imColorReconstruct (const T &value, const T &min, const T &max)
template<class T >	
void	imColorYCbCr2RGB (const T Y, const T Cb, const T Cr, T &R, T &G, T &B, const T &zero, const T &min, const T &max)
template<class T >	
void	imColorRGB2YCbCr (const T R, const T G, const T B, T &Y, T &Cb, T &Cr, const T &zero)
template<class T >	
void	imColorCMYK2RGB (const T C, const T M, const T Y, const T K, T &R, T &G, T &B, const T &max)
template<class T >	
void	imColorXYZ2RGB (const T X, const T Y, const T Z, T &R, T &G, T &B)
template<class T >	
void	imColorRGB2XYZ (const T R, const T G, const T B, T &X, T &Y, T &Z)
void	imColorXYZ2Lab (const double X, const double Y, const double Z, double &L, double &a, double &b)
void	imColorLab2XYZ (const double L, const double a, const double b, double &X, double &Y, double &Z)
void	imColorXYZ2Luv (const double X, const double Y, const double Z, double &L, double &u, double &v)
void	imColorLuv2XYZ (const double L, const double u, const double v, double &X, double &Y, double &Z)
double	imColorTransfer2Linear (const double &nonlinear_value)
double	imColorTransfer2Nonlinear (const double &value)
void	imColorRGB2RGBNonlinear (const double RL, const double GL, const double BL, double &R, double &G, double &B)
template<class T >	
T	imColorRGB2Luma (const T R, const T G, const T B)
double	imColorLuminance2Lightness (const double &Y)
double	imColorLightness2Luminance (const double &L)

Detailed Description

See Copyright Notice in im_lib.h

Define Documentation

#define IM_FWLAB (_w)

Value:

```
(_w > 0.008856?               \
                         pow(_w, 1.0/3.0):        \
                         7.787 * _w + 0.16/1.16)
```

#define IM_GWLAB (_w)

Value:

```
(_w > 0.20689?                 \
                         pow(_w, 3.0):                 \
                         0.1284 * (_w - 0.16/1.16))
```

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Functions

im_colorhsi.h File Reference

HSI Color Manipulation. More...

Functions

void	imColorRGB2HSI (double r, double g, double b, double *h, double *s, double *i)
void	imColorRGB2HSIbyte (unsigned char r, unsigned char g, unsigned char b, double *h, double *s, double *i)
void	imColorHSI2RGB (double h, double s, double i, double *r, double *g, double *b)
void	imColorHSI2RGBbyte (double h, double s, double i, unsigned char *r, unsigned char *g, unsigned char *b)
double	imColorHue (double R, double G, double B)
double	imColorHueByte (unsigned char r, unsigned char g, unsigned char b)
double	imColorIntensity (double R, double G, double B)
double	imColorIntensityByte (unsigned char r, unsigned char g, unsigned char b)
double	imColorSaturation (double R, double G, double B)
double	imColorSaturationByte (unsigned char r, unsigned char g, unsigned char b)
double	imColorHSI_ImaxS (double h, double cosH, double sinH)
double	imColorHSI_Smax (double h, double cosH, double sinH, double i)

Detailed Description

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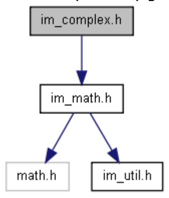
Data Structures | Typedefs | Functions

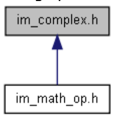
im_complex.h File Reference

Complex Data Type. More...

Include dependency graph for im_complex.h:



This graph shows which files directly or indirectly include this file:



Data Structures

class	imComplex< T >
	Complex Float Data Type Class. More...

Typedefs

typedef imComplex< float >	imcfloat
typedef imComplex< double >	imcdouble

Functions

template<class T >	
int	**operator<=** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
int	**operator<=** (const imComplex< T > &C, const float &R)
template<class T >	
int	**operator<=** (const imComplex< T > &C, const double &R)
template<class T >	
int	**operator<** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
int	**operator<** (const imComplex< T > &C, const T &R)
template<class T >	
int	**operator>** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	

int	**operator>** (const imComplex< T > &C, const T &R)
template<class T >	
imComplex< T >	**operator+** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
imComplex< T >	**operator+** (const imComplex< T > &C, const T &R)
template<class T >	
imComplex< T >	**operator+=** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
imComplex< T >	**operator-** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
imComplex< T >	**operator-** (const imComplex< T > &C, const T &R)
template<class T >	
imComplex< T >	**operator*** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
imComplex< T >	**operator/** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
imComplex< T >	**operator/** (const imComplex< T > &C, const float &R)
template<class T >	
imComplex< T >	**operator/** (const imComplex< T > &C, const double &R)
template<class T >	
imComplex< T >	**operator/=** (const imComplex< T > &C, const float &R)
template<class T >	
imComplex< T >	**operator/=** (const imComplex< T > &C, const double &R)
template<class T >	
imComplex< T >	**operator*** (const imComplex< T > &C, const float &R)
template<class T >	
imComplex< T >	**operator*** (const imComplex< T > &C, const double &R)
template<class T >	
int	**operator==** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
T	**cpxreal** (const imComplex< T > &C)
template<class T >	
T	**cpximag** (const imComplex< T > &C)
template<class T >	
T	**cpxmag** (const imComplex< T > &C)
template<class T >	
T	**cpxphase** (const imComplex< T > &C)
template<class T >	
imComplex< T >	**cpxconj** (const imComplex< T > &C)
template<class T >	
imComplex< T >	**cpxpolar** (const T &mag, const T &phase)
template<class T >	
imComplex< T >	**log** (const imComplex< T > &C)
template<class T >	
imComplex< T >	**exp** (const imComplex< T > &C)
template<class T >	
imComplex< T >	**pow** (const imComplex< T > &C1, const imComplex< T > &C2)
template<class T >	
imComplex< T >	**pow** (const imComplex< T > &C1, const T &R)
template<class T >	
imComplex< T >	**sqrt** (const imComplex< T > &C)

Detailed Description

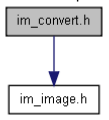
See Copyright Notice in im_lib.h

Enumerations | Functions

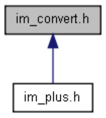
im_convert.h File Reference

Image Conversion. More...

Include dependency graph for im_convert.h:



This graph shows which files directly or indirectly include this file:



Enumerations

enum	imComplex2Real { **IM_CPX_REAL**, **IM_CPX_IMAG**, **IM_CPX_MAG**, **IM_CPX_PHASE** }
enum	imGammaFactor { **IM_GAMMA_LINEAR** = 0, **IM_GAMMA_LOGLITE** = -10, **IM_GAMMA_LOGHEAVY** = -1000, **IM_GAMMA_EXPLITE** = 2, **IM_GAMMA_EXPHEAVY** = 7 }
enum	imCastMode { IM_CAST_MINMAX, IM_CAST_FIXED, IM_CAST_DIRECT, IM_CAST_USER }

Functions

int	imConvertDataType (const imImage *src_image, imImage *dst_image, int cpx2real, double gamma, int absolute, int cast_mode)
int	imConvertColorSpace (const imImage *src_image, imImage *dst_image)
int	imConvertToBitmap (const imImage *src_image, imImage *dst_image, int cpx2real, double gamma, int absolute, int cast_mode)
void *	imImageGetOpenGLData (const imImage *image, int *glformat)
imImage *	imImageCreateFromOpenGLData (int width, int height, int glformat, const void *gldata)
void	imConvertPacking (const void *src_data, void *dst_data, int width, int height, int src_depth, int dst_depth, int data_type, int src_is_packed)
void	imConvertMapToRGB (unsigned char *data, int count, int depth, int packed, long *palette, int palette_count)
int	**imConvertRGB2Map** (int width, int height, unsigned char *red, unsigned char *green, unsigned char *blue, unsigned char *map, long *palette, int *palette_count)
int	**imConvertRGB2MapCounter** (int width, int height, unsigned char *red, unsigned char *green, unsigned char *blue, unsigned char *map, long *palette, int *palette_count, int counter)

Detailed Description

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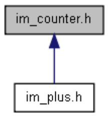
Typedefs | Functions

im_counter.h File Reference

Processing Counter. More...

This graph shows which files directly or indirectly include this file:



Typedefs

typedef int(*	imCounterCallback)(int counter, void *cb_user_data, const char *text, int progress)

Functions

imCounterCallback	imCounterSetCallback (void *cb_user_data, imCounterCallback counter_func)
int	imCounterHasCallback (void)
int	imCounterBegin (const char *title)
void	imCounterEnd (int counter)
int	imCounterInc (int counter)
int	imCounterIncTo (int counter, int count)
void	imCounterTotal (int counter, int total, const char *message)
void *	imCounterGetUserData (int counter)
void	imCounterSetUserData (int counter, void *userdata)

Detailed Description

See Copyright Notice in im_lib.h

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Data Structures | Typedefs | Functions

im_dib.h File Reference

Windows DIB (Device Independent Bitmap). More...

Data Structures

struct	_imDib

	Windows DIB Structure. More...

Typedefs

typedef struct _imDib	imDib
typedef unsigned int(*	imDibLineGetPixel)(unsigned char *line, int col)
typedef void(*	imDibLineSetPixel)(unsigned char *line, int col, unsigned int pixel)

Functions

imDib *	imDibCreate (int width, int height, int bpp)
imDib *	imDibCreateCopy (const imDib *dib)
imDib *	imDibCreateReference (BYTE *bmi, BYTE *bits)
imDib *	imDibCreateSection (HDC hDC, HBITMAP *bitmap, int width, int height, int bpp)
void	imDibDestroy (imDib *dib)
imDibLineGetPixel	imDibLineGetPixelFunc (int bpp)
imDibLineSetPixel	imDibLineSetPixelFunc (int bpp)
imDib *	imDibFromHBitmap (const HBITMAP image, const HPALETTE hPalette)
HBITMAP	imDibToHBitmap (const imDib *dib)
HPALETTE	imDibLogicalPalette (const imDib *dib)
imDib *	imDibCaptureScreen (int x, int y, int width, int height)
void	imDibCopyClipboard (imDib *dib)
imDib *	imDibPasteClipboard (void)
int	imDibIsClipboardAvailable (void)
int	imDibSaveFile (const imDib *dib, const char *filename)
imDib *	imDibLoadFile (const char *filename)
void	imDibDecodeToRGBA (const imDib *dib, unsigned char *red, unsigned char *green, unsigned char *blue, unsigned char *alpha)
void	imDibDecodeToMap (const imDib *dib, unsigned char *map, long *palette)
void	imDibEncodeFromRGBA (imDib *dib, const unsigned char *red, const unsigned char *green, const unsigned char *blue, const unsigned char *alpha)
void	imDibEncodeFromMap (imDib *dib, const unsigned char *map, const long *palette, int palette_count)
void	imDibEncodeFromBitmap (imDib *dib, const unsigned char *data)
void	imDibDecodeToBitmap (const imDib *dib, unsigned char *data)

Detailed Description

See Copyright Notice in im_lib.h

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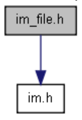
Data Structures | Functions

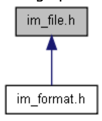
im_file.h File Reference

File Access. More...

Include dependency graph for im_file.h:



This graph shows which files directly or indirectly include this file:



Data Structures

struct	_imFile
	Image File Structure (SDK Use Only). More...

Functions

void	**imFileClear** (imFile *ifile)
void	**imFileLineBufferInit** (imFile *ifile)
int	**imFileCheckConversion** (imFile *ifile)
int	imFileLineBufferCount (imFile *ifile)
void	imFileLineBufferInc (imFile *ifile, int *line, int *plane)
void	imFileLineBufferRead (imFile *ifile, void *data, int line, int plane)
void	imFileLineBufferWrite (imFile *ifile, const void *data, int line, int plane)
int	imFileLineSizeAligned (int width, int bpp, int align)
void	imFileSetBaseAttributes (imFile *ifile)

Detailed Description

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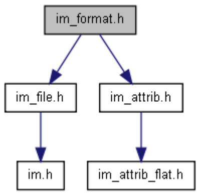
Data Structures | Defines | Functions

im_format.h File Reference

File Format Access. More...

Include dependency graph for im_format.h:



Data Structures

class	imFileFormatBase
	Image File Format Virtual Base Class (SDK Use Only). More...
class	imFormat
	Image File Format Descriptor Class (SDK Use Only). More...

Functions

imFileFormatBase *	**imFileFormatBaseOpen** (const char *file_name, int *error)
imFileFormatBase *	**imFileFormatBaseOpenAs** (const char *file_name, const char *format, int *error)
imFileFormatBase *	**imFileFormatBaseNew** (const char *file_name, const char *format, int *error)
void	imFormatRegister (imFormat *iformat)

Detailed Description

See Copyright Notice in im_lib.h

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Functions

im_format_all.h File Reference

All the Internal File Formats. They are all automatically registered by the library. The signatures are in C, but the functions are C++. Header for internal use only. More...

Functions

void	**imFormatRegisterTIFF** (void)
void	**imFormatRegisterJPEG** (void)
void	**imFormatRegisterPNG** (void)
void	**imFormatRegisterGIF** (void)
void	**imFormatRegisterBMP** (void)
void	**imFormatRegisterRAS** (void)
void	**imFormatRegisterLED** (void)
void	**imFormatRegisterSGI** (void)
void	**imFormatRegisterPCX** (void)
void	**imFormatRegisterTGA** (void)
void	**imFormatRegisterPNM** (void)
void	**imFormatRegisterPFM** (void)
void	**imFormatRegisterICO** (void)
void	**imFormatRegisterKRN** (void)

Detailed Description

See Copyright Notice in im_lib.h

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Functions

im_format_avi.h File Reference

Register the AVI Format. More...

Functions

void	imFormatRegisterAVI (void)

Detailed Description

See Copyright Notice in im_lib.h

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Functions

im_format_ecw.h File Reference

Register the ECW Format. More...

Functions	
void	imFormatRegisterECW (void)

Detailed Description

See Copyright Notice in im_lib.h

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Functions

im_format_jp2.h File Reference

Register the JP2 Format. More...

Functions	
void	imFormatRegisterJP2 (void)

Detailed Description

See Copyright Notice in im_lib.h

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Functions

im_format_raw.h File Reference

Initialize the RAW Format Driver Header for internal use only. More...

Functions	
imFormat *	**imFormatInitRAW** (void)
void	**imFormatFinishRAW** (void)

Detailed Description

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Functions

im_format_wmv.h File Reference

Register the WMF Format. More...

Functions	
void	imFormatRegisterWMV (void)

Detailed Description

See Copyright Notice in im_lib.h

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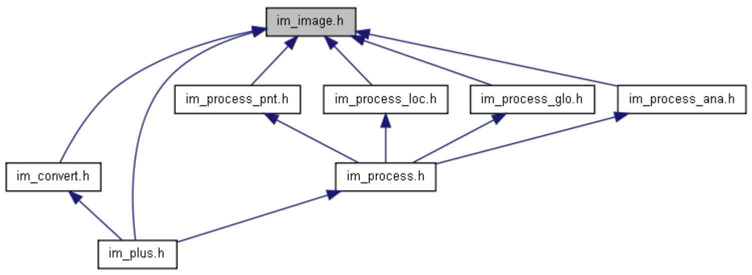
Data Structures | Defines | Typedefs | Functions

im_image.h File Reference

Image Manipulation. More...

This graph shows which files directly or indirectly include this file:



Data Structures

struct	_imImage
	Image Representation Structure. More...

Defines

#define	imcdCanvasPutImage(_canvas, _image, _x, _y, _w, _h, _xmin, _xmax, _ymin, _ymax)

Typedefs

typedef struct _imImage	imImage

Functions

imImage *	imImageCreate (int width, int height, int color_space, int data_type)
imImage *	imImageInit (int width, int height, int color_mode, int data_type, void *data_buffer, long *palette, int palette_count)
imImage *	imImageCreateBased (const imImage *image, int width, int height, int color_space, int data_type)
void	imImageDestroy (imImage *image)
void	imImageAddAlpha (imImage *image)
void	imImageSetAlpha (imImage *image, double alpha)
void	imImageRemoveAlpha (imImage *image)
void	imImageReshape (imImage *image, int width, int height)
void	imImageCopy (const imImage *src_image, imImage *dst_image)
void	imImageCopyData (const imImage *src_image, imImage *dst_image)
void	imImageCopyAttributes (const imImage *src_image, imImage *dst_image)
void	imImageMergeAttributes (const imImage *src_image, imImage *dst_image)
void	imImageCopyPlane (const imImage *src_image, int src_plane, imImage *dst_image, int dst_plane)
imImage *	imImageDuplicate (const imImage *image)
imImage *	imImageClone (const imImage *image)
void	imImageSetAttribute (const imImage *image, const char *attrib, int data_type, int count, const void *data)
void	imImageSetAttribInteger (const imImage *image, const char *attrib, int data_type, int value)
void	imImageSetAttribReal (const imImage *image, const char *attrib, int data_type, double value)
void	imImageSetAttribString (const imImage *image, const char *attrib, const char *value)
const void *	imImageGetAttribute (const imImage *image, const char *attrib, int *data_type, int *count)
int	imImageGetAttribInteger (const imImage *image, const char *attrib, int index)
double	imImageGetAttribReal (const imImage *image, const char *attrib, int index)
const char *	imImageGetAttribString (const imImage *image, const char *attrib)
void	imImageGetAttributeList (const imImage *image, char **attrib, int *attrib_count)
void	imImageClear (imImage *image)
int	imImageIsBitmap (const imImage *image)
void	imImageSetPalette (imImage *image, long *palette, int palette_count)
int	imImageMatchSize (const imImage *image1, const imImage *image2)
int	imImageMatchColor (const imImage *image1, const imImage *image2)
int	imImageMatchDataType (const imImage *image1, const imImage *image2)
int	imImageMatchColorSpace (const imImage *image1, const imImage *image2)
int	imImageMatch (const imImage *image1, const imImage *image2)
void	imImageSetMap (imImage *image)
void	imImageSetBinary (imImage *image)
void	imImageSetGray (imImage *image)
void	imImageMakeBinary (imImage *image)
void	imImageMakeGray (imImage *image)
imImage *	imFileLoadImage (imFile *ifile, int index, int *error)
void	imFileLoadImageFrame (imFile *ifile, int index, imImage *image, int *error)
imImage *	imFileLoadBitmap (imFile *ifile, int index, int *error)
imImage *	imFileLoadImageRegion (imFile *ifile, int index, int bitmap, int *error, int xmin, int xmax, int ymin, int ymax, int width, int height)
void	imFileLoadBitmapFrame (imFile *ifile, int index, imImage *image, int *error)
int	imFileSaveImage (imFile *ifile, const imImage *image)

imImage *	imFileImageLoad (const char *file_name, int index, int *error)
imImage *	imFileImageLoadBitmap (const char *file_name, int index, int *error)
imImage *	imFileImageLoadRegion (const char *file_name, int index, int bitmap, int *error, int xmin, int xmax, int ymin, int ymax, int width, int height)
int	imFileImageSave (const char *file_name, const char *format, const imImage *image)

Detailed Description

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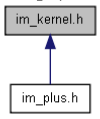
Functions

im_kernel.h File Reference

Kernel Generators Creates several known kernels. More...

This graph shows which files directly or indirectly include this file:



Functions

imImage *	imKernelSobel (void)
imImage *	imKernelPrewitt (void)
imImage *	imKernelKirsh (void)
imImage *	imKernelLaplacian4 (void)
imImage *	imKernelLaplacian8 (void)
imImage *	imKernelLaplacian5x5 (void)
imImage *	imKernelLaplacian7x7 (void)
imImage *	imKernelGradian3x3 (void)
imImage *	imKernelGradian7x7 (void)
imImage *	imKernelSculpt (void)
imImage *	imKernelMean3x3 (void)
imImage *	imKernelMean5x5 (void)
imImage *	imKernelCircularMean5x5 (void)
imImage *	imKernelMean7x7 (void)
imImage *	imKernelCircularMean7x7 (void)
imImage *	imKernelGaussian3x3 (void)
imImage *	imKernelGaussian5x5 (void)
imImage *	imKernelBarlett5x5 (void)
imImage *	imKernelTopHat5x5 (void)
imImage *	imKernelTopHat7x7 (void)
imImage *	imKernelEnhance (void)

Detailed Description

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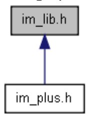
Defines | Functions

im_lib.h File Reference

Library Management and Main Documentation. More...

This graph shows which files directly or indirectly include this file:



Defines

#define	**IM_NAME**	"IM - An Imaging Toolkit"
#define	**IM_DESCRIPTION**	"Toolkit for Image Representation, Storage, Capture and Processing"
#define	**IM_COPYRIGHT**	"Copyright (C) 1994-2020 Tecgraf/PUC-Rio"
#define	**IM_AUTHOR**	"Antonio Scuri"
#define	**IM_VERSION**	"3.15"
#define	**IM_VERSION_NUMBER**	315000
#define	**IM_VERSION_DATE**	"2020/07/30"

Functions

const char *	imVersion (void)
const char *	imVersionDate (void)
int	imVersionNumber (void)

Detailed Description

See Copyright Notice in this file.

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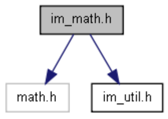
Defines | Functions

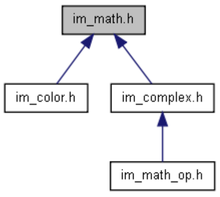
im_math.h File Reference

Math Utilities. More...

Include dependency graph for im_math.h:



This graph shows which files directly or indirectly include this file:



Defines

#define	**C0** (-c3 + 2.0f*c2 - c)
#define	**C1** (c3 - 2.0f*c2 + 1.0)
#define	**C2** (-c3 + c2 + c)
#define	**C3** (c3 - c2)

Functions

int	imRound (float x)
int	**imRound** (double x)
template<class T >	
T	**imAbs** (const T &v)
int	imResampleInt (int x, double factor)
template<class T , class TU >	
T	imZeroOrderDecimation (int width, int height, T *map, double xl, double yl, double box_width, double box_height, TU Dummy)
template<class T , class TU >	
T	imBilinearDecimation (int width, int height, T *map, double xl, double yl, double box_width, double box_height, TU Dummy)
template<class T >	
T	imZeroOrderInterpolation (int width, int height, T *map, double xl, double yl)
template<class T >	
T	imBilinearInterpolation (int width, int height, T *map, double xl, double yl)
template<class T , class TU >	
T	imBicubicInterpolation (int width, int height, T *map, double xl, double yl, TU Dummy)
template<class T >	
void	imMinMax (const T *map, int count, T &min, T &max, int absolute=0)
template<class T >	
void	imMinMaxType (const T *map, int count, T &min, T &max, int absolute=0)

Detailed Description

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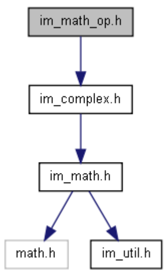
Defines | Functions

im_math_op.h File Reference

Math Operations. More...

Include dependency graph for im_math_op.h:



Defines

#define	**ISQRT_NEXT**(n, i) (((n) + (i)/(n)) >> 1)

Functions

template<class T >	
T	crop_byte (const T &v)
template<class T1 , class T2 >	
T1	add_op (const T1 &v1, const T2 &v2)
template<class T1 , class T2 >	
T1	sub_op (const T1 &v1, const T2 &v2)
template<class T1 , class T2 >	
T1	mul_op (const T1 &v1, const T2 &v2)
template<class T1 , class T2 >	
T1	div_op (const T1 &v1, const T2 &v2)
template<class T >	
T	inv_op (const T &v)
template<class T1 , class T2 >	
T1	diff_op (const T1 &v1, const T2 &v2)
template<class T1 , class T2 >	
T1	min_op (const T1 &v1, const T2 &v2)
template<class T1 , class T2 >	
T1	max_op (const T1 &v1, const T2 &v2)
int	**ipow** (int base, int exp)
imbyte	**pow_op** (const imbyte &v1, const imbyte &v2)
imushort	**pow_op** (const imushort &v1, const imushort &v2)
short	**pow_op** (const short &v1, const short &v2)
int	**pow_op** (const int &v1, const int &v2)
template<class T1 , class T2 >	
T1	pow_op (const T1 &v1, const T2 &v2)
template<class T >	
T	abs_op (const T &v)
template<class T >	
T	less_op (const T &v)
template<class T >	
T	sqr_op (const T &v)
unsigned int	**isqrt** (unsigned int number)
int	**sqrt** (const int &v)
template<class T >	
T	sqrt_op (const T &v)
int	**exp** (const int &v)
template<class T >	
T	exp_op (const T &v)
int	**log** (const int &v)
template<class T >	
T	log_op (const T &v)
imcfloat	**sin** (const imcfloat &v)
int	**sin** (const int &v)
template<class T >	
T	sin_op (const T &v)
imcfloat	**cos** (const imcfloat &v)
int	**cos** (const int &v)
template<class T >	
T	cos_op (const T &v)
void	imDataBitSet (imbyte *data, int index, int bit)
int	imDataBitGet (imbyte *data, int index)

Detailed Description

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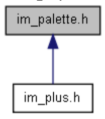
Functions

im_palette.h File Reference

Palette Generators. More...

This graph shows which files directly or indirectly include this file:



Functions

long *	imPaletteNew (int count)
void	imPaletteRelease (long *palette)
long *	imPaletteDuplicate (const long *palette, int count)
int	imPaletteFindNearest (const long *palette, int palette_count, long color)
int	imPaletteFindColor (const long *palette, int palette_count, long color, unsigned char tol)
long *	imPaletteGray (void)
long *	imPaletteRed (void)
long *	imPaletteGreen (void)
long *	imPaletteBlue (void)
long *	imPaletteYellow (void)
long *	imPaletteMagenta (void)
long *	imPaletteCyan (void)
long *	imPaletteRainbow (void)
long *	imPaletteHues (void)
long *	imPaletteBlueIce (void)
long *	imPaletteHotIron (void)
long *	imPaletteBlackBody (void)
long *	imPaletteHighContrast (void)
long *	imPaletteLinear (void)
long *	imPaletteUniform (void)
int	imPaletteUniformIndex (long color)
int	imPaletteUniformIndexHalftoned (long color, int x, int y)

Detailed Description

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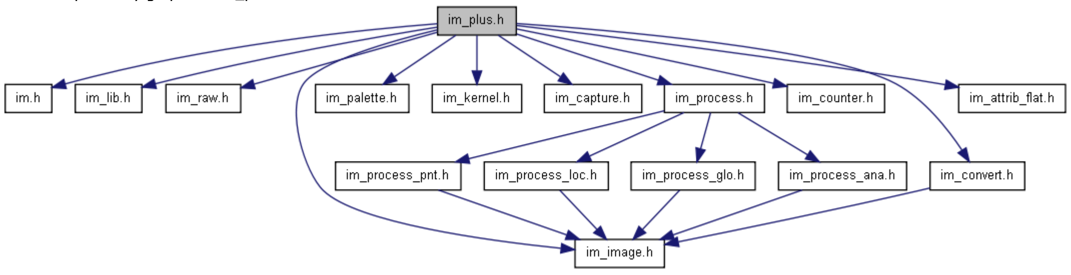
Namespaces | Functions

im_plus.h File Reference

Name space for C++ high level API. More...

Include dependency graph for im_plus.h:



Namespaces

namespace	im

Functions

const char *	**im::Version** ()
const char *	**im::VersionDate** ()

int	**im::VersionNumber** ()
void	**im::Format::RegisterInternal** ()
void	**im::Format::RemoveAll** ()
void	**im::Format::List** (char **format_list, int &format_count)
int	**im::Format::Info** (const char *format, char *desc, char *ext, int &can_sequence)
int	**im::Format::InfoExtra** (const char *format, char *extra)
int	**im::Format::Compressions** (const char *format, char **comp, int &comp_count, int color_mode, int data_type)
int	**im::Format::CanWriteImage** (const char *format, const char *compression, int color_mode, int data_type)
void	**im::VideoCaptureDevice::ReloadList** ()
void	**im::VideoCaptureDevice::ReleaseList** ()
int	**im::VideoCaptureDevice::Count** ()
const char *	**im::VideoCaptureDevice::DeviceDescription** (int device)
const char *	**im::VideoCaptureDevice::DeviceExtendedDescription** (int device)
const char *	**im::VideoCaptureDevice::DevicePath** (int device)
const char *	**im::VideoCaptureDevice::DeviceVendorInfo** (int device)
Image	**im::Kernel::Sobel** ()
Image	**im::Kernel::Prewitt** ()
Image	**im::Kernel::Kirsh** ()
Image	**im::Kernel::Laplacian4** ()
Image	**im::Kernel::Laplacian8** ()
Image	**im::Kernel::Laplacian5x5** ()
Image	**im::Kernel::Laplacian7x7** ()
Image	**im::Kernel::Gradian3x3** ()
Image	**im::Kernel::Gradian7x7** ()
Image	**im::Kernel::Sculpt** ()
Image	**im::Kernel::Mean3x3** ()
Image	**im::Kernel::Mean5x5** ()
Image	**im::Kernel::CircularMean5x5** ()
Image	**im::Kernel::Mean7x7** ()
Image	**im::Kernel::CircularMean7x7** ()
Image	**im::Kernel::Gaussian3x3** ()
Image	**im::Kernel::Gaussian5x5** ()
Image	**im::Kernel::Barlett5x5** ()
Image	**im::Kernel::TopHat5x5** ()
Image	**im::Kernel::TopHat7x7** ()
Image	**im::Kernel::Enhance** ()
int	**im::Process::GaussianStdDev2KernelSize** (double stddev)
double	**im::Process::GaussianKernelSize2StdDev** (int kernel_size)
void	**im::Process::CalcRotateSize** (int width, int height, int &new_width, int &new_height, double cos0, double sin0)
int	**im::Process::OpenMPSetMinCount** (int min_count)
int	**im::Process::OpenMPSetNumThreads** (int thread_count)
int	**im::Process::HoughLines** (const Image &src_image, Image &dst_image)
int	**im::Process::HoughLinesDraw** (const Image &src_image, const Image &hough, const Image &hough_points, Image &dst_image)
void	**im::Process::CrossCorrelation** (const Image &src_image1, const Image &src_image2, Image &dst_image)
void	**im::Process::AutoCorrelation** (const Image &src_image, Image &dst_image)
void	**im::Process::DistanceTransform** (const Image &src_image, Image &dst_image)
void	**im::Process::RegionalMaximum** (const Image &src_image, Image &dst_image)
void	**im::Process::FFT** (const Image &src_image, Image &dst_image)
void	**im::Process::IFFT** (const Image &src_image, Image &dst_image)
int	**im::Process::UnaryPointOp** (const Image &src_image, Image &dst_image, imUnaryPointOpFunc func, double *params, void *userdata, const char *op_name)
int	**im::Process::UnaryPointColorOp** (const Image &src_image, Image &dst_image, imUnaryPointColorOpFunc func, double *params, void *userdata, const char *op_name)
int	**im::Process::MultiPointOp** (const Image *src_image_list, int src_image_count, Image &dst_image, imMultiPointOpFunc func, double *params, void *userdata, const char *op_name)
int	**im::Process::MultiPointColorOp** (const Image *src_image_list, int src_image_count, Image &dst_image, imMultiPointColorOpFunc func, double *params, void *userdata, const char *op_name)
void	**im::Process::UnArithmeticOp** (const Image &src_image, Image &dst_image, int op)
void	**im::Process::ArithmeticOp** (const Image &src_image1, const Image &src_image2, Image &dst_image, int op)
void	**im::Process::ArithmeticConstOp** (const Image &src_image, double src_const, Image &dst_image, int op)
void	**im::Process::BlendConst** (const Image &src_image1, const Image &src_image2, Image &dst_image, double alpha)
void	**im::Process::Blend** (const Image &src_image1, const Image &src_image2, const Image &alpha_image, Image &dst_image)
void	**im::Process::Compose** (const Image &src_image1, const Image &src_image2, Image &dst_image)
void	**im::Process::SplitComplex** (const Image &src_image, Image &dst_image1, Image &dst_image2, int polar)
void	**im::Process::MergeComplex** (const Image &src_image1, const Image &src_image2, Image &dst_image, int polar)
void	**im::Process::MultipleMean** (const Image *src_image_list, int src_image_count, Image &dst_image)
void	**im::Process::MultipleStdDev** (const Image *src_image_list, int src_image_count, const Image &mean_image, Image &dst_image)

int	**im::Process::MultipleMedian** (const Image *src_image_list, int src_image_count, Image &dst_image)
int	**im::Process::AutoCovariance** (const Image &src_image, const Image &mean_image, Image &dst_image)
void	**im::Process::MultiplyConj** (const Image &src_image1, const Image &src_image2, Image &dst_image)
void	**im::Process::BackSub** (const Image &src_image1, const Image &src_image2, Image &dst_image, double tol, int diff)
void	**im::Process::QuantizeRGBUniform** (const Image &src_image, Image &dst_image, int do_dither)
void	**im::Process::QuantizeRGBMedianCut** (const Image &src_image, Image &dst_image)
void	**im::Process::QuantizeGrayUniform** (const Image &src_image, Image &dst_image, int grays)
void	**im::Process::QuantizeGrayMedianCut** (const Image &src_image, Image &dst_image, int grays)
void	**im::Process::ExpandHistogram** (const Image &src_image, Image &dst_image, double percent)
void	**im::Process::EqualizeHistogram** (const Image &src_image, Image &dst_image)
void	**im::Process::SplitYChroma** (const Image &src_image, Image &y_image, Image &chroma_image)
void	**im::Process::SplitHSI** (const Image &src_image, Image &h_image, Image &s_image, Image &i_image)
void	**im::Process::MergeHSI** (const Image &h_image, const Image &s_image, const Image &i_image, Image &dst_image)
void	**im::Process::SplitComponents** (const Image &src_image, Image *dst_image_list)
void	**im::Process::MergeComponents** (const Image *src_image_list, Image &dst_image)
void	**im::Process::NormalizeComponents** (const Image &src_image, Image &dst_image)
void	**im::Process::PseudoColor** (const Image &src_image, Image &dst_image)
void	**im::Process::FixBGR** (const Image &src_image, Image &dst_image)
void	**im::Process::SelectHue** (const Image &src_image, Image &dst_image, double hue_start, double hue_end)
void	**im::Process::SelectHSI** (const Image &src_image, Image &dst_image, double hue_start, double hue_end, double sat_start, double sat_end, double int_start, double int_end)
void	**im::Process::ReplaceColor** (const Image &src_image, Image &dst_image, double *src_color, double *dst_color)
void	**im::Process::SetAlphaColor** (const Image &src_image, Image &dst_image, double *src_color, double dst_alpha)
void	**im::Process::BitwiseOp** (const Image &src_image1, const Image &src_image2, Image &dst_image, int op)
void	**im::Process::BitwiseNot** (const Image &src_image, Image &dst_image)
void	**im::Process::BitMask** (const Image &src_image, Image &dst_image, unsigned char mask, int op)
void	**im::Process::BitPlane** (const Image &src_image, Image &dst_image, int plane, int do_reset)
int	**im::Process::RenderAddSpeckleNoise** (const Image &src_image, Image &dst_image, double percent)
int	**im::Process::RenderAddGaussianNoise** (const Image &src_image, Image &dst_image, double mean, double stddev)
int	**im::Process::RenderAddUniformNoise** (const Image &src_image, Image &dst_image, double mean, double stddev)
void	**im::Process::ToneGamut** (const Image &src_image, Image &dst_image, int op, double *params)
void	**im::Process::UnNormalize** (const Image &src_image, Image &dst_image)
void	**im::Process::DirectConv** (const Image &src_image, Image &dst_image)
void	**im::Process::Negative** (const Image &src_image, Image &dst_image)
double	**im::Process::CalcAutoGamma** (const Image &image)
void	**im::Process::ShiftHSI** (const Image &src_image, Image &dst_image, double h_shift, double s_shift, double i_shift)
void	**im::Process::ShiftComponent** (const Image &src_image, Image &dst_image, double h_shift, double s_shift, double i_shift)
void	**im::Process::Threshold** (const Image &src_image, Image &dst_image, double level, int value)
void	**im::Process::ThresholdByDiff** (const Image &src_image1, const Image &src_image2, Image &dst_image)
void	**im::Process::HysteresisThreshold** (const Image &src_image, Image &dst_image, int low_thres, int high_thres)
void	**im::Process::HysteresisThresEstimate** (const Image &image, int &low_level, int &high_level)
int	**im::Process::UniformErrThreshold** (const Image &src_image, Image &dst_image)
void	**im::Process::DiffusionErrThreshold** (const Image &src_image, Image &dst_image, int level)
int	**im::Process::PercentThreshold** (const Image &src_image, Image &dst_image, double percent)
int	**im::Process::OtsuThreshold** (const Image &src_image, Image &dst_image)
double	**im::Process::MinMaxThreshold** (const Image &src_image, Image &dst_image)
void	**im::Process::LocalMaxThresEstimate** (const Image &image, int &level)
void	**im::Process::SliceThreshold** (const Image &src_image, Image &dst_image, double start_level, double end_level)
void	**im::Process::ThresholdColor** (const Image &src_image, Image &dst_image, double *src_color, double tol)
void	**im::Process::ThresholdSaturation** (const Image &src_image, Image &dst_image, double S_min)
void	**im::Process::Pixelate** (const Image &src_image, Image &dst_image, int box_size)
void	**im::Process::Posterize** (const Image &src_image, Image &dst_image, int level)
void	**im::Process::BinaryMask** (const Image &src_image, Image &dst_image, Image &mask_image)
void	**im::Process::NormDiffRatio** (const Image &image1, const Image &image2, Image &dst_image)
void	**im::Process::AbnormalHyperionCorrection** (const Image &src_image, Image &dst_image, int threshold_consecutive, int threshold_percent, Image &image_abnormal)
int	**im::Process::ConvertDataType** (const Image &src_image, Image &dst_image, int cpx2real, double gamma, int absolute, int cast_mode)
int	**im::Process::ConvertColorSpace** (const Image &src_image, Image &dst_image)
int	**im::Process::ConvertToBitmap** (const Image &src_image, Image &dst_image, int cpx2real, double gamma, int absolute, int cast_mode)
int	**im::Process::Reduce** (const Image &src_image, Image &dst_image, int order)
int	**im::Process::Resize** (const Image &src_image, Image &dst_image, int order)
int	**im::Process::ReduceBy4** (const Image &src_image, Image &dst_image)
int	**im::Process::Crop** (const Image &src_image, Image &dst_image, int xmin, int ymin)
int	**im::Process::Insert** (const Image &src_image, const Image &region_image, Image &dst_image, int xmin, int ymin)
int	**im::Process::AddMargins** (const Image &src_image, Image &dst_image, int xmin, int ymin)
int	**im::Process::Rotate** (const Image &src_image, Image &dst_image, double cos0, double sin0, int order)
int	**im::Process::RotateRef** (const Image &src_image, Image &dst_image, double cos0, double sin0, int x, int y, int to_origin, int order)
int	**im::Process::Rotate90** (const Image &src_image, Image &dst_image, int dir_clockwise)
int	**im::Process::Rotate180** (const Image &src_image, Image &dst_image)

int	**im::Process::Mirror** (const Image &src_image, Image &dst_image)
int	**im::Process::Flip** (const Image &src_image, Image &dst_image)
int	**im::Process::Radial** (const Image &src_image, Image &dst_image, double k1, int order)
int	**im::Process::LensDistort** (const Image &src_image, Image &dst_image, double a, double b, double c, int order)
int	**im::Process::Swirl** (const Image &src_image, Image &dst_image, double k1, int order)
int	**im::Process::InterlaceSplit** (const Image &src_image, Image &dst_image1, Image &dst_image2)
int	**im::Process::GrayMorphConvolve** (const Image &src_image, Image &dst_image, const Image &kernel, int ismax)
int	**im::Process::GrayMorphErode** (const Image &src_image, Image &dst_image, int kernel_size)
int	**im::Process::GrayMorphDilate** (const Image &src_image, Image &dst_image, int kernel_size)
int	**im::Process::GrayMorphOpen** (const Image &src_image, Image &dst_image, int kernel_size)
int	**im::Process::GrayMorphClose** (const Image &src_image, Image &dst_image, int kernel_size)
int	**im::Process::GrayMorphTopHat** (const Image &src_image, Image &dst_image, int kernel_size)
int	**im::Process::GrayMorphWell** (const Image &src_image, Image &dst_image, int kernel_size)
int	**im::Process::GrayMorphGradient** (const Image &src_image, Image &dst_image, int kernel_size)
int	**im::Process::BinMorphConvolve** (const Image &src_image, Image &dst_image, const Image &kernel, int hit_white, int iter)
int	**im::Process::BinMorphErode** (const Image &src_image, Image &dst_image, int kernel_size, int iter)
int	**im::Process::BinMorphDilate** (const Image &src_image, Image &dst_image, int kernel_size, int iter)
int	**im::Process::BinMorphOpen** (const Image &src_image, Image &dst_image, int kernel_size, int iter)
int	**im::Process::BinMorphClose** (const Image &src_image, Image &dst_image, int kernel_size, int iter)
int	**im::Process::BinMorphOutline** (const Image &src_image, Image &dst_image, int kernel_size, int iter)
int	**im::Process::BinThinNhMaps** (const Image &src_image, Image &dst_image)
int	**im::Process::BinThinZhangSuen** (const Image &src_image, Image &dst_image)
int	**im::Process::MedianConvolve** (const Image &src_image, Image &dst_image, int kernel_size)
int	**im::Process::RangeConvolve** (const Image &src_image, Image &dst_image, int kernel_size)
int	**im::Process::RankClosestConvolve** (const Image &src_image, Image &dst_image, int kernel_size)
int	**im::Process::RankMaxConvolve** (const Image &src_image, Image &dst_image, int kernel_size)
int	**im::Process::RankMinConvolve** (const Image &src_image, Image &dst_image, int kernel_size)
int	**im::Process::RangeContrastThreshold** (const Image &src_image, Image &dst_image, int kernel_size, int min_range)
int	**im::Process::LocalMaxThreshold** (const Image &src_image, Image &dst_image, int kernel_size, int min_level)
int	**im::Process::Convolve** (const Image &src_image, Image &dst_image, const Image &kernel)
int	**im::Process::ConvolveSep** (const Image &src_image, Image &dst_image, const Image &kernel)
int	**im::Process::ConvolveDual** (const Image &src_image, Image &dst_image, const Image &kernel1, const Image &kernel2)
int	**im::Process::ConvolveRep** (const Image &src_image, Image &dst_image, const Image &kernel, int rep_count)
int	**im::Process::CompassConvolve** (const Image &src_image, Image &dst_image, Image &kernel)
int	**im::Process::DiffOfGaussianConvolve** (const Image &src_image, Image &dst_image, double stddev1, double stddev2)
int	**im::Process::LapOfGaussianConvolve** (const Image &src_image, Image &dst_image, double stddev)
int	**im::Process::MeanConvolve** (const Image &src_image, Image &dst_image, int kernel_size)
int	**im::Process::GaussianConvolve** (const Image &src_image, Image &dst_image, double stddev)
int	**im::Process::BarlettConvolve** (const Image &src_image, Image &dst_image, int kernel_size)
int	**im::Process::SobelConvolve** (const Image &src_image, Image &dst_image)
int	**im::Process::PrewittConvolve** (const Image &src_image, Image &dst_image)
int	**im::Process::SplineEdgeConvolve** (const Image &src_image, Image &dst_image)
int	**im::Process::ZeroCrossing** (const Image &src_image, Image &dst_image)
int	**im::Process::Canny** (const Image &src_image, Image &dst_image, double stddev)
int	**im::Process::Unsharp** (const Image &src_image, Image &dst_image, double stddev, double amount, double threshold)
int	**im::Process::Sharp** (const Image &src_image, Image &dst_image, double amount, double threshold)
int	**im::Process::SharpKernel** (const Image &src_image, const Image &kernel, Image &dst_image, double amount, double threshold)
int	**im::Process::PerimeterLine** (const Image &src_image, Image &dst_image)
int	**im::Process::RemoveByArea** (const Image &src_image, Image &dst_image, int connect, int start_size, int end_size, int inside)
int	**im::Process::FillHoles** (const Image &src_image, Image &dst_image, int connect)
void	**im::Process::RotateKernel** (Image &kernel)
void	**im::Process::FFTraw** (Image &image, int inverse, int center, int normalize)
void	**im::Process::SwapQuadrants** (Image &image, int center2origin)
int	**im::Process::RenderOp** (Image &image, imRenderFunc render_func, const char *render_name, double *params, int plus)
int	**im::Process::RenderCondOp** (Image &image, imRenderCondFunc render_cond_func, const char *render_name, double *params)
int	**im::Process::RenderOpAlpha** (Image &image, imRenderFunc render_func, const char *render_name, double *params, int plus)
int	**im::Process::RenderCondOpAlpha** (Image &image, imRenderCondFunc render_cond_func, const char *render_name, double *params)
int	**im::Process::RenderRandomNoise** (Image &image)
int	**im::Process::RenderConstant** (Image &image, double *value)
int	**im::Process::RenderWheel** (Image &image, int internal_radius, int external_radius)
int	**im::Process::RenderCone** (Image &image, int radius)
int	**im::Process::RenderTent** (Image &image, int tent_width, int tent_height)
int	**im::Process::RenderRamp** (Image &image, int start, int end, int vert_dir)
int	**im::Process::RenderBox** (Image &image, int box_width, int box_height)
int	**im::Process::RenderSinc** (Image &image, double x_period, double y_period)
int	**im::Process::RenderGaussian** (Image &image, double stddev)
int	**im::Process::RenderLapOfGaussian** (Image &image, double stddev)

int	**im::Process::RenderCosine** (Image &image, double x_period, double y_period)
int	**im::Process::RenderGrid** (Image &image, int x_space, int y_space)
int	**im::Process::RenderChessboard** (Image &image, int x_space, int y_space)
void	**im::Process::RenderFloodFill** (Image &image, int start_x, int start_y, double *replace_color, double tolerance)
int	**im::Calc::RMSError** (const Image &image1, const Image &image2, double &rmserror)
int	**im::Calc::SNR** (const Image &src_image, const Image &noise_image, double &snr)
int	**im::Calc::CountColors** (const Image &image, unsigned long &count)
int	**im::Calc::GrayHistogram** (const Image &image, im::Histogram &histogram, int cumulative)
int	**im::Calc::Histogram** (const Image &image, im::Histogram &histogram, int plane, int cumulative)
int	**im::Calc::ImageStatistics** (const Image &image, imStats &stats)
int	**im::Calc::HistogramStatistics** (const Image &image, imStats &stats)
int	**im::Calc::HistoImageStatistics** (const Image &image, int *median, int *mode)
int	**im::Calc::PercentMinMax** (const Image &image, double percent, int ignore_zero, int &min, int &max)
int	**im::Analyze::FindRegions** (const Image &image, Image &region_image, int connect, int touch_border, int &region_count)
int	**im::Analyze::MeasureArea** (const Image &region_image, MeasureTable &measure_table)
int	**im::Analyze::MeasurePerimArea** (const Image &region_image, MeasureTable &measure_table)
int	**im::Analyze::MeasureCentroid** (const Image &region_image, MeasureTable &measure_table)
int	**im::Analyze::MeasurePrincipalAxis** (const Image &region_image, MeasureTable &measure_table)
int	**im::Analyze::MeasureHoles** (const Image &region_image, int connect, MeasureTable &measure_table)
int	**im::Analyze::MeasurePerimeter** (const Image &region_image, MeasureTable &measure_table)

Detailed Description

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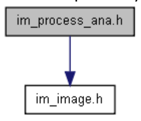
Data Structures | Typedefs | Functions

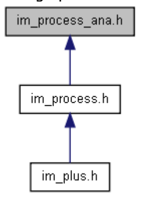
im_process_ana.h File Reference

Image Statistics and Analysis. More...

Include dependency graph for im_process_ana.h:



This graph shows which files directly or indirectly include this file:



Data Structures

struct	_imStats
	Numerical Statistics Structure. More...

Typedefs

typedef struct _imStats	imStats

Functions

int	imCalcRMSError (const imImage *image1, const imImage *image2, double *rmserror)
int	imCalcSNR (const imImage *src_image, const imImage *noise_image, double *snr)
int	imCalcCountColors (const imImage *image, unsigned long *count)
int	imCalcGrayHistogram (const imImage *image, unsigned long *histo, int cumulative)
int	imCalcHistogram (const imImage *image, unsigned long *histo, int plane, int cumulative)
void	imCalcByteHistogram (const unsigned char *data, int count, unsigned long *histo, int cumulative)
void	imCalcUShortHistogram (const unsigned short *data, int count, unsigned long *histo, int cumulative)
void	imCalcShortHistogram (const short *data, int count, unsigned long *histo, int cumulative)
unsigned long *	imHistogramNew (int data_type, int *hcount)
void	imHistogramRelease (unsigned long *histo)
int	imHistogramShift (int data_type)
int	imHistogramCount (int data_type)
int	imCalcImageStatistics (const imImage *image, imStats *stats)
int	imCalcHistogramStatistics (const imImage *image, imStats *stats)
int	imCalcHistoImageStatistics (const imImage *image, int *median, int *mode)

int	imCalcPercentMinMax (const imImage *image, double percent, int ignore_zero, int *min, int *max)
int	imAnalyzeFindRegions (const imImage *src_image, imImage *dst_image, int connect, int touch_border, int *region_count)
int	imAnalyzeMeasureArea (const imImage *image, int *area, int region_count)
int	imAnalyzeMeasurePerimArea (const imImage *image, double *perimarea, int region_count)
int	imAnalyzeMeasureCentroid (const imImage *image, const int *area, int region_count, double *cx, double *cy)
int	imAnalyzeMeasurePrincipalAxis (const imImage *image, const int *area, const double *cx, const double *cy, const int region_count, double *major_slope, double *major_length, double *minor_slope, double *minor_length)
int	imAnalyzeMeasureHoles (const imImage *image, int connect, int region_count, int *holes_count, int *holes_area, double *holes_perim)
int	imAnalyzeMeasurePerimeter (const imImage *image, double *perim, int region_count)
int	imProcessPerimeterLine (const imImage *src_image, imImage *dst_image)
int	imProcessRemoveByArea (const imImage *src_image, imImage *dst_image, int connect, int start_size, int end_size, int inside)
int	imProcessFillHoles (const imImage *src_image, imImage *dst_image, int connect)

Detailed Description

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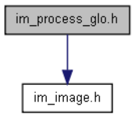
Functions

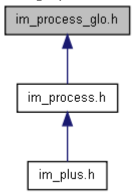
im_process_glo.h File Reference

Image Processing - Global Operations. More...

Include dependency graph for im_process_glo.h:



This graph shows which files directly or indirectly include this file:



Functions

int	imProcessHoughLines (const imImage *src_image, imImage *dst_image)
int	imProcessHoughLinesDraw (const imImage *src_image, const imImage *hough, const imImage *hough_points, imImage *dst_image)
void	imProcessCrossCorrelation (const imImage *src_image1, const imImage *src_image2, imImage *dst_image)
void	imProcessAutoCorrelation (const imImage *src_image, imImage *dst_image)
void	imProcessDistanceTransform (const imImage *src_image, imImage *dst_image)
void	imProcessRegionalMaximum (const imImage *src_image, imImage *dst_image)
void	imProcessFFT (const imImage *src_image, imImage *dst_image)
void	imProcessIFFT (const imImage *src_image, imImage *dst_image)
void	imProcessFFTraw (imImage *image, int inverse, int center, int normalize)
void	imProcessSwapQuadrants (imImage *image, int center2origin)
int	imProcessOpenMPSetMinCount (int min_count)
int	imProcessOpenMPSetNumThreads (int count)

Detailed Description

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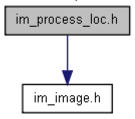
Functions

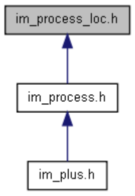
im_process_loc.h File Reference

Image Processing - Local Operations. More...

Include dependency graph for im_process_loc.h:



This graph shows which files directly or indirectly include this file:



Functions

int	imProcessReduce (const imImage *src_image, imImage *dst_image, int order)
int	imProcessResize (const imImage *src_image, imImage *dst_image, int order)
int	imProcessReduceBy4 (const imImage *src_image, imImage *dst_image)
int	imProcessCrop (const imImage *src_image, imImage *dst_image, int xmin, int ymin)
int	imProcessInsert (const imImage *src_image, const imImage *region_image, imImage *dst_image, int xmin, int ymin)
int	imProcessAddMargins (const imImage *src_image, imImage *dst_image, int xmin, int ymin)
void	imProcessCalcRotateSize (int width, int height, int *new_width, int *new_height, double cos0, double sin0)
int	imProcessRotate (const imImage *src_image, imImage *dst_image, double cos0, double sin0, int order)
int	imProcessRotateRef (const imImage *src_image, imImage *dst_image, double cos0, double sin0, int x, int y, int to_origin, int order)
int	imProcessRotate90 (const imImage *src_image, imImage *dst_image, int dir_clockwise)
int	imProcessRotate180 (const imImage *src_image, imImage *dst_image)
int	imProcessMirror (const imImage *src_image, imImage *dst_image)
int	imProcessFlip (const imImage *src_image, imImage *dst_image)
int	imProcessRadial (const imImage *src_image, imImage *dst_image, double k1, int order)
int	imProcessLensDistort (const imImage *src_image, imImage *dst_image, double a, double b, double c, int order)
int	imProcessSwirl (const imImage *src_image, imImage *dst_image, double k1, int order)
int	imProcessInterlaceSplit (const imImage *src_image, imImage *dst_image1, imImage *dst_image2)
int	imProcessGrayMorphConvolve (const imImage *src_image, imImage *dst_image, const imImage *kernel, int ismax)
int	imProcessGrayMorphErode (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessGrayMorphDilate (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessGrayMorphOpen (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessGrayMorphClose (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessGrayMorphTopHat (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessGrayMorphWell (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessGrayMorphGradient (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessBinMorphConvolve (const imImage *src_image, imImage *dst_image, const imImage *kernel, int hit_white, int iter)
int	imProcessBinMorphErode (const imImage *src_image, imImage *dst_image, int kernel_size, int iter)
int	imProcessBinMorphDilate (const imImage *src_image, imImage *dst_image, int kernel_size, int iter)
int	imProcessBinMorphOpen (const imImage *src_image, imImage *dst_image, int kernel_size, int iter)
int	imProcessBinMorphClose (const imImage *src_image, imImage *dst_image, int kernel_size, int iter)
int	imProcessBinMorphOutline (const imImage *src_image, imImage *dst_image, int kernel_size, int iter)
int	imProcessBinThinZhangSuen (imImage *src_image, imImage *dst_image)
int	imProcessBinThinNhMaps (const imImage *src_image, imImage *dst_image)
int	imProcessMedianConvolve (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessRangeConvolve (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessRankClosestConvolve (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessRankMaxConvolve (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessRankMinConvolve (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessRangeContrastThreshold (const imImage *src_image, imImage *dst_image, int kernel_size, int min_range)
int	imProcessLocalMaxThreshold (const imImage *src_image, imImage *dst_image, int kernel_size, int min_level)
int	imProcessConvolve (const imImage *src_image, imImage *dst_image, const imImage *kernel)
int	imProcessConvolveSep (const imImage *src_image, imImage *dst_image, const imImage *kernel)
int	imProcessConvolveDual (const imImage *src_image, imImage *dst_image, const imImage *kernel1, const imImage *kernel2)
int	imProcessConvolveRep (const imImage *src_image, imImage *dst_image, const imImage *kernel, int count)
int	imProcessCompassConvolve (const imImage *src_image, imImage *dst_image, imImage *kernel)
void	imProcessRotateKernel (imImage *kernel)
int	imProcessDiffOfGaussianConvolve (const imImage *src_image, imImage *dst_image, double stddev1, double stddev2)
int	imProcessLapOfGaussianConvolve (const imImage *src_image, imImage *dst_image, double stddev)
int	imProcessMeanConvolve (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessGaussianConvolve (const imImage *src_image, imImage *dst_image, double stddev)
int	imProcessBarlettConvolve (const imImage *src_image, imImage *dst_image, int kernel_size)
int	imProcessSobelConvolve (const imImage *src_image, imImage *dst_image)
int	imProcessPrewittConvolve (const imImage *src_image, imImage *dst_image)
int	imProcessSplineEdgeConvolve (const imImage *src_image, imImage *dst_image)
int	imProcessZeroCrossing (const imImage *src_image, imImage *dst_image)
int	imProcessCanny (const imImage *src_image, imImage *dst_image, double stddev)
int	imGaussianStdDev2KernelSize (double stddev)
double	imGaussianKernelSize2StdDev (int kernel_size)

int	imProcessUnsharp (const imImage *src_image, imImage *dst_image, double stddev, double amount, double threshold)
int	imProcessSharp (const imImage *src_image, imImage *dst_image, double amount, double threshold)
int	imProcessSharpKernel (const imImage *src_image, const imImage *kernel, imImage *dst_image, double amount, double threshold)

Detailed Description

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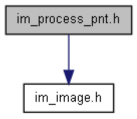
Defines | Typedefs | Enumerations | Functions

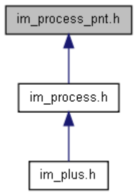
im_process_pnt.h File Reference

Image Processing - Point Operations. More...

Include dependency graph for im_process_pnt.h:



This graph shows which files directly or indirectly include this file:



Defines

#define	imImageGamma(_image, _gamma) { double params[1]; params[0] = _gamma; imProcessToneGamut(_image, _image, IM_GAMUT_POW, params); }
#define	imImageBrightnessContrast(_image, _bright_shift, _contrast_factor) { double _params[2]; _params[0] = bright_shift; _params[1] = contrast_factor; imProcessToneGamut(_image, _image, IM_GAMUT_BRIGHTCONT, _params); }
#define	imImageLevel(_image, _start, _end) { double _params[2]; _params[0] = _start; _params[1] = _end; imProcessToneGamut(_image, _image, IM_GAMUT_EXPAND, _params); }
#define	imImageEqualize(_image) imProcessEqualizeHistogram(_image, _image)
#define	imImageNegative(_image) imProcessNegative(_image, _image)
#define	imImageAutoLevel(_image, _percent) imProcessExpandHistogram(_image, _image, _percent)

Typedefs

typedef int(*	imUnaryPointOpFunc)(double src_value, double *dst_value, double *params, void *userdata, int x, int y, int d)
typedef int(*	imUnaryPointColorOpFunc)(const double *src_value, double *dst_value, double *params, void *userdata, int x, int y)
typedef int(*	imMultiPointOpFunc)(const double *src_value, double *dst_value, double *params, void *userdata, int x, int y, int d, int src_image_count)
typedef int(*	imMultiPointColorOpFunc)(double *src_value, double *dst_value, double *params, void *userdata, int x, int y, int src_image_count, int src_depth, int dst_depth)
typedef double(*	imRenderFunc)(int x, int y, int d, double *params)
typedef double(*	imRenderCondFunc)(int x, int y, int d, int *cond, double *params)

Enumerations

enum	imUnaryOp { IM_UN_EQL, IM_UN_ABS, IM_UN_LESS, IM_UN_INV, IM_UN_SQR, IM_UN_SQRT, IM_UN_LOG, IM_UN_EXP, IM_UN_SIN, IM_UN_COS, IM_UN_CONJ, IM_UN_CPXNORM, IM_UN_POSITIVES, IM_UN_NEGATIVES }
enum	imBinaryOp { IM_BIN_ADD, IM_BIN_SUB, IM_BIN_MUL, IM_BIN_DIV, IM_BIN_DIFF, IM_BIN_POW, IM_BIN_MIN, IM_BIN_MAX }
enum	imLogicOp { IM_BIT_AND, IM_BIT_OR, IM_BIT_XOR }
enum	imToneGamut { IM_GAMUT_NORMALIZE, IM_GAMUT_POW, IM_GAMUT_LOG, IM_GAMUT_EXP, IM_GAMUT_INVERT, IM_GAMUT_ZEROSTART, IM_GAMUT_SOLARIZE, IM_GAMUT_SLICE, IM_GAMUT_EXPAND, IM_GAMUT_CROP, IM_GAMUT_BRIGHTCONT }
enum	imToneGamutFlags { IM_GAMUT_MINMAX = 0x0100 }

Functions

int	imProcessUnaryPointOp (const imImage *src_image, imImage *dst_image, imUnaryPointOpFunc func, double *params, void *userdata, const char *op_name)
int	imProcessUnaryPointColorOp (const imImage *src_image, imImage *dst_image, imUnaryPointColorOpFunc func, double *params, void *userdata, const char *op_name)
int	imProcessMultiPointOp (const imImage **src_image_list, int src_image_count, imImage *dst_image, imMultiPointOpFunc func, double *params, void *userdata, const char *op_name)
int	imProcessMultiPointColorOp (const imImage **src_image_list, int src_image_count, imImage *dst_image, imMultiPointColorOpFunc func, double *params, void *userdata, const char *op_name)

void	imProcessUnArithmeticOp (const imImage *src_image, imImage *dst_image, int op)
void	imProcessArithmeticOp (const imImage *src_image1, const imImage *src_image2, imImage *dst_image, int op)
void	imProcessArithmeticConstOp (const imImage *src_image, double src_const, imImage *dst_image, int op)
void	imProcessBlendConst (const imImage *src_image1, const imImage *src_image2, imImage *dst_image, double alpha)
void	imProcessBlend (const imImage *src_image1, const imImage *src_image2, const imImage *alpha_image, imImage *dst_image)
void	imProcessCompose (const imImage *src_image1, const imImage *src_image2, imImage *dst_image)
void	imProcessSplitComplex (const imImage *src_image, imImage *dst_image1, imImage *dst_image2, int polar)
void	imProcessMergeComplex (const imImage *src_image1, const imImage *src_image2, imImage *dst_image, int polar)
void	imProcessMultipleMean (const imImage **src_image_list, int src_image_count, imImage *dst_image)
void	imProcessMultipleStdDev (const imImage **src_image_list, int src_image_count, const imImage *mean_image, imImage *dst_image)
int	imProcessMultipleMedian (const imImage **src_image_list, int src_image_count, imImage *dst_image)
int	imProcessAutoCovariance (const imImage *src_image, const imImage *mean_image, imImage *dst_image)
void	imProcessMultiplyConj (const imImage *src_image1, const imImage *src_image2, imImage *dst_image)
void	imProcessBackSub (const imImage *src_image1, imImage *src_image2, imImage *dst_image, double tol, int show_diff)
void	imProcessQuantizeRGBUniform (const imImage *src_image, imImage *dst_image, int do_dither)
void	imProcessQuantizeRGBMedianCut (const imImage *image, imImage *NewImage)
void	imProcessQuantizeGrayUniform (const imImage *src_image, imImage *dst_image, int grays)
void	imProcessQuantizeGrayMedianCut (imImage *src_image, imImage *dst_image, int grays)
void	imProcessExpandHistogram (const imImage *src_image, imImage *dst_image, double percent)
void	imProcessEqualizeHistogram (const imImage *src_image, imImage *dst_image)
void	imProcessSplitYChroma (const imImage *src_image, imImage *y_image, imImage *chroma_image)
void	imProcessSplitHSI (const imImage *src_image, imImage *h_image, imImage *s_image, imImage *i_image)
void	imProcessMergeHSI (const imImage *h_image, const imImage *s_image, const imImage *i_image, imImage *dst_image)
void	imProcessSplitComponents (const imImage *src_image, imImage **dst_image_list)
void	imProcessMergeComponents (const imImage **src_image_list, imImage *dst_image)
void	imProcessNormalizeComponents (const imImage *src_image, imImage *dst_image)
void	imProcessReplaceColor (const imImage *src_image, imImage *dst_image, double *src_color, double *dst_color)
void	imProcessSetAlphaColor (const imImage *src_image, imImage *dst_image, double *src_color, double dst_alpha)
void	imProcessPseudoColor (const imImage *src_image, imImage *dst_image)
void	imProcessFixBGR (const imImage *src_image, imImage *dst_image)
void	imProcessSelectHue (const imImage *src_image, imImage *dst_image, double hue_start, double hue_end)
void	imProcessSelectHSI (const imImage *src_image, imImage *dst_image, double hue_start, double hue_end, double sat_start, double sat_end, double int_start, double int_end)
void	imProcessBitwiseOp (const imImage *src_image1, const imImage *src_image2, imImage *dst_image, int op)
void	imProcessBitwiseNot (const imImage *src_image, imImage *dst_image)
void	imProcessBitMask (const imImage *src_image, imImage *dst_image, unsigned char mask, int op)
void	imProcessBitPlane (const imImage *src_image, imImage *dst_image, int plane, int do_reset)
int	imProcessRenderOp (imImage *image, imRenderFunc func, const char *render_name, double *params, int plus)
int	imProcessRenderOpAlpha (imImage *image, imRenderFunc func, const char *render_name, double *params, int plus)
int	imProcessRenderCondOp (imImage *image, imRenderCondFunc func, const char *render_name, double *params)
int	imProcessRenderCondOpAlpha (imImage *image, imRenderCondFunc func, const char *render_name, double *params)
int	imProcessRenderAddSpeckleNoise (const imImage *src_image, imImage *dst_image, double percent)
int	imProcessRenderAddGaussianNoise (const imImage *src_image, imImage *dst_image, double mean, double stddev)
int	imProcessRenderAddUniformNoise (const imImage *src_image, imImage *dst_image, double mean, double stddev)
int	imProcessRenderRandomNoise (imImage *image)
int	imProcessRenderConstant (imImage *image, double *value)
int	imProcessRenderWheel (imImage *image, int internal_radius, int external_radius)
int	imProcessRenderCone (imImage *image, int radius)
int	imProcessRenderTent (imImage *image, int tent_width, int tent_height)
int	imProcessRenderRamp (imImage *image, int start, int end, int vert_dir)
int	imProcessRenderBox (imImage *image, int box_width, int box_height)
int	imProcessRenderSinc (imImage *image, double x_period, double y_period)
int	imProcessRenderGaussian (imImage *image, double stddev)
int	imProcessRenderLapOfGaussian (imImage *image, double stddev)
int	imProcessRenderCosine (imImage *image, double x_period, double y_period)
int	imProcessRenderGrid (imImage *image, int x_space, int y_space)
int	imProcessRenderChessboard (imImage *image, int x_space, int y_space)
void	imProcessRenderFloodFill (imImage *image, int start_x, int start_y, double *replace_color, double tolerance)
void	imProcessToneGamut (const imImage *src_image, imImage *dst_image, int op, double *params)
void	imProcessUnNormalize (const imImage *src_image, imImage *dst_image)
void	imProcessDirectConv (const imImage *src_image, imImage *dst_image)
void	imProcessNegative (const imImage *src_image, imImage *dst_image)
double	imProcessCalcAutoGamma (const imImage *image)
void	imProcessShiftHSI (const imImage *src_image, imImage *dst_image, double h_shift, double s_shift, double i_shift)
void	imProcessShiftComponent (const imImage *src_image, imImage *dst_image, double c0_shift, double c1_shift, double c2_shift)
void	imProcessThreshold (const imImage *src_image, imImage *dst_image, double level, int value)
void	imProcessThresholdByDiff (const imImage *src_image1, const imImage *src_image2, imImage *dst_image)
void	imProcessHysteresisThreshold (const imImage *src_image, imImage *dst_image, int low_thres, int high_thres)

void	imProcessHysteresisThresEstimate (const imImage *image, int *low_level, int *high_level)
int	imProcessUniformErrThreshold (const imImage *src_image, imImage *dst_image)
void	imProcessDiffusionErrThreshold (const imImage *src_image, imImage *dst_image, int level)
int	imProcessPercentThreshold (const imImage *src_image, imImage *dst_image, double percent)
int	imProcessOtsuThreshold (const imImage *src_image, imImage *dst_image)
double	imProcessMinMaxThreshold (const imImage *src_image, imImage *dst_image)
void	imProcessLocalMaxThresEstimate (const imImage *image, int *level)
void	imProcessSliceThreshold (const imImage *src_image, imImage *dst_image, double start_level, double end_level)
void	imProcessThresholdColor (const imImage *src_image, imImage *dst_image, double *src_color, double tol)
void	imProcessThresholdSaturation (imImage *src_image, imImage *dst_image, double S_min)
void	imProcessPixelate (const imImage *src_image, imImage *dst_image, int box_size)
void	imProcessPosterize (const imImage *src_image, imImage *dst_image, int level)
void	imProcessBinaryMask (const imImage *src_image, imImage *dst_image, const imImage *mask_image)
void	imProcessNormDiffRatio (const imImage *image1, const imImage *image2, imImage *dst_image)
void	imProcessAbnormalHyperionCorrection (const imImage *src_image, imImage *dst_image, int threshold_consecutive, int threshold_percent, imImage *image_abnormal)
int	imProcessConvertDataType (const imImage *src_image, imImage *dst_image, int cpx2real, double gamma, int absolute, int cast_mode)
int	imProcessConvertColorSpace (const imImage *src_image, imImage *dst_image)
int	imProcessConvertToBitmap (const imImage *src_image, imImage *dst_image, int cpx2real, double gamma, int absolute, int cast_mode)

Detailed Description

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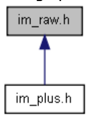
Functions

im_raw.h File Reference

RAW File Format. More...

This graph shows which files directly or indirectly include this file:



Functions

imFile *	imFileOpenRaw (const char *file_name, int *error)
imFile *	imFileNewRaw (const char *file_name, int *error)

Detailed Description

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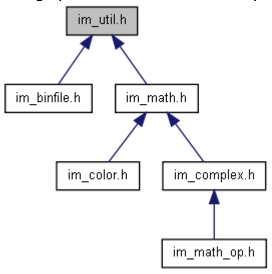
Defines | Typedefs | Enumerations | Functions

im_util.h File Reference

Utilities. More...

This graph shows which files directly or indirectly include this file:



Defines

#define	**IM_MIN**(_a, _b) (_a < _b? _a: _b)
#define	**IM_MAX**(_a, _b) (_a > _b? _a: _b)
#define	imColorModeSpace(_cm) (_cm & 0xFF)
#define	imColorModeMatch(_cm1, _cm2) (imColorModeSpace(_cm1) == imColorModeSpace(_cm2))
#define	imColorModeHasAlpha(_cm) (_cm & IM_ALPHA)
#define	imColorModeIsPacked(_cm) (_cm & IM_PACKED)
#define	imColorModeIsTopDown(_cm) (_cm & IM_TOPDOWN)
#define	IM_MAXDEPTH 5
#define	**IM_BYTECROP**(_v) (_v < 0? 0: _v > 255? 255: _v)

#define	**IM_FLOATCROP**(_v) (_v < 0? 0: _v > 1.0f? 1.0f: _v)
#define	**IM_CROPMAX**(_v, _max) (_v < 0? 0: _v > _max? _max: _v)
#define	**IM_CROPMINMAX**(_v, _min, _max) (_v < _min? _min: _v > _max? _max: _v)

Typedefs

typedef unsigned char	**imbyte**
typedef unsigned short	**imushort**

Enumerations

enum	imByteOrder { IM_LITTLEENDIAN, IM_BIGENDIAN }

Functions

int	imStrEqual (const char *str1, const char *str2)
int	imStrNLen (const char *str, int max_len)
int	imStrCheck (const void *data, int count)
int	imImageDataSize (int width, int height, int color_mode, int data_type)
int	imImageLineSize (int width, int color_mode, int data_type)
int	imImageLineCount (int width, int color_mode)
int	imImageCheckFormat (int color_mode, int data_type)
long	imColorEncode (unsigned char red, unsigned char green, unsigned char blue)
void	imColorDecode (unsigned char *red, unsigned char *green, unsigned char *blue, long color)
const char *	imColorModeSpaceName (int color_mode)
const char *	imColorModeComponentName (int color_space, int component)
int	imColorModeDepth (int color_mode)
int	imColorModeToBitmap (int color_mode)
int	imColorModeIsBitmap (int color_mode, int data_type)
int	imDataTypeSize (int data_type)
const char *	imDataTypeName (int data_type)
unsigned long	imDataTypeIntMax (int data_type)
long	imDataTypeIntMin (int data_type)
int	imBinCPUByteOrder (void)
void	imBinSwapBytes (void *data, int count, int size)
void	imBinSwapBytes2 (void *data, int count)
void	imBinSwapBytes4 (void *data, int count)
void	imBinSwapBytes8 (void *data, int count)
int	imCompressDataZ (const void *src_data, int src_size, void *dst_data, int dst_size, int zip_quality)
int	imCompressDataUnZ (const void *src_data, int src_size, void *dst_data, int dst_size)
int	imCompressDataLZF (const void *src_data, int src_size, void *dst_data, int dst_size)
int	imCompressDataUnLZF (const void *src_data, int src_size, void *dst_data, int dst_size)
int	imCompressDataLZ4 (const void *src_data, int src_size, void *dst_data, int dst_size)
int	imCompressDataUnLZ4 (const void *src_data, int src_size, void *dst_data, int dst_size)

Detailed Description

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Functions

imlua.h File Reference

IM Lua 5 Binding. More...

Functions

int	imlua_open (lua_State *L)
int	imlua_close (lua_State *L)
int	imlua_open_capture (lua_State *L)
int	imlua_open_process (lua_State *L)
int	imlua_open_fftw (lua_State *L)

Detailed Description

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Defines | Typedefs | Enumerations | Functions

im_old.h File Reference

Old API. More...

Defines

#define	**IM_ERR_READ** IM_ERR_ACCESS
#define	**IM_ERR_WRITE** IM_ERR_ACCESS
#define	**IM_ERR_TYPE** IM_ERR_DATA
#define	**IM_ERR_COMP** IM_ERR_COMPRESS
#define	**IM_INTERRUPTED** -1
#define	**IM_ALL** -1
#define	**IM_COUNTER_CB** 0
#define	**IM_RESOLUTION_CB** 1
#define	**IM_GIF_TRANSPARENT_COLOR_CB** 0
#define	**IM_TIF_IMAGE_DESCRIPTION_CB** 0

Typedefs

typedef int(*	**imCallback**)(char *filename)
typedef int(*	**imFileCounterCallback**)(char *filename, int percent, int io)
typedef int(*	**imResolutionCallback**)(char *filename, double *xres, double *yres, int *res_unit)
typedef int(*	**imGifTranspIndex**)(char *filename, unsigned char *transp_index)
typedef int(*	**imTiffImageDesc**)(char *filename, char *img_desc)

Enumerations

enum	{ **IM_BMP**, **IM_PCX**, **IM_GIF**, **IM_TIF**, **IM_RAS**, **IM_SGI**, **IM_JPG**, **IM_LED**, **IM_TGA** }
enum	{ **IM_NONE** = 0x0000, **IM_DEFAULT** = 0x0100, **IM_COMPRESSED** = 0x0200 }
enum	{ **IM_RES_NONE**, **IM_RES_DPI**, **IM_RES_DPC** }

Functions

long	**imEncodeColor** (unsigned char red, unsigned char green, unsigned char blue)
void	**imDecodeColor** (unsigned char *red, unsigned char *green, unsigned char *blue, long palette)
int	**imFileFormat** (char *filename, int *format)
int	**imImageInfo** (char *filename, int *width, int *height, int *type, int *palette_count)
int	**imLoadRGB** (char *filename, unsigned char *red, unsigned char *green, unsigned char *blue)
int	**imSaveRGB** (int width, int height, int format, unsigned char *red, unsigned char *green, unsigned char *blue, char *filename)
int	**imLoadMap** (char *filename, unsigned char *map, long *palette)
int	**imSaveMap** (int width, int height, int format, unsigned char *map, int palette_count, long *palette, char *filename)
void	**imRGB2Map** (int width, int height, unsigned char *red, unsigned char *green, unsigned char *blue, unsigned char *map, int palette_count, long *palette)
void	**imMap2RGB** (int width, int height, unsigned char *map, int palette_count, long *colors, unsigned char *red, unsigned char *green, unsigned char *blue)
void	**imRGB2Gray** (int width, int height, unsigned char *red, unsigned char *green, unsigned char *blue, unsigned char *map, long *grays)
void	**imMap2Gray** (int width, int height, unsigned char *map, int palette_count, long *colors, unsigned char *grey_map, long *grays)
void	**imResize** (int src_width, int src_height, unsigned char *src_map, int dst_width, int dst_height, unsigned char *dst_map)
void	**imStretch** (int src_width, int src_height, unsigned char *src_map, int dst_width, int dst_height, unsigned char *dst_map)
int	**imRegisterCallback** (imCallback cb, int cb_id, int format)

Detailed Description

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- All
- Functions
- Typedefs
- Enumerations
- Enumerator
- Defines

- a
- c
- d
- e
- i
- l
- m
- p
- s

Here is a list of all documented functions, variables, defines, enums, and typedefs with links to the documentation:

- a -

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- All
- Functions
- Typedefs
- Enumerations
- Enumerator
- Defines

- a
- c
- d
- e
- i
- l
- m
- p
- s

- a -

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- All
- Functions
- Typedefs
- Enumerations
- Enumerator
- Defines

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- All
- Functions
- Typedefs
- Enumerations
- Enumerator
- Defines

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- All
- Functions
- Typedefs
- Enumerations
- Enumerator
- Defines

- i

- i -

- All
- Functions
- Typedefs
- Enumerations
- Enumerator
- Defines
