OpenGL 3.0+ and Visual Studio 2017 Setup

Wednesday, February 13, 2019  12:50 PM  
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Steps:
1. Download and install Visual Studio 2017
   a. Use this link: [https://visualstudio.microsoft.com/downloads/](https://visualstudio.microsoft.com/downloads/)
   b. Choose the Community Version. It is free for academic use.
2. Download GLFW
   a. Use this link: [https://www.glfw.org/](https://www.glfw.org/)
   b. Don't click the "Download GLFW 3.x.x", click the "Download" on top right.
   c. On next page, scroll to "Windows pre-compiled binaries", you either choose the "32-bit Windows binaries", or the 64-bit one. Most of the time you only need the 32-bit one, especially for beginner proposes.
d. Click and download the zip file.

3. Download GLEW.
   a. Use this link: http://glew.sourceforge.net/ (Or Google "glew")
   b. Select "Windows 32-bit and 64-bit"

c. Click and download the zip file.

4. Folder Placement (Setup of the OpenGL programming environment)
Now we have the VS2017, the latest GLFW and the latest GLEW. We can beginning.
   a. Extract the previous downloaded GLFW and GLEW zip file.

   ![Screenshot of file structure]

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   b. Now we create another folder for our C++ project directory
   Let's name it "CS428".
   You can create this folder anywhere for you convenience. For example I created one on "C:\CS428".
You can later rename this folder (the root folder), move it to a different location / computer, and it will still run. Because library files will be link to this folder.

c. Inside "CS428", create a folder where the GLFW and GLEW library will be placed. I name it "External Resources", you can name it whatever you like.

d. Move/copy those two folders with GLFW and GLEW libraries into "External Resources"

 e. I suggest renaming GLFW and GLEW libraries folder for easier to maintain.

5. Setup a new project in Visual Studio 2017
   
a. Launch VS2017
   b. File -> New -> Project
c. Choose: Visual C++ -> Empty Project -> Browse...

![Image of Visual Studio New Project dialog]

d. Find the project root folder you created. Click "select".

![Image of selecting folder in Visual Studio]

e. You see the Location of the Project is changed. Now we can name the project, for example: Lecture1

![Image of renaming project in Visual Studio]
Click "OK".

f. You have your new project

6. Create main.cpp
   a. In "Solution Explorer", right click your project, go to Add -> New Item...
b. rename "main.cpp" -> Add

7. Link libraries to project
   a. Right click your project -> Property
b. On next window, make sure:
Configuration: "All Configuration"

![Configuration Settings](image)

Platform: Win32 if you chose 32-bit

![Platform Settings](image)

c. Go to: C/C++ -> General -> Additional Include Directories -> Edit
(If you skipped creating "main.cpp" in the previous step, "C/C++" tab can't be found.)

![Include Directories Settings](image)

d. In the pop-up window, type in `${SolutionDir}/../External Resources/GLEW/include`
"$(SolutionDir)" is where your project file is:

This PC > Windows (C:) > CS428 > Lecture1

"../" is go back one directory.

"/External Resources/GLEW/include" is what we are linking.

E. Same thing goes to the GLEW
You can copy and paste and just change "E" with "F", if you used the naming strategy mentioned in step 4.e.
f. When done typing/copying, click OK.

8. Link libraries (part 2)
   a. Go to: Linker -> General -> Additional Library Directories -> Edit

b. Almost the same with the previous "$(SolutionDir)/" path, but a bit different:
   You can still copy and paste to save your time.
I am pretty sure you won't have the "lib-vc2017" inside GLFW folder, by now. But "lib-vc2017" works just fine.

e. Click OK.

9. Link libraries (part 3)
   a. Go to: Linker -> Input -> Additional Dependencies -> Edit

b. Type in: 
   opengl32.lib
"opengl32.lib" is included in the Windows 10. For "glew32.lib" and "glfw3.lib" spellings, you can check files in "\GLEW\lib\Release\Win32" and "\GLFW\lib-vc2015" to verify.

c. Click OK.
d. Click Apply.
e. Close Property window.

10. Link libraries (Part 4)
   a. Go to your folder and copy the "glew32.dll"
b. Go to your project folder, where your main.cpp file is. Paste the glew32.dll file to that location.

c. Go to where your solution file (.sln file) is, create a folder called "Debug"

Paste the .dll file inside folder "Debug"

d. Go back the where your solution file (.sln file) is, create a folder called "Release". Paste the .dll file in there as well.
11. We are all set!

12. Copy code into main.cpp and test the result. Click green arrow to run.

Success!