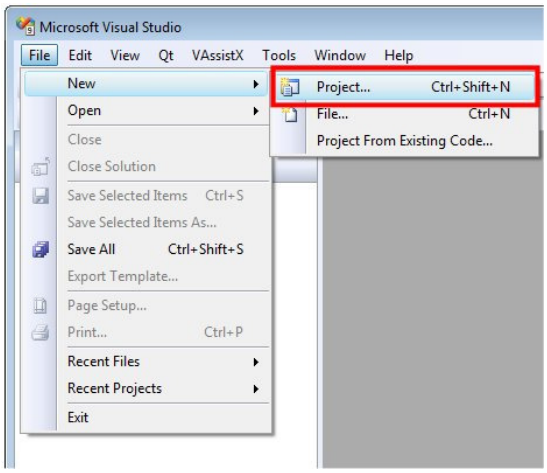
Introduction to Computer Graphics for Engineering – PUC-Rio

Tutorial for creation of a simple program for 2D drawing using Visual Studio 9 (2008), Qt, and OpenGL.

1.



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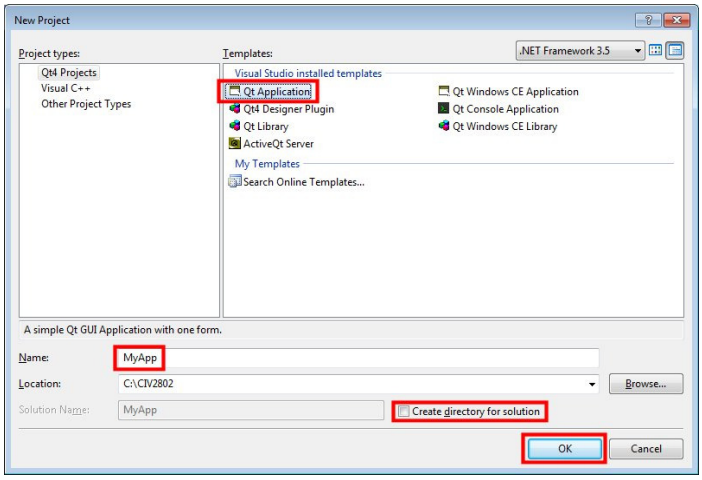

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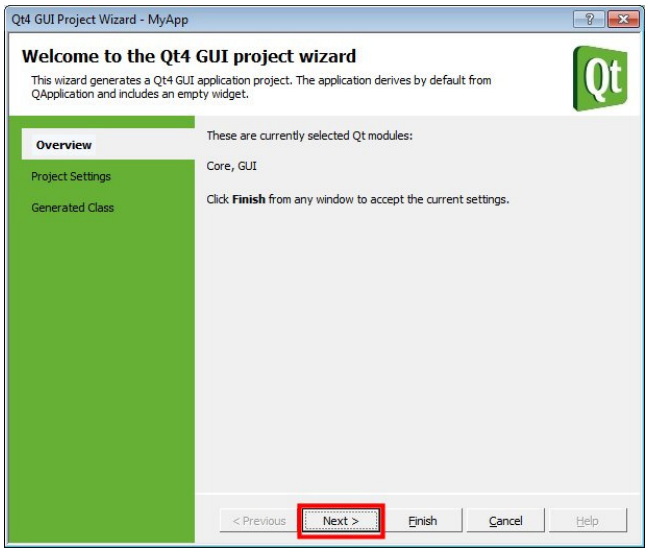

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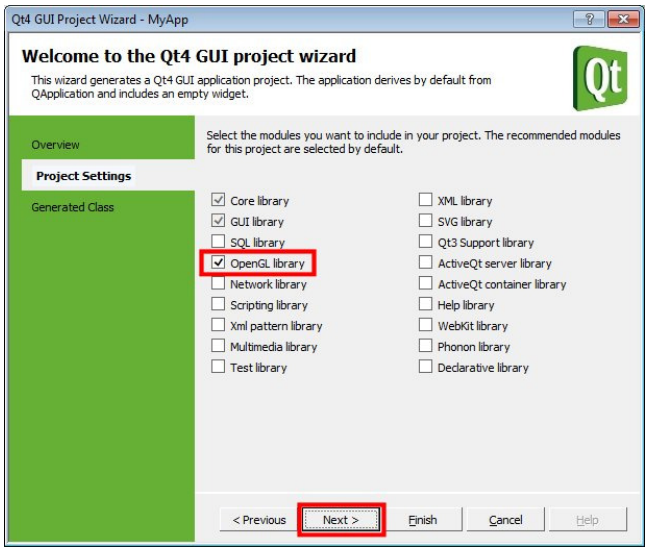

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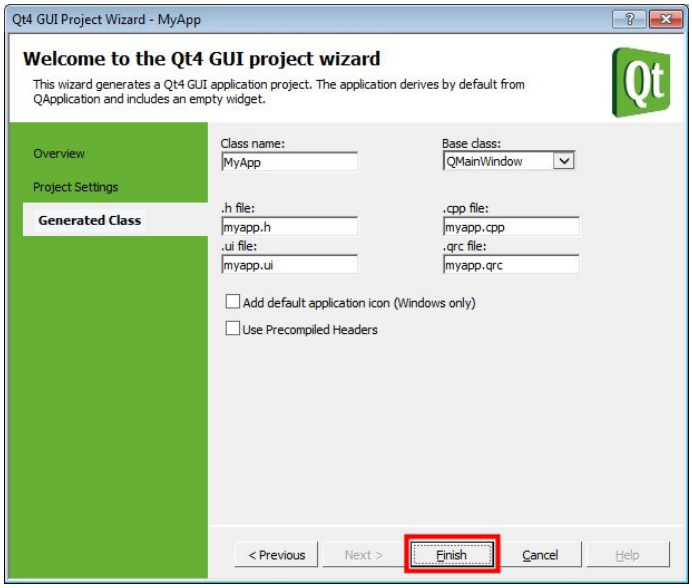

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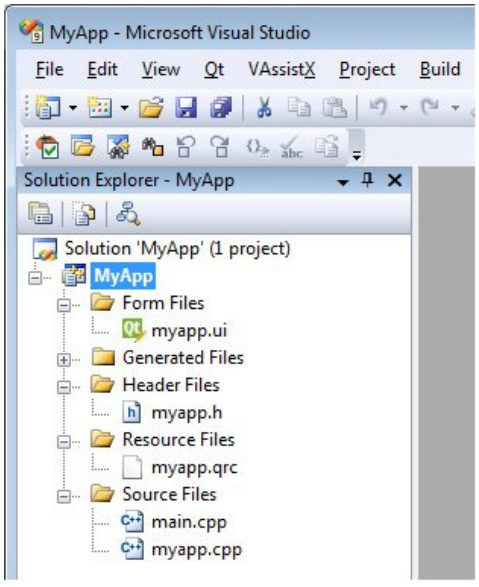

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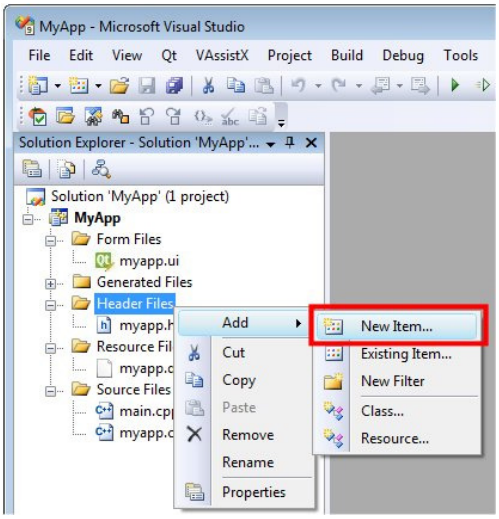

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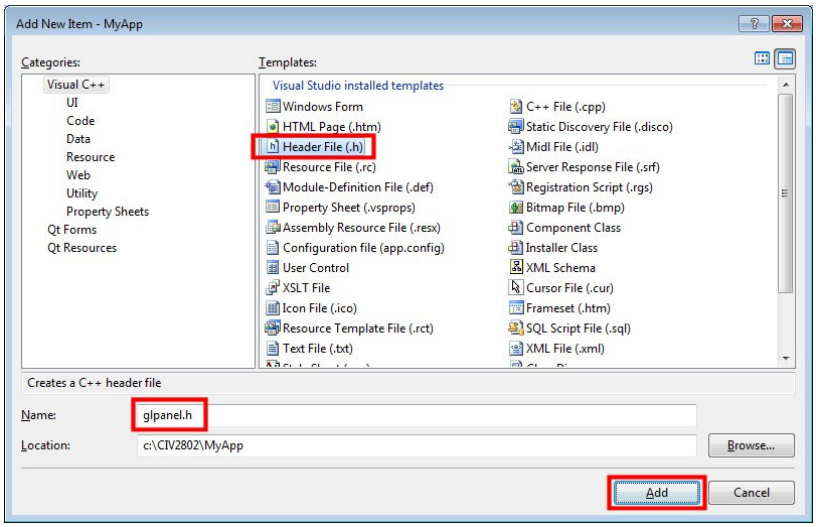

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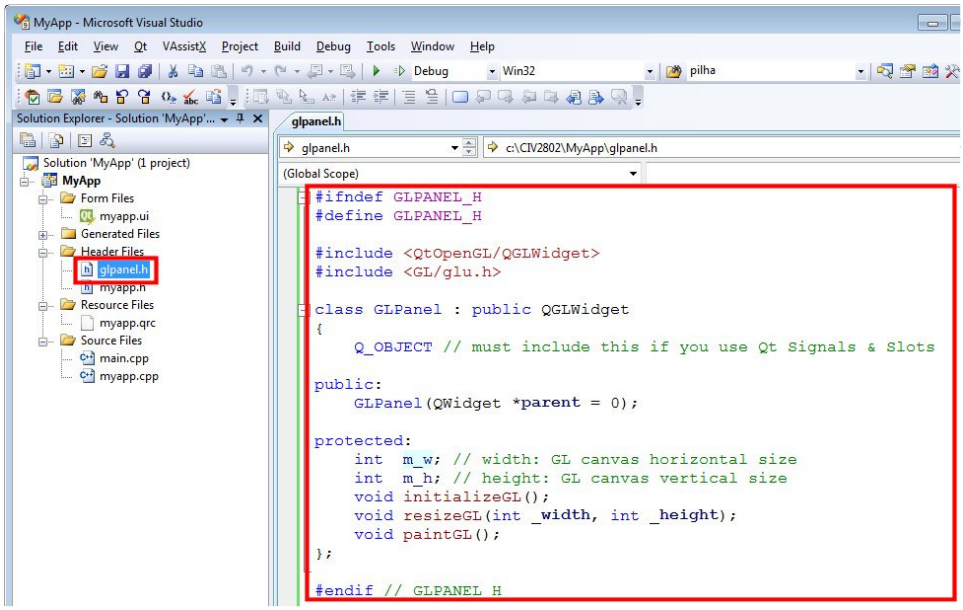
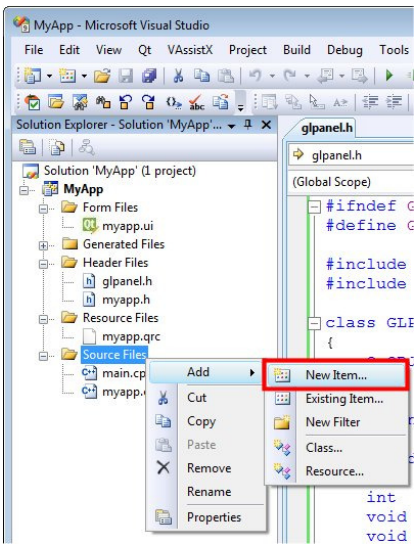


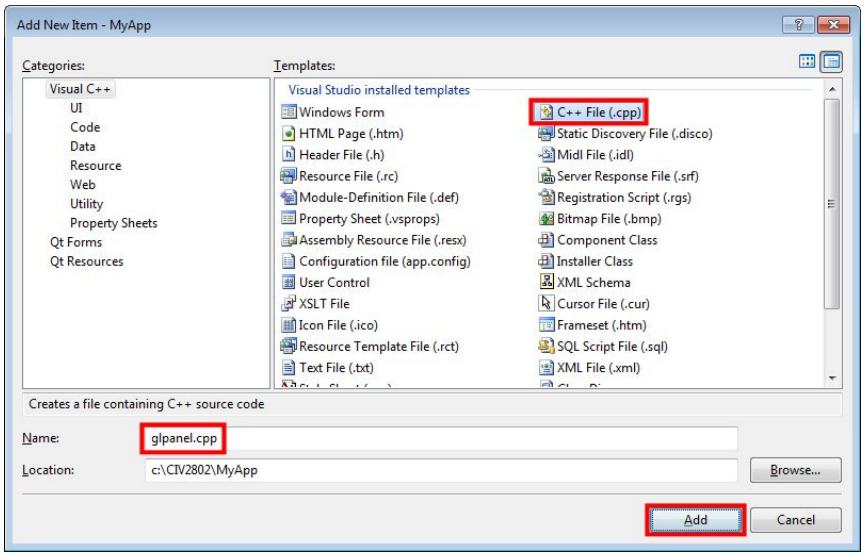
gpanel.h

```
#ifndef GLPANEL_H
#define GLPANEL_H

#include <QtOpenGL/QGLWidget>

class GLPanel : public QGLWidget
{
    Q_OBJECT // must include this if you use Qt Signals & Slots

public:
    GLPanel(QWidget *parent = 0);

protected:
    int  m_w; // width: GL canvas horizontal size
    int  m_h; // height: GL canvas vertical size
    void initializeGL();
    void resizeGL(int _width, int _height);
    void paintGL();
};

#endif // GLPANEL_H
```

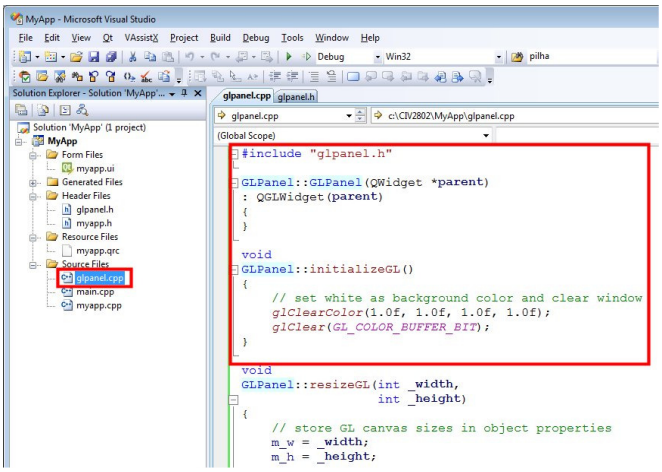
10.


MyApp - Microsoft Visual Studio
File Edit View Qt VAssistX Project Build Debug Tools
Solution Explorer - Solution 'MyApp'...
Solution 'MyApp' (1 project)
MyApp
Form Files
myapp.ui
Generated Files
Header Files
glpanel.h
myapp.h
Resource Files
myapp.qrc
Source Files
main.cp
myapp.
Add
Cut
Copy
Paste
Remove
Rename
Properties
New Item...
Existing Item...
New Filter
Class...
Resource...
glpanel.h
(Global Scope)
#ifndef G
#define G
#include
#include
class GLP
{
int
void
void

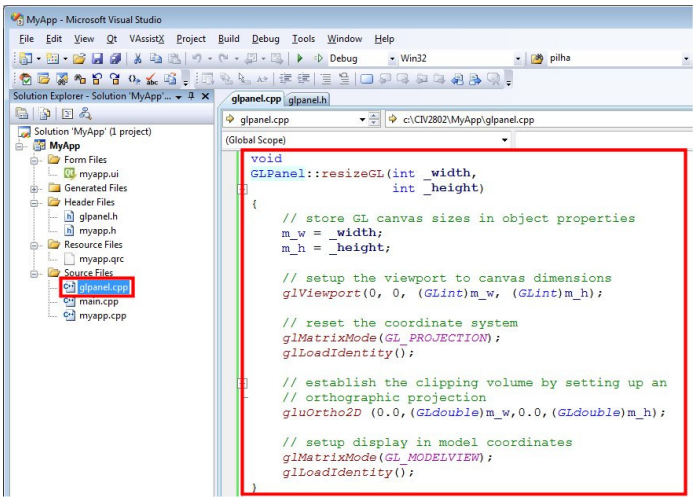
11.


Add New Item - MyApp
Categories:
Visual C++
UI
Code
Data
Resource
Web
Utility
Property Sheets
Qt Forms
Qt Resources
Templates:
Visual Studio installed templates
Windows Form
HTML Page (.htm)
Header File (.h)
Resource File (.rc)
Module-Definition File (.def)
Property Sheet (.vsprops)
Assembly Resource File (.resx)
Configuration file (app.config)
User Control
XSLT File
Icon File (.ico)
Resource Template File (.rct)
Text File (.txt)
C++ File (.cpp)
Static Discovery File (.disco)
Midl File (.idl)
Server Response File (.srf)
Registration Script (.rgs)
Bitmap File (.bmp)
Component Class
Installer Class
XML Schema
Cursor File (.cur)
Frameset (.htm)
SQL Script File (.sql)
XML File (.xml)
Creates a file containing C++ source code
Name:
glpanel.cpp
Location:
c:\CIV2802\MyApp
Browse...
Add
Cancel

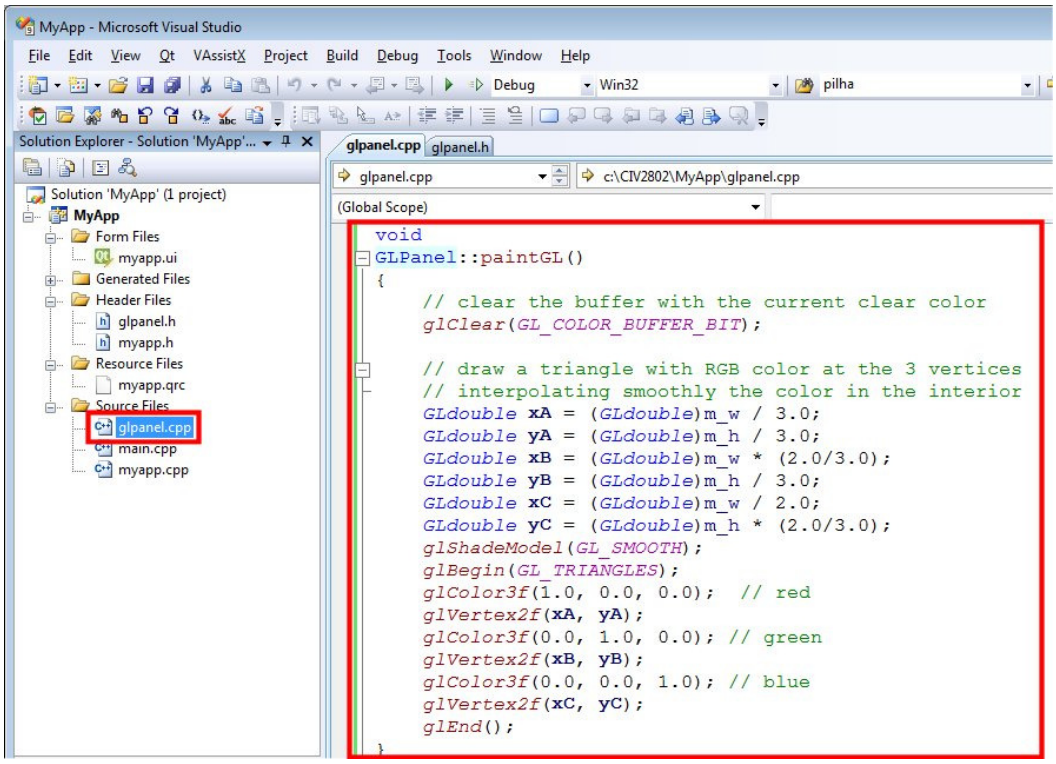
12.


MyApp - Microsoft Visual Studio
glpanel.cpp
glpanel.h
c:\CIV2802\MyApp\glpanel.cpp
(Global Scope)
#include "glpanel.h"
GLPanel::GLPanel(QWidget *parent)
: QGLWidget(parent)
{
}
void
GLPanel::initializeGL()
{
// set white as background color and clear window
glClearColor(1.0f, 1.0f, 1.0f, 1.0f);
glClear(GL_COLOR_BUFFER_BIT);
}
void
GLPanel::resizeGL(int _width,
int _height)
{
// store GL canvas sizes in object properties
m_w = _width;
m_h = _height;

13.


MyApp - Microsoft Visual Studio
glpanel.cpp
glpanel.h
c:\CIV2802\MyApp\glpanel.cpp
(Global Scope)
void
GLPanel::resizeGL(int _width,
int _height)
{
// store GL canvas sizes in object properties
m_w = _width;
m_h = _height;
// setup the viewport to canvas dimensions
glViewport(0, 0, (GLint)m_w, (GLint)m_h);
// reset the coordinate system
glMatrixMode(GL_PROJECTION);
glLoadIdentity();
// establish the clipping volume by setting up an
// orthographic projection
gluOrtho2D (0.0,(GLdouble)m_w,0.0,(GLdouble)m_h);
// setup display in model coordinates
glMatrixMode(GL_MODELVIEW);
glLoadIdentity();
}

14.


MyApp - Microsoft Visual Studio
File Edit View Qt VAssistX Project Build Debug Tools Window Help
Debug
Win32
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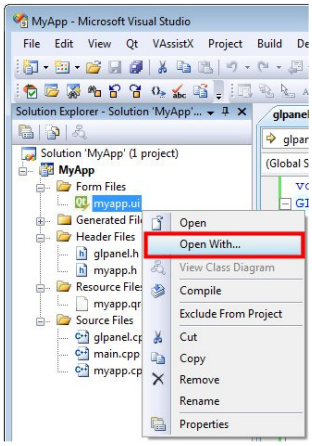
Solution Explorer - Solution 'MyApp'...
Solution 'MyApp' (1 project)
MyApp
Form Files
myapp.ui
Generated Files
Header Files
glpanel.h
myapp.h
Resource Files
myapp.qrc
Source Files
glpanel.cpp
main.cpp
myapp.cpp
glpanel.cpp
glpanel.h
c:\CIV2802\MyApp\glpanel.cpp
(Global Scope)
void
GLPanel::paintGL()
{
// clear the buffer with the current clear color
glClear(GL_COLOR_BUFFER_BIT);
// draw a triangle with RGB color at the 3 vertices
// interpolating smoothly the color in the interior
GLdouble xA = (GLdouble)m_w / 3.0;
GLdouble yA = (GLdouble)m_h / 3.0;
GLdouble xB = (GLdouble)m_w * (2.0/3.0);
GLdouble yB = (GLdouble)m_h / 3.0;
GLdouble xC = (GLdouble)m_w / 2.0;
GLdouble yC = (GLdouble)m_h * (2.0/3.0);
glShadeModel(GL_SMOOTH);
glBegin(GL_TRIANGLES);
glColor3f(1.0, 0.0, 0.0); // red
glVertex2f(xA, yA);
glColor3f(0.0, 1.0, 0.0); // green
glVertex2f(xB, yB);
glColor3f(0.0, 0.0, 1.0); // blue
glVertex2f(xC, yC);
glEnd();
}

gpanel.cpp

```
#include "glpanel.h"

GLPanel::GLPanel(QWidget *parent)
: QGLWidget(parent)
{
}

void
GLPanel::initializeGL()
{
    // set white as background color and clear window
    glClearColor(1.0f, 1.0f, 1.0f, 1.0f);
    glClear(GL_COLOR_BUFFER_BIT);
}

void
GLPanel::resizeGL(int _width,
                  int _height)
{
    // store GL canvas sizes in object properties
    m_w = _width;
    m_h = _height;

    // setup the viewport to canvas dimensions
    glViewport(0, 0, (GLint)m_w, (GLint)m_h);

    // reset the coordinate system
    glMatrixMode(GL_PROJECTION);
    glLoadIdentity();

    // establish the clipping volume by setting up an
    // orthographic projection
    glOrtho(0.0,(GLdouble)m_w,0.0,(GLdouble)m_h, -1.0, 1.0);

    // setup display in model coordinates
    glMatrixMode(GL_MODELVIEW);
    glLoadIdentity();
}

void
GLPanel::paintGL()
{
    // clear the buffer with the current clear color
    glClear(GL_COLOR_BUFFER_BIT);

    // draw a triangle with RGB color at the 3 vertices
    // interpolating smoothly the color in the interior
    GLdouble xA = (GLdouble)m_w / 3.0;
    GLdouble yA = (GLdouble)m_h / 3.0;
    GLdouble xB = (GLdouble)m_w * (2.0/3.0);
    GLdouble yB = (GLdouble)m_h / 3.0;
    GLdouble xC = (GLdouble)m_w / 2.0;
    GLdouble yC = (GLdouble)m_h * (2.0/3.0);
    glShadeModel(GL_SMOOTH);
    glBegin(GL_TRIANGLES);
    glColor3f(1.0, 0.0, 0.0);  // red
    glVertex2f(xA, yA);
    glColor3f(0.0, 1.0, 0.0); // green
    glVertex2f(xB, yB);
    glColor3f(0.0, 0.0, 1.0); // blue
    glVertex2f(xC, yC);
    glEnd();
}
```

15.



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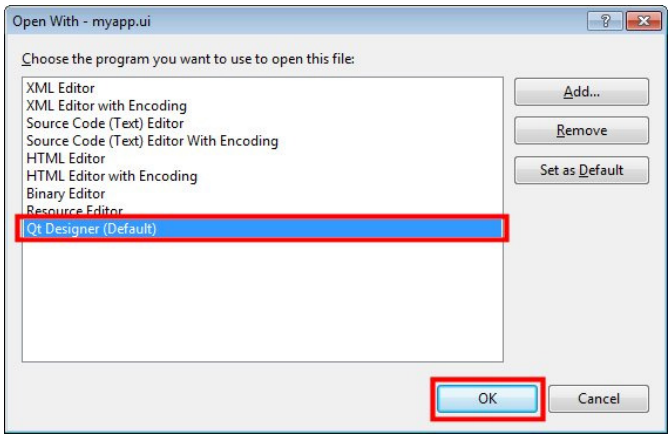

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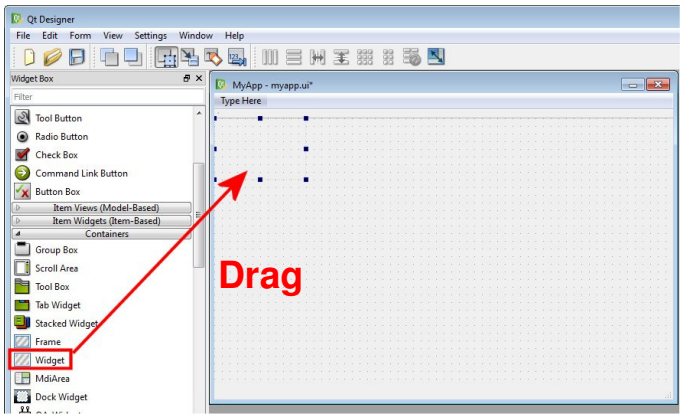

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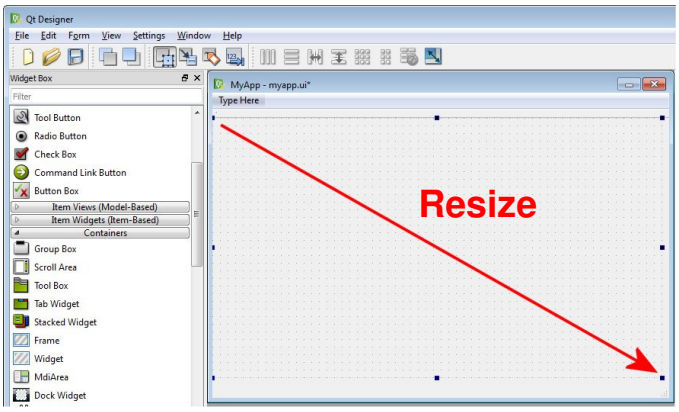

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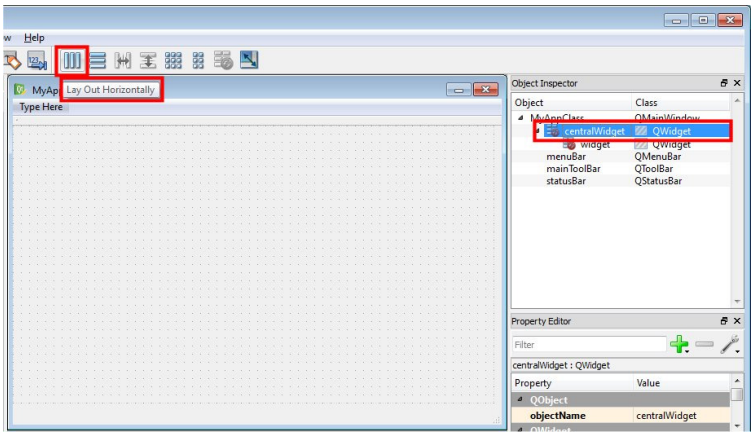

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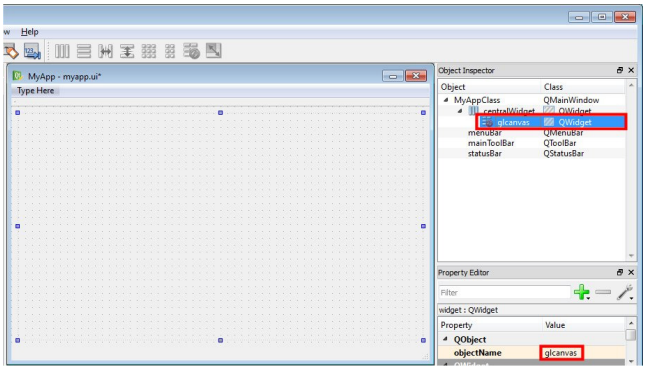

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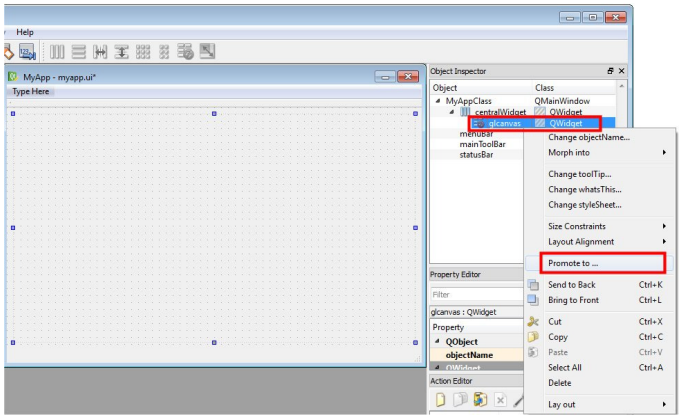

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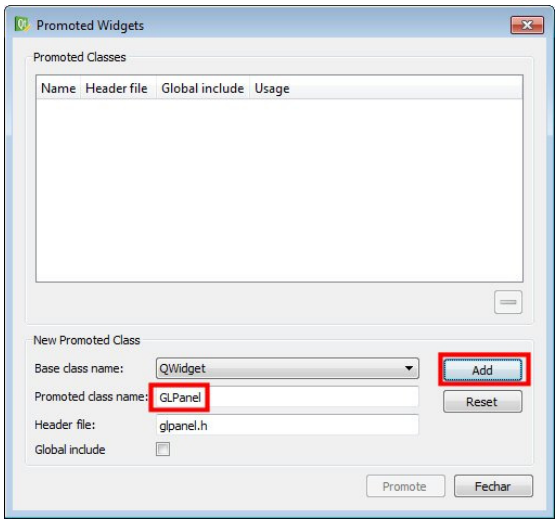
Promoted Widgets
Promoted Classes
Name
Header file
Global include
Usage
New Promoted Class
Base class name:
QWidget
Promoted class name:
GLPanel
Header file:
glpanel.h
Global include
Add
Reset
Promote
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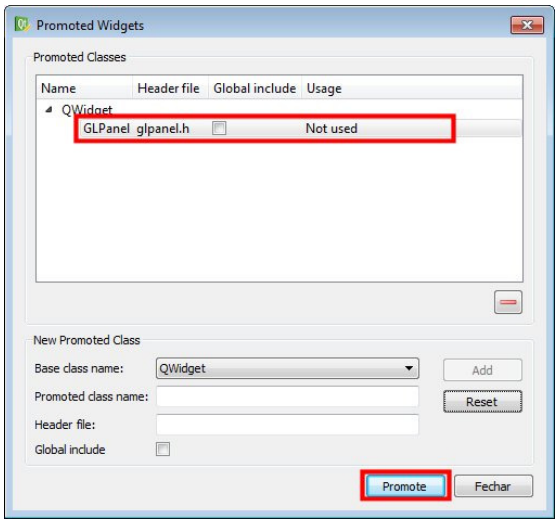
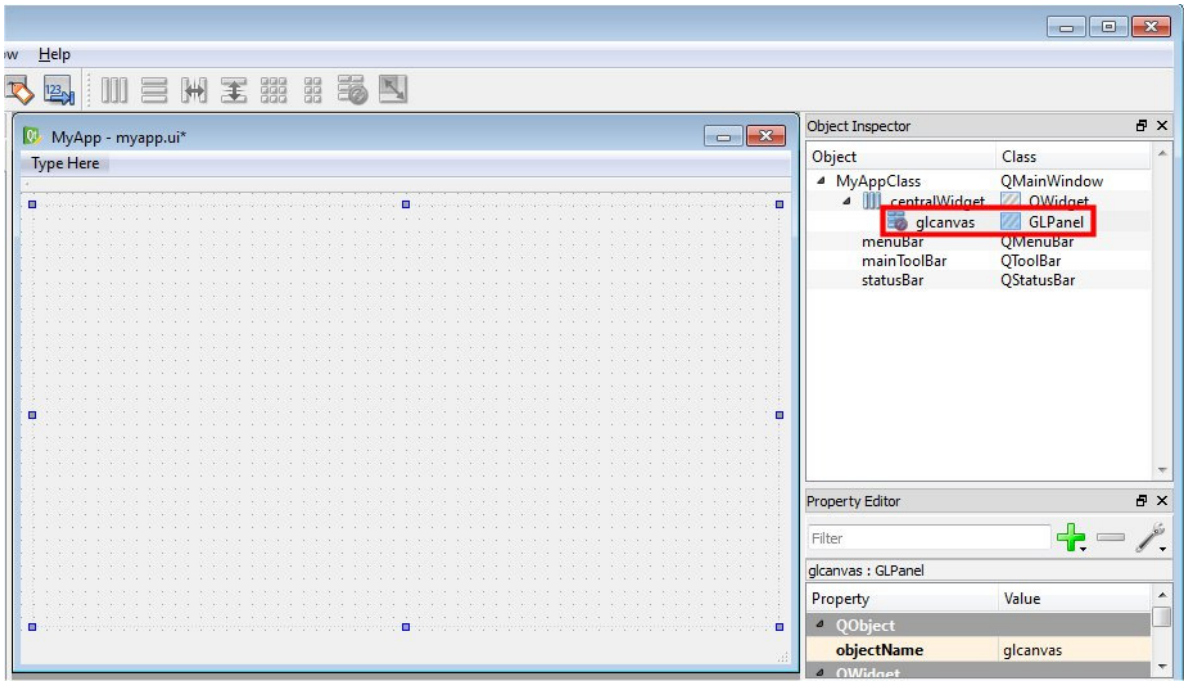
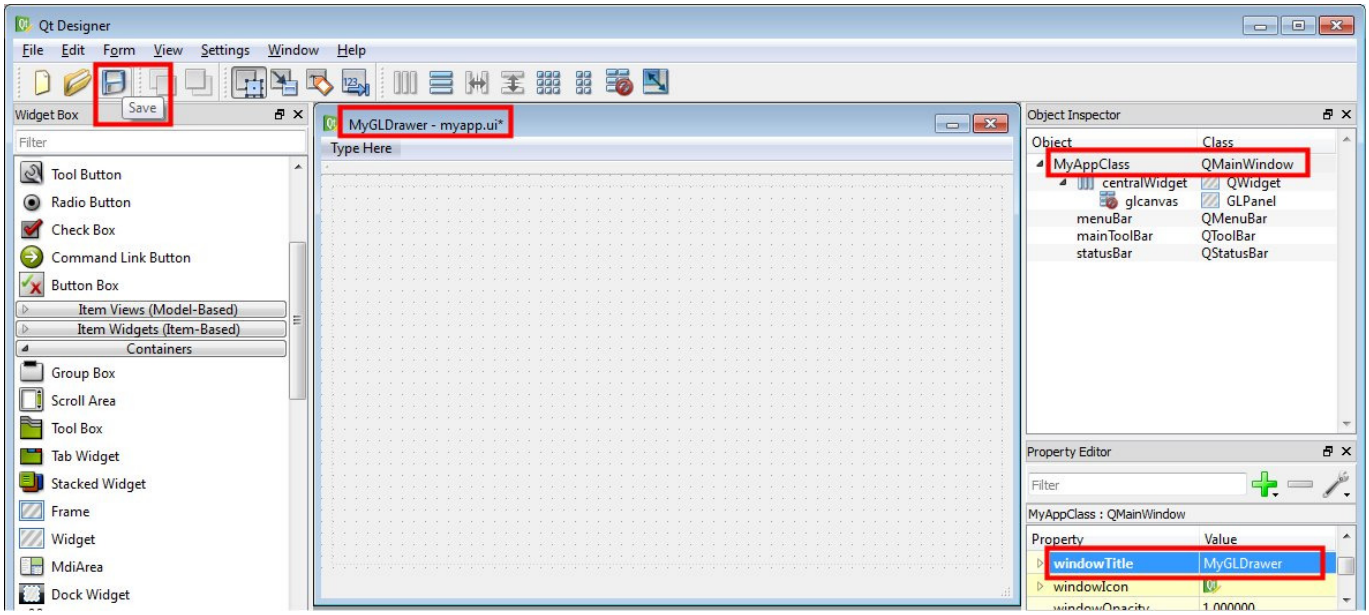
23.


Promoted Widgets
Promoted Classes
Name
Header file
Global include
Usage
QWidget
GLPanel
glpanel.h
Not used
New Promoted Class
Base class name:
QWidget
Promoted class name:
Header file:
Global include
Add
Reset
Promote
Fechar

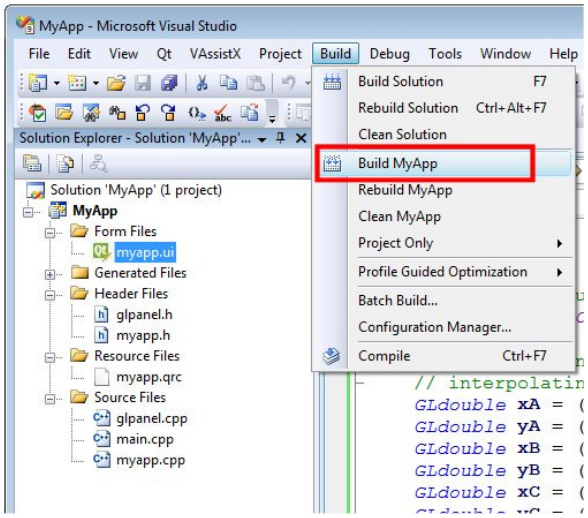
24.


Help
MyApp - myapp.ui*
Type Here
Object Inspector
Object
Class
MyAppClass
QMainWindow
centralWidget
QWidget
glcanvas
GLPanel
menuBar
QMenuBar
mainToolBar
QToolBar
statusBar
QStatusBar
Property Editor
Filter
glcanvas : GLPanel
Property
Value
QObject
objectName
glcanvas

25.


Qt Designer
File
Edit
Form
View
Settings
Window
Help
Save
Widget Box
Filter
Tool Button
Radio Button
Check Box
Command Link Button
Button Box
Item Views (Model-Based)
Item Widgets (Item-Based)
Containers
Group Box
Scroll Area
Tool Box
Tab Widget
Stacked Widget
Frame
Widget
MdiArea
Dock Widget
MyGLDrawer - myapp.ui*
Type Here
Object Inspector
Object
Class
MyAppClass
QMainWindow
centralWidget
QWidget
glcanvas
GLPanel
menuBar
QMenuBar
mainToolBar
QToolBar
statusBar
QStatusBar
Property Editor
Filter
MyAppClass : QMainWindow
Property
Value
windowTitle
MyGLDrawer
windowIcon

26.


MyApp - Microsoft Visual Studio
File Edit View Qt VAssistX Project Build Debug Tools Window Help
Build Solution F7
Rebuild Solution Ctrl+Alt+F7
Clean Solution
Build MyApp
Rebuild MyApp
Clean MyApp
Project Only
Profile Guided Optimization
Batch Build...
Configuration Manager...
Compile Ctrl+F7
Solution Explorer - Solution 'MyApp'...
Solution 'MyApp' (1 project)
MyApp
Form Files
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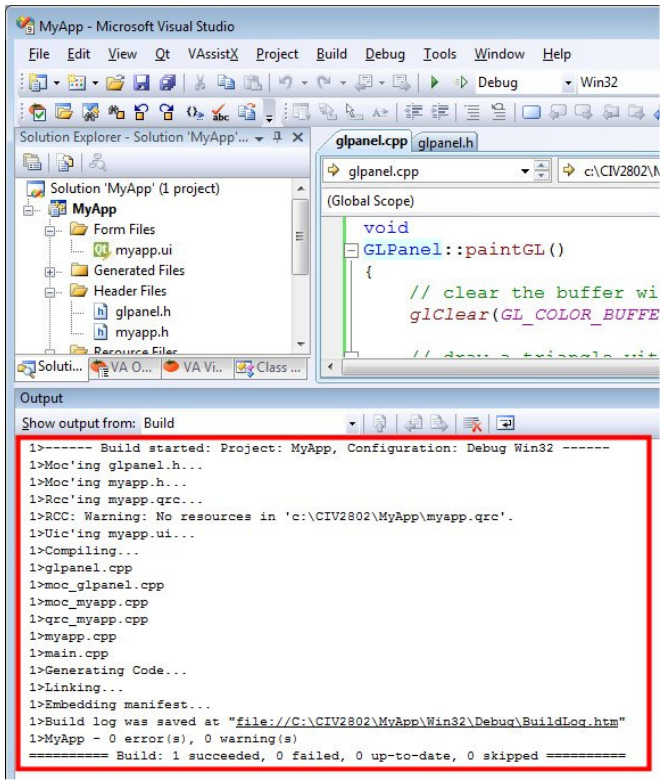
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Debug Win32
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MyApp
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glpanel.cpp glpanel.h
(Global Scope)
void
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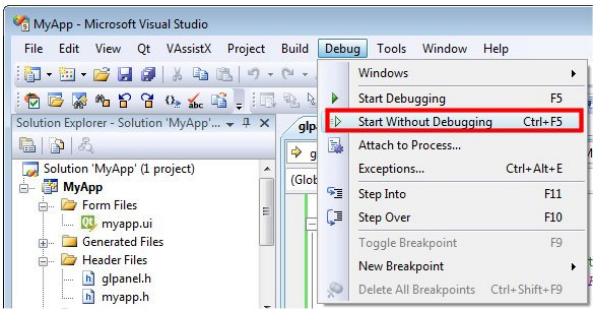
{
// clear the buffer wi
glClear(GL_COLOR_BUFFE
Output
Show output from: Build
1>------ Build started: Project: MyApp, Configuration: Debug Win32 ------
1>Moc'ing glpanel.h...
1>Moc'ing myapp.h...
1>Rcc'ing myapp.qrc...
1>RCC: Warning: No resources in 'c:\CIV2802\MyApp\myapp.qrc'.
1>Uic'ing myapp.ui...
1>Compiling...
1>glpanel.cpp
1>moc_glpanel.cpp
1>moc_myapp.cpp
1>qrc_myapp.cpp
1>myapp.cpp
1>main.cpp
1>Generating Code...
1>Linking...
1>Embedding manifest...
1>Build log was saved at "file://C:\CIV2802\MyApp\Win32\Debug\BuildLog.htm"
1>MyApp - 0 error(s), 0 warning(s)
========== Build: 1 succeeded, 0 failed, 0 up-to-date, 0 skipped ==========

28.


MyApp - Microsoft Visual Studio
File Edit View Qt VAssistX Project Build Debug Tools Window Help
Windows
Start Debugging F5
Start Without Debugging Ctrl+F5
Attach to Process...
Exceptions... Ctrl+Alt+E
Step Into F11
Step Over F10
Toggle Breakpoint F9
New Breakpoint
Delete All Breakpoints Ctrl+Shift+F9
Solution Explorer - Solution 'MyApp'...
Solution 'MyApp' (1 project)
MyApp
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Header Files
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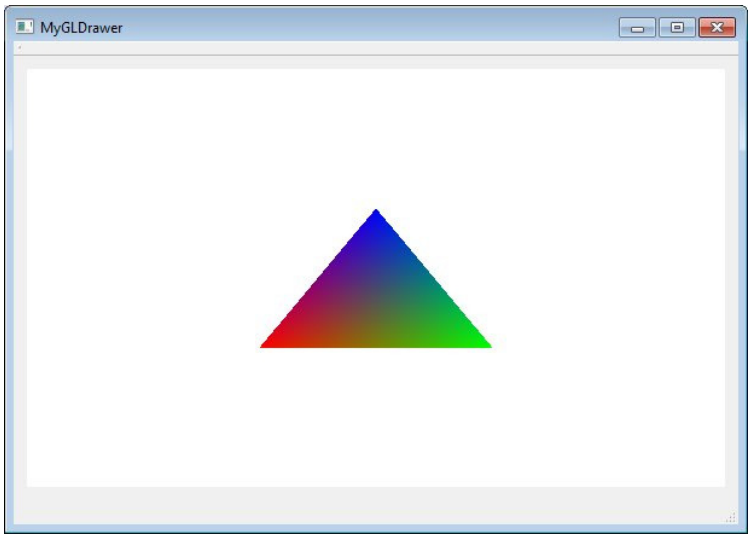
29.


MyGLDrawer