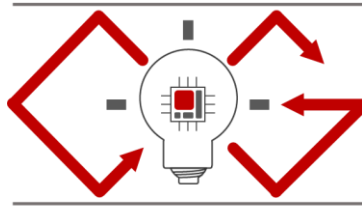


Prerequisite for PA

2023 Computer Graphics



Computer **G**raphics
Laboratory

Prerequisite

You need to install three components

1. IDE (e.g. visual studio) / C++ compiler and text editor
2. Cmake
3. Git / additional Git GUI tool (e.g. GitKraken)

Please use C++ language. (no Java, python, ...)

IDE

If you use windows OS, I recommend Visual Studio (I tested Visual Studio 2019)

<https://visualstudio.microsoft.com/ko/downloads/>

Community version is free for students / individuals

워크로드 개별 구성 요소 언어 팩 설치 위치

Windows (3)

- .NET 데스크톱 개발
C#, Visual Basic 및 F#를 사용하여 WPF, Windows Forms 및 콘솔 응용 프로그램을 빌드합니다.
- C++를 사용한 데스크톱 개발
Microsoft C++ 도구 집합, ATL 또는 MFC를 사용하여 Windows 데스크톱 응용 프로그램을 빌드합니다.
- 유니버설 Windows 플랫폼 개발
C#, VB, JavaScript 또는 선택적으로 C++를 사용하여 유니버설 Windows 플랫폼용 응용 프로그램을 만듭니다.

웹 및 클라우드 (7)

- ASP.NET 및 웹 개발
Docker 지원이 포함된 ASP.NET, ASP.NET Core, HTML/JavaScript 및 컨테이너를 사용하여 웹 응용 프로그...
- Azure 개발
클라우드 앱 개발, 리소스 생성, Docker 지원 등 컨테이너를 빌드하기 위한 Azure SDK, 도구 및 프로젝트입니다.
- Python 개발
Python에 대한 편집, 디버깅, 대화형 개발 및 소스 제어입니...
- Node.js 개발
비동기 이벤트 구동 JavaScript 런타임인 Node.js를 사용하...

위치
C:\Program Files (x86)\Microsoft Visual Studio\2017\Community 변경...

설치 세부 정보

> Visual Studio 핵심 편집기
✓ C++를 사용한 데스크톱 개발 포함됨
 ✓ Visual C++ 핵심 데스크톱 기능

옵션

- Just-In-Time 디버거
- VC++ 2017 version 15.9 v14.16 latest v141 tools
- C++ 프로파일링 도구
- Windows 10 SDK(10.0.17763.0)
- CMake용 Visual C++ 도구
- x86 및 x64용 Visual C++ ATL
- Test Adapter for Boost.Test
- Test Adapter for Google Test
- Windows 8.1 SDK 및 UCRT SDK
- C++용 Windows XP 지원
- x86 및 x64용 Visual C++ MFC
- C++/CLI 지원
- 표준 라이브러리에 대한 모듈(실험적)
- IncrediBuild - 빌드 가속
- Windows 10 SDK(10.0.17134.0)
- Windows 10 SDK(10.0.16299.0)
- Windows 10 SDK(10.0.15063.0)
- Windows 10 SDK(10.0.14393.0)

필요한 총 공간 31MB

계속하면 선택한 Visual Studio 버전에 대한 [라이선스](#)에 동의하는 것입니다. Microsoft는 Visual Studio와 함께 다른 소프트웨어를 다운로드할 수 있는 기능도 제공합니다. 이 소프트웨어는 [타사 고지 사항](#) 또는 해당 라이선스에 명시된 대로 별도로 사용이 허가됩니다. 계속하면 이러한 라이선스에도 동의하는 것입니다.

다운로드하는 동안 설치 닫기

Cmake

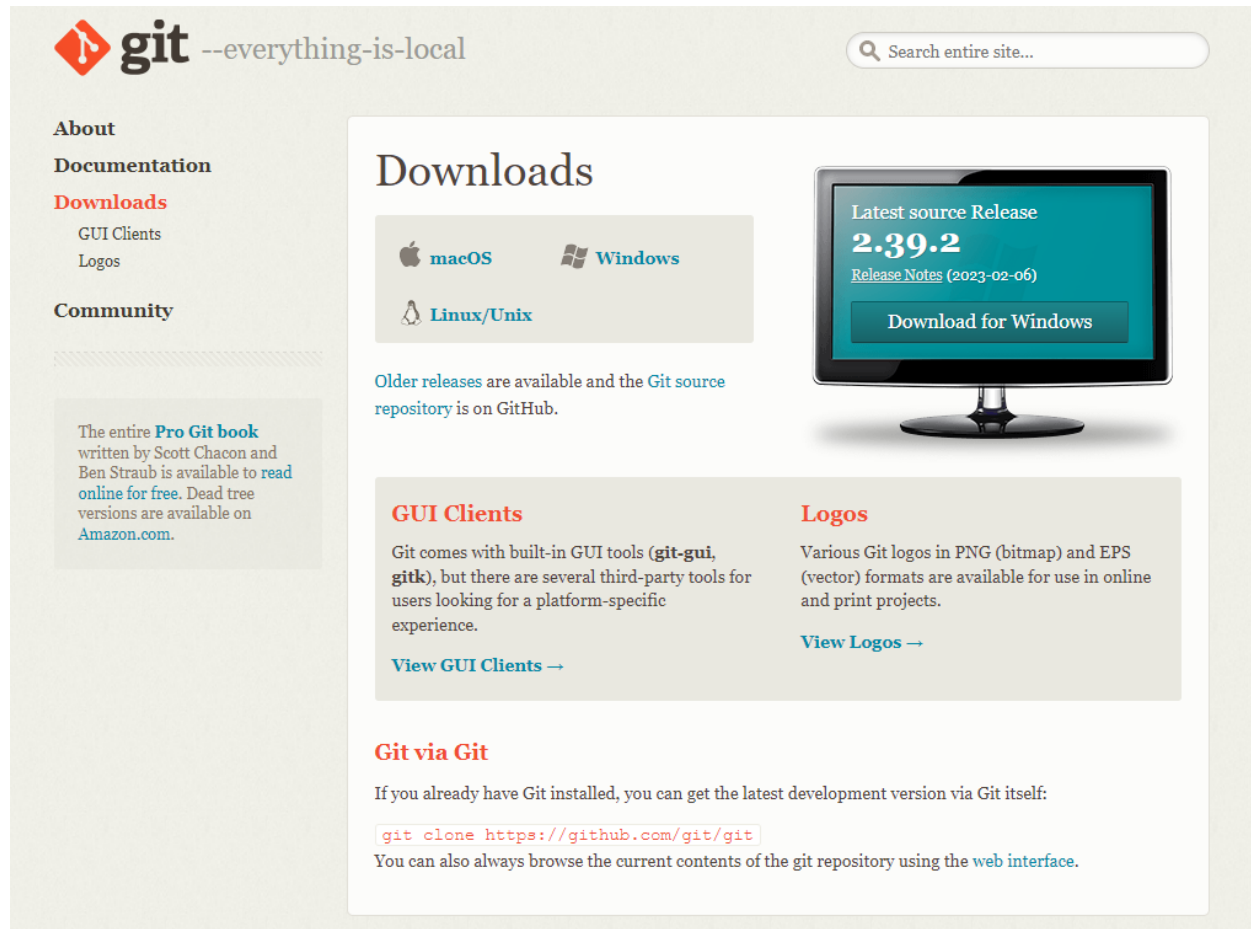
<https://cmake.org/download/>

Binary distributions:

Platform	Files
Windows x64 Installer:	cmake-3.26.0-rc5-windows-x86_64.msi
Windows x64 ZIP	cmake-3.26.0-rc5-windows-x86_64.zip
Windows i386 Installer:	cmake-3.26.0-rc5-windows-i386.msi
Windows i386 ZIP	cmake-3.26.0-rc5-windows-i386.zip
Windows ARM64 Installer:	cmake-3.26.0-rc5-windows-arm64.msi
Windows ARM64 ZIP	cmake-3.26.0-rc5-windows-arm64.zip
macOS 10.13 or later	cmake-3.26.0-rc5-macos-universal.dmg cmake-3.26.0-rc5-macos-universal.tar.gz
macOS 10.10 or later	cmake-3.26.0-rc5-macos10.10-universal.dmg cmake-3.26.0-rc5-macos10.10-universal.tar.gz
Linux x86_64	cmake-3.26.0-rc5-linux-x86_64.sh cmake-3.26.0-rc5-linux-x86_64.tar.gz
Linux aarch64	cmake-3.26.0-rc5-linux-aarch64.sh cmake-3.26.0-rc5-linux-aarch64.tar.gz

Git

<https://git-scm.com/downloads>



The screenshot shows the Git website's Downloads page. At the top left is the Git logo and tagline "--everything-is-local". A search bar is at the top right. The left sidebar contains navigation links: About, Documentation, Downloads (highlighted), GUI Clients, Logos, and Community. Below the sidebar is a text box about the Pro Git book. The main content area is titled "Downloads" and features a central monitor graphic displaying the latest source release "2.39.2" with a "Download for Windows" button. Below the monitor, there are sections for "GUI Clients" and "Logos". At the bottom, there is a "Git via Git" section with a terminal command to clone the repository.

git --everything-is-local

Search entire site...

About

Documentation

Downloads

GUI Clients

Logos

Community

The entire **Pro Git book** written by Scott Chacon and Ben Straub is available to [read online for free](#). Dead tree versions are available on [Amazon.com](#).

Downloads

macOS Windows Linux/Unix

Latest source Release
2.39.2
Release Notes (2023-02-06)

Download for Windows

Older releases are available and the Git source repository is on GitHub.

GUI Clients

Git comes with built-in GUI tools (**git-gui**, **gitk**), but there are several third-party tools for users looking for a platform-specific experience.

[View GUI Clients →](#)

Logos

Various Git logos in PNG (bitmap) and EPS (vector) formats are available for use in online and print projects.

[View Logos →](#)

Git via Git

If you already have Git installed, you can get the latest development version via Git itself:

```
git clone https://github.com/git/git
```

You can also always browse the current contents of the git repository using the [web interface](#).

Install prerequisites in Ubuntu

```
sudo apt-get update
```

```
sudo apt-get install -y build-essential cmake git
```

```
ubuntu@DESKTOP-D5NU00P:~$ sudo apt-get install -y build-essential cmake git
```

```
ubuntu@DESKTOP-D5NU00P:~$ g++  
g++: fatal error: no input files  
compilation terminated.
```

```
ubuntu@DESKTOP-D5NU00P:~$ cmake
```

```
Usage
```

```
cmake [options] <path-to-source>  
cmake [options] <path-to-existing-build>  
cmake [options] -S <path-to-source> -B <path-to-build>
```

Specify a source directory to (re-)generate a build system for it in the current working directory. Specify an existing build directory to re-generate its build system.

Run 'cmake --help' for more information.

```
ubuntu@DESKTOP-D5NU00P:~$ git
```

```
usage: git [--version] [--help] [-C <path>] [-c <name>=<value>]  
      [--exec-path[=<path>]] [--html-path] [--man-path] [--info-path]  
      [-p | --paginate | -P | --no-pager] [--no-replace-objects] [--bare]  
      [--git-dir=<path>] [--work-tree=<path>] [--namespace=<name>]  
      <command> [<args>]
```

Accept assignment

1. Login to github
2. <https://classroom.github.com/a/rWUvPjYu> go to following link
3. Accept the assignment

2023-ComputerGraphics

Accept the assignment — programming assignment 1

Once you accept this assignment, you will be granted access to the `programming-assignment-1-ychanu` repository in the [CGLAB-Classes](#) organization on GitHub.

Click



Accept this assignment

Accept assignment




You're ready to go!

You accepted the assignment, **programming assignment 1**.

Your assignment repository has been created:


<https://github.com/CGLAB-Classes/programming-assignment-1-ychanu>

We've configured the repository associated with this assignment ([update](#)).

 Your assignment is due by **Mar 6, 2023, 11:00**



You accepted the assignment, **programming assignment 1**. We're configuring your repository now. This may take a few minutes to complete. Refresh this page to see updates.

 Your assignment is due by **Mar 6, 2023, 11:00**

Click the link below



Join the GitHub Student Developer Pack

Verified students receive free GitHub Pro plus thousands of dollars worth of the best real-world tools and training from GitHub Education partners — for free. [Learn more](#)

Apply

How to clone your repository

You can clone your PA repository using command line after you install Git.

The screenshot shows a GitHub repository page for 'CGLAB-Classes / programming-assignment-1-ychanu'. The repository is private and generated from 'CGLAB-Classes/glskeleton'. The main content area shows a file tree with folders 'doc', 'extern', and 'src', and files '.gitignore', '.gitmodules', 'CMakeLists.txt', 'README.md', and 'report.md'. A dropdown menu is open from the 'Code' button, showing options for cloning the repository. The 'Clone' section is selected, and the 'Copy URL' button is highlighted with a blue arrow. The URL 'https://github.com/CGLAB-Classes/programming-' is visible in the dropdown menu.

Copy URL using this button

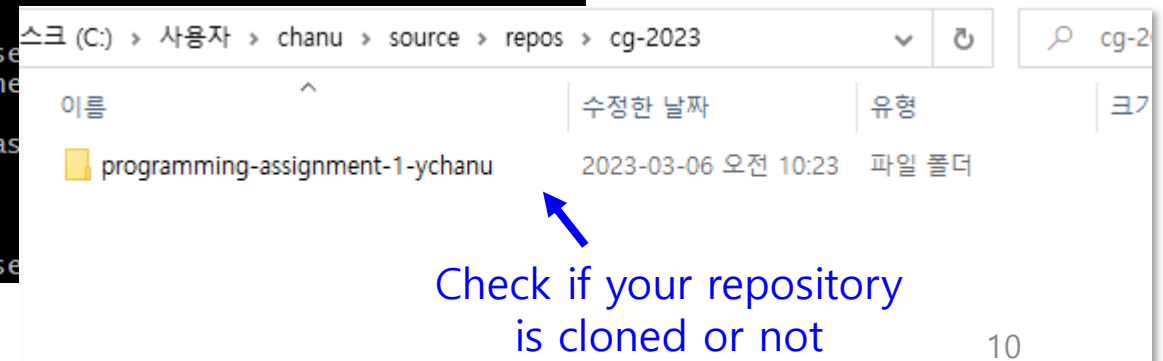
How to clone your repository

You can clone your PA repository using command line after you install Git.

Go to the directory you want and type

```
git clone --recursive https://github.com/CGLAB-Classes/programming-assignment-1-YOUR_GITHUB_ID.git
```

```
chanu@DESKTOP-11DE06T MINGW64 ~/source/repos/cg-2023 (master)
$ git clone --recursive https://github.com/CGLAB-Classes/programming-assignment-1-ychanu.git
Cloning into 'programming-assignment-1-ychanu'...
remote: Enumerating objects: 21, done.
remote: Counting objects: 100% (21/21), done.
remote: Compressing objects: 100% (20/20), done.
remote: Total 21 (delta 0), reused 15 (delta 0), pack-reused 0
Receiving objects: 100% (21/21), 88.36 KiB | 2.52 MiB/s, done.
Submodule 'extern/glad' (https://github.com/Dav1dde/glad.git) registered for path 'extern/glad'
Submodule 'extern/glfw' (https://github.com/glfw/glfw.git) registered for path 'extern/glfw'
Submodule 'extern/glm' (https://github.com/g-truc/glm.git) registered for path 'extern/glm'
Cloning into 'C:/Users/chanu/source/repos/cg-2023/programming-assignment-1-ychanu/extern/glad'...
remote: Enumerating objects: 6634, done.
remote: Counting objects: 100% (249/249), done.
remote: Compressing objects: 100% (134/134), done.
remote: Total 6634 (delta 84), reused 205 (delta 76), pack-reused 6424
Receiving objects: 100% (6634/6634), 5.69 MiB | 8.04 MiB/s, done.
Resolving deltas: 100% (3703/3703), done.
Cloning into 'C:/Users/chanu/source/repos/cg-2023/programming-assignment-1-ychanu/extern/glfw'...
remote: Enumerating objects: 30778, done.
remote: Counting objects: 100% (66/66), done.
remote: Compressing objects: 100% (50/50), done.
remote: Total 30778 (delta 36), reused 30 (delta 16), pack-reused 30742
```

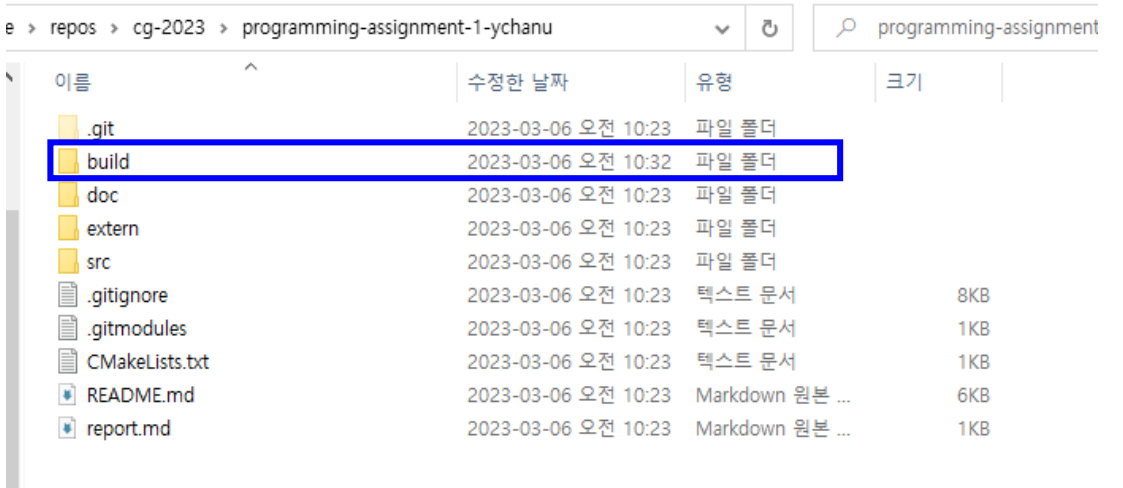


Check if your repository is cloned or not

How to build your repository

1. Set source code directory to project-root.
2. Set build directory to project-root/build.
3. Click configure.
4. Select your Visual Studio version and finish.
5. Click Generate.
6. Now we have solution file for visual studio of your assignment.

Make 'build' folder

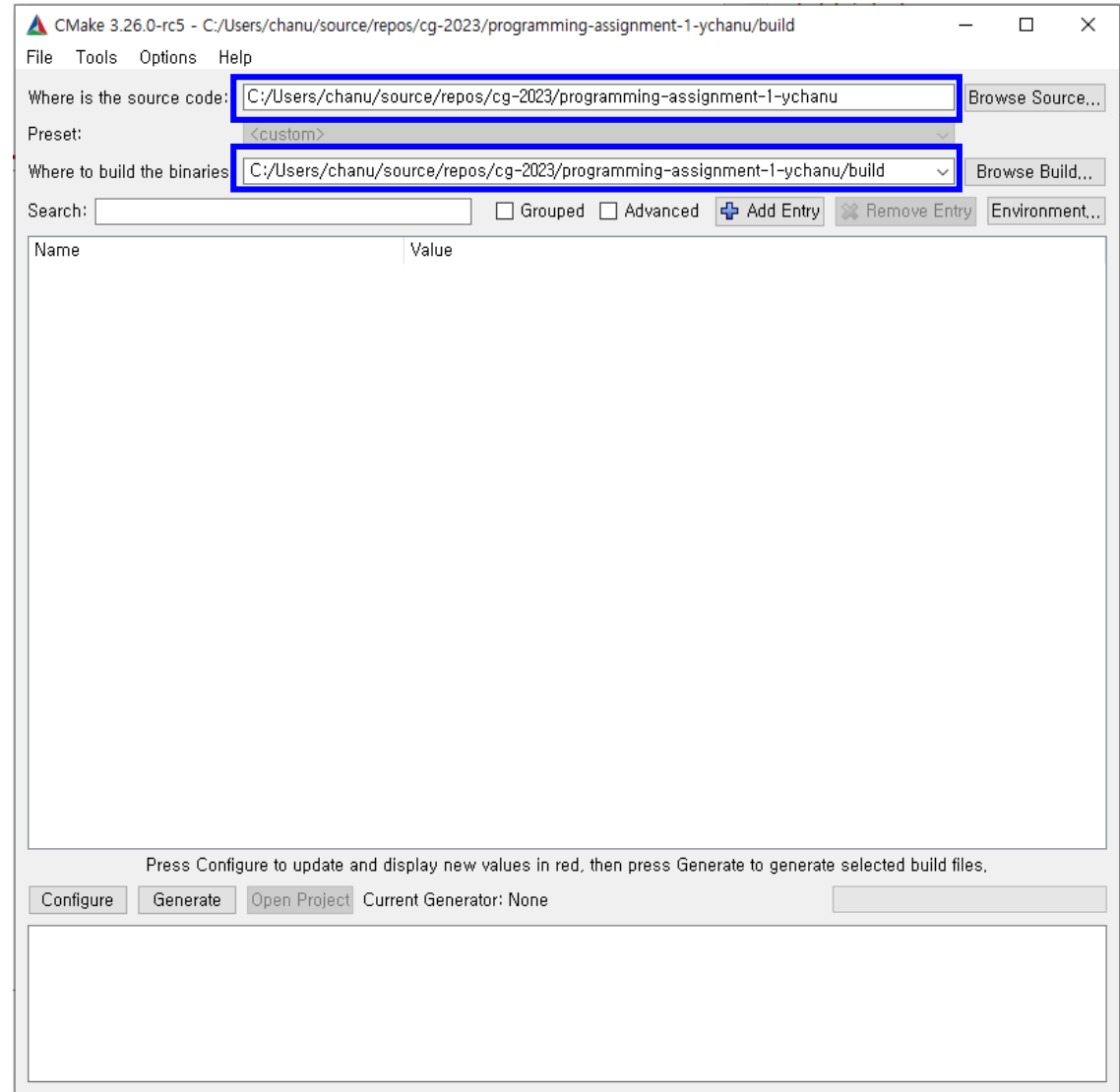


The screenshot shows a file explorer window with the path 'e > repos > cg-2023 > programming-assignment-1-ychanu'. The search bar contains 'programming-assignment'. The file list is as follows:

이름	수정한 날짜	유형	크기
.git	2023-03-06 오전 10:23	파일 폴더	
build	2023-03-06 오전 10:32	파일 폴더	
doc	2023-03-06 오전 10:23	파일 폴더	
extern	2023-03-06 오전 10:23	파일 폴더	
src	2023-03-06 오전 10:23	파일 폴더	
.gitignore	2023-03-06 오전 10:23	텍스트 문서	8KB
.gitmodules	2023-03-06 오전 10:23	텍스트 문서	1KB
CMakeLists.txt	2023-03-06 오전 10:23	텍스트 문서	1KB
README.md	2023-03-06 오전 10:23	Markdown 원본 ...	6KB
report.md	2023-03-06 오전 10:23	Markdown 원본 ...	1KB

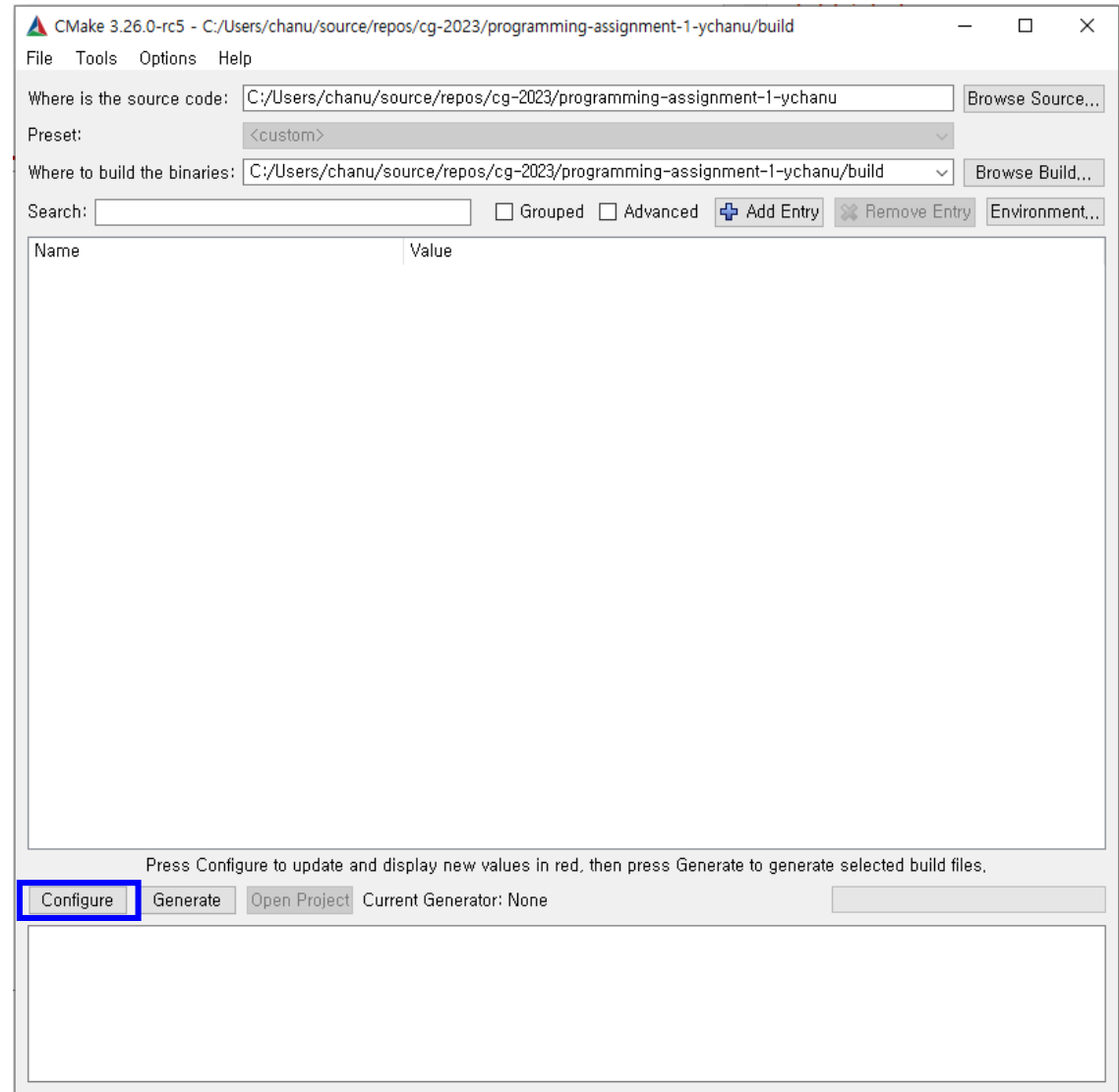
How to build your repository

1. Set source code directory to project-root.
2. Set build directory to project-root/build.
3. Click configure.
4. Select your Visual Studio version and finish.
5. Click Generate.
6. Now we have solution file for visual studio of your assignment.



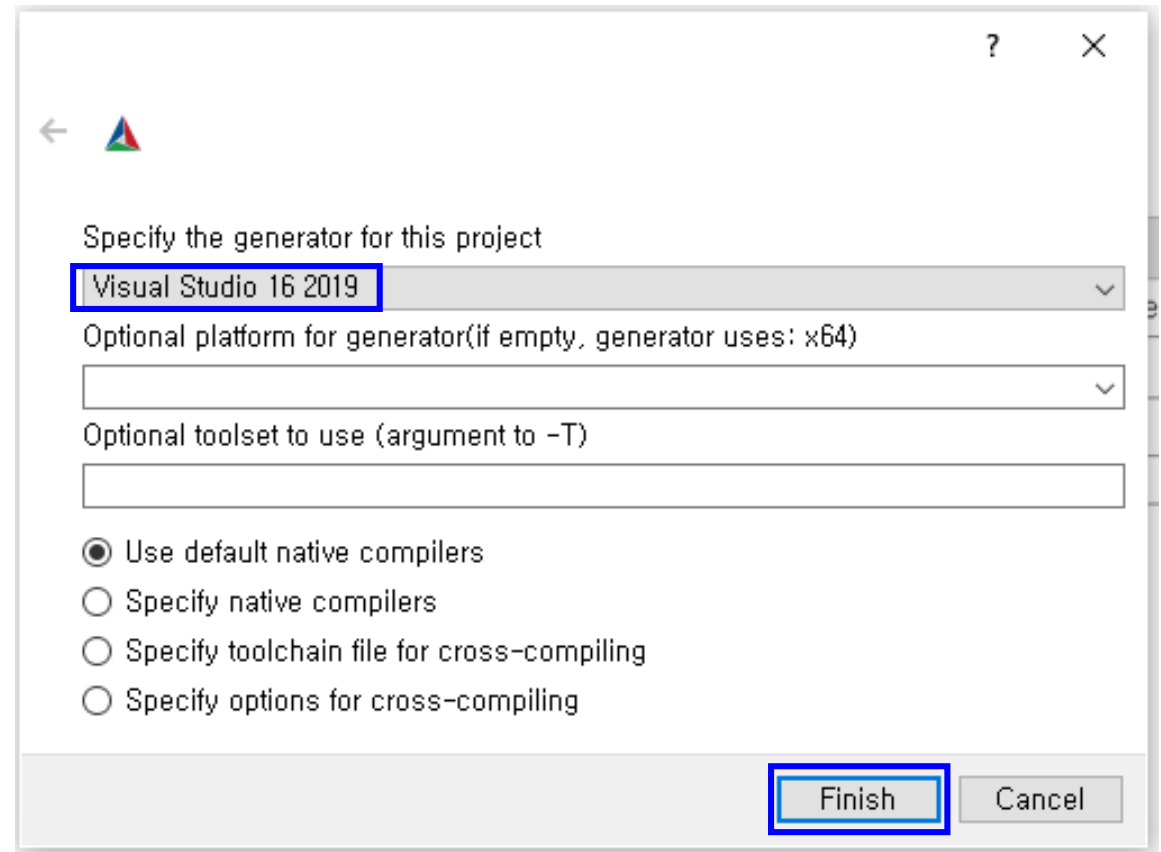
How to build your repository

1. Set source code directory to project-root.
2. Set build directory to project-root/build.
3. Click configure.
4. Select your Visual Studio version and finish.
5. Click Generate.
6. Now we have solution file for visual studio of your assignment.



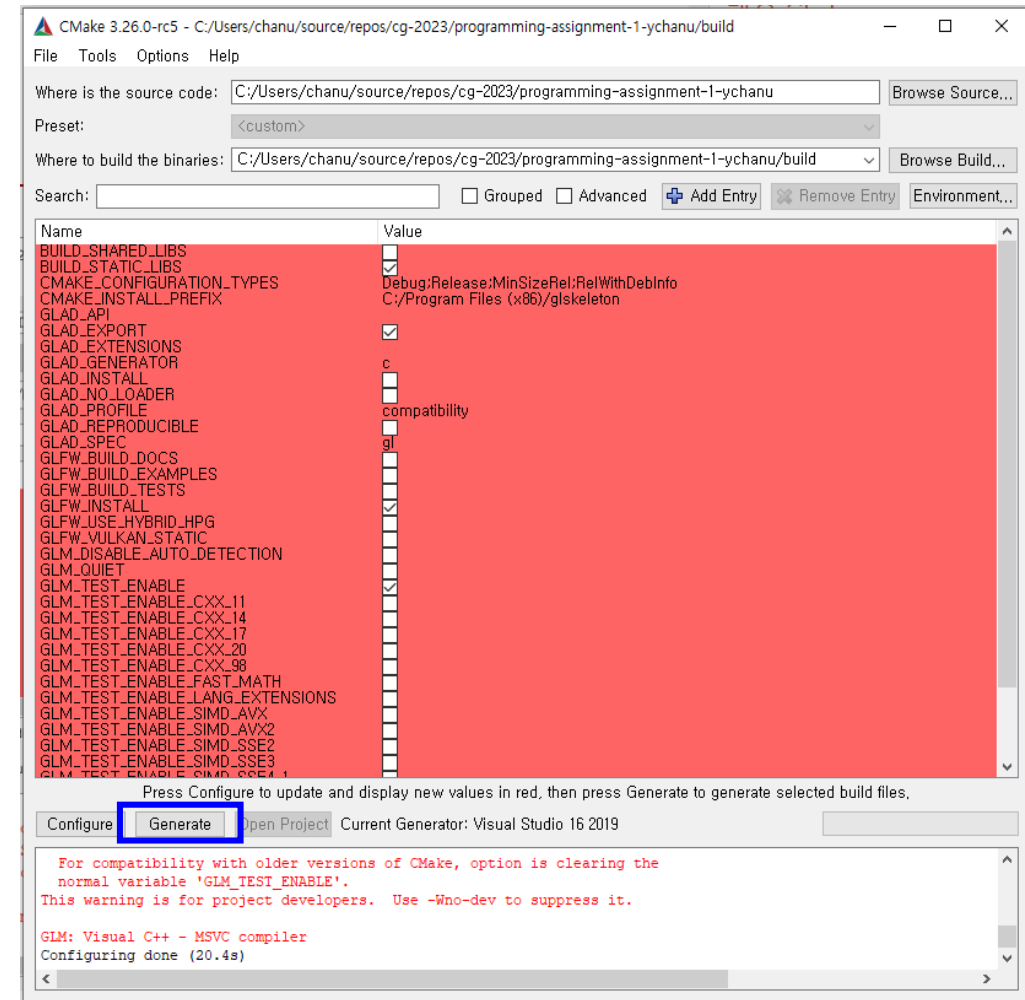
How to build your repository

1. Set source code directory to project-root.
2. Set build directory to project-root/build.
3. Click configure.
4. Select your Visual Studio version and finish.
5. Click Generate.
6. Now we have solution file for visual studio of your assignment.



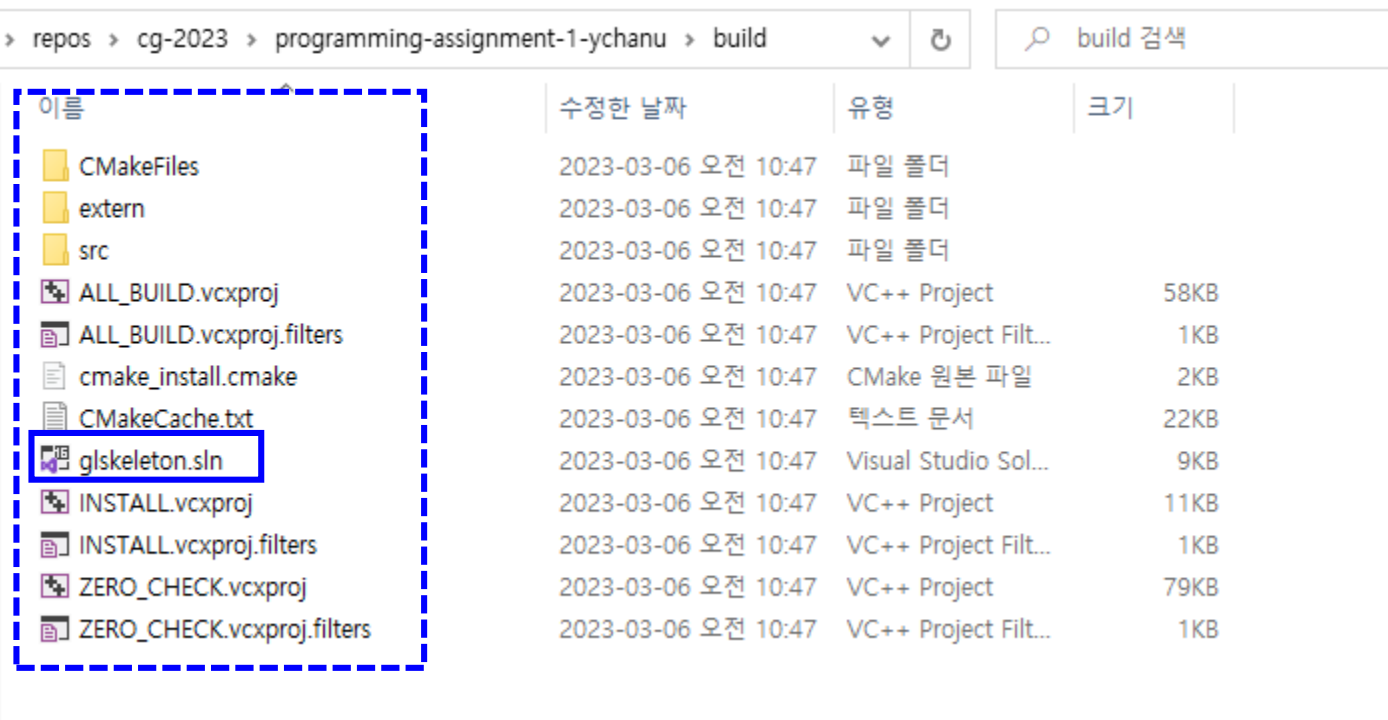
How to build your repository

1. Set source code directory to project-root.
2. Set build directory to project-root/build.
3. Click configure.
4. Select your Visual Studio version and finish.
5. Click Generate.
6. Now we have solution file for visual studio of your assignment.



How to build your repository

1. Set source code directory to project-root.
2. Set build directory to project-root/build.
3. Click configure.
4. Select your Visual Studio version and finish.
5. Click Generate.
6. Now we have solution file for visual studio of your assignment.

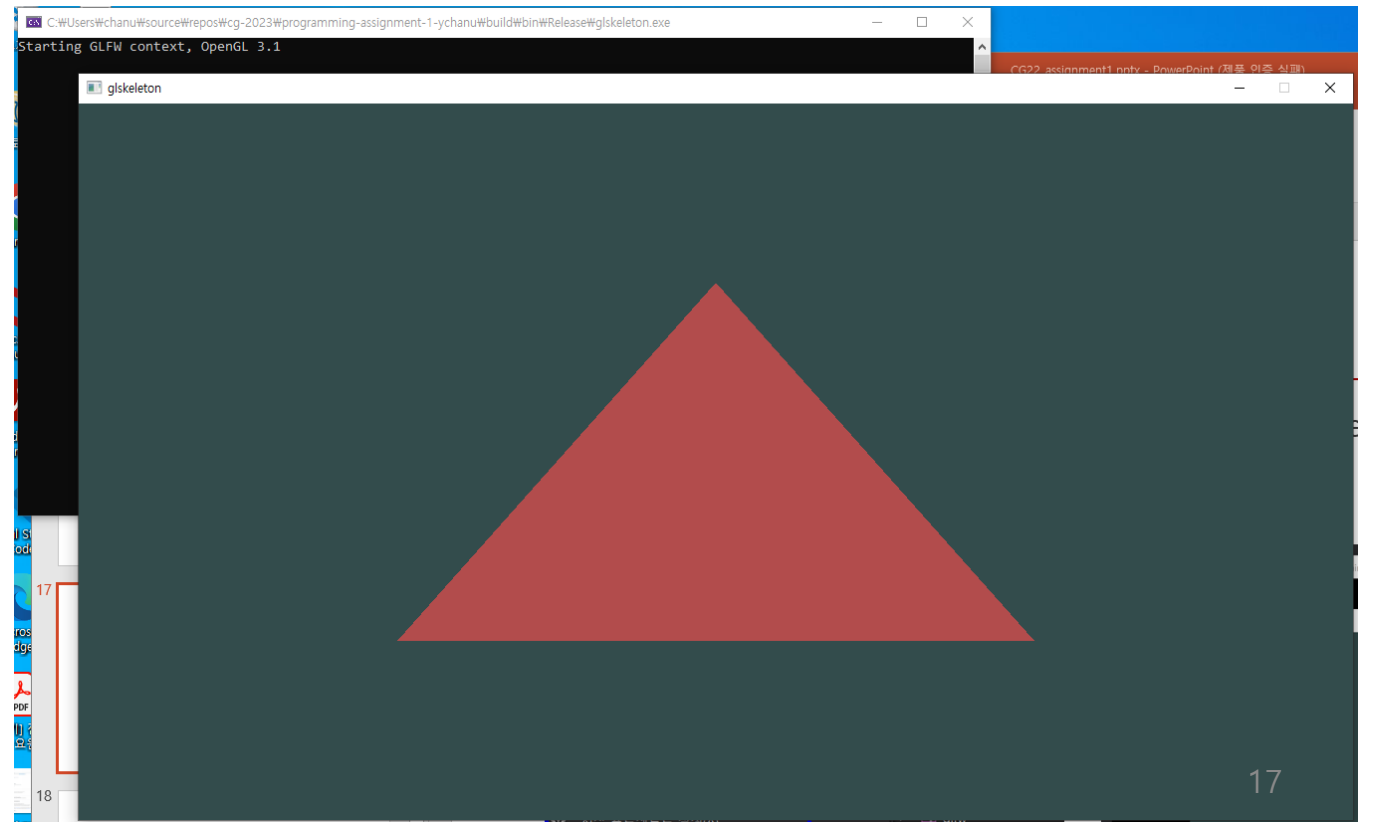
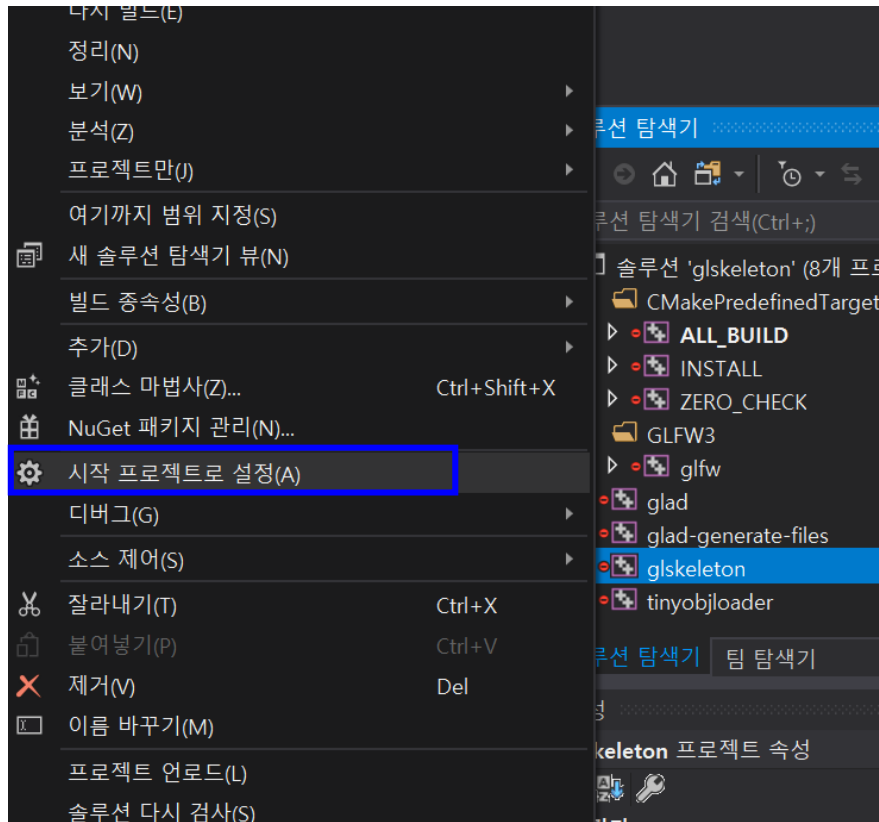


이름	수정한 날짜	유형	크기
CMakeFiles	2023-03-06 오전 10:47	파일 폴더	
extern	2023-03-06 오전 10:47	파일 폴더	
src	2023-03-06 오전 10:47	파일 폴더	
ALL_BUILD.vcxproj	2023-03-06 오전 10:47	VC++ Project	58KB
ALL_BUILD.vcxproj.filters	2023-03-06 오전 10:47	VC++ Project Filt...	1KB
cmake_install.cmake	2023-03-06 오전 10:47	CMake 원본 파일	2KB
CMakeCache.txt	2023-03-06 오전 10:47	텍스트 문서	22KB
glskeleton.sln	2023-03-06 오전 10:47	Visual Studio Sol...	9KB
INSTALL.vcxproj	2023-03-06 오전 10:47	VC++ Project	11KB
INSTALL.vcxproj.filters	2023-03-06 오전 10:47	VC++ Project Filt...	1KB
ZERO_CHECK.vcxproj	2023-03-06 오전 10:47	VC++ Project	79KB
ZERO_CHECK.vcxproj.filters	2023-03-06 오전 10:47	VC++ Project Filt...	1KB

Set Startup Project

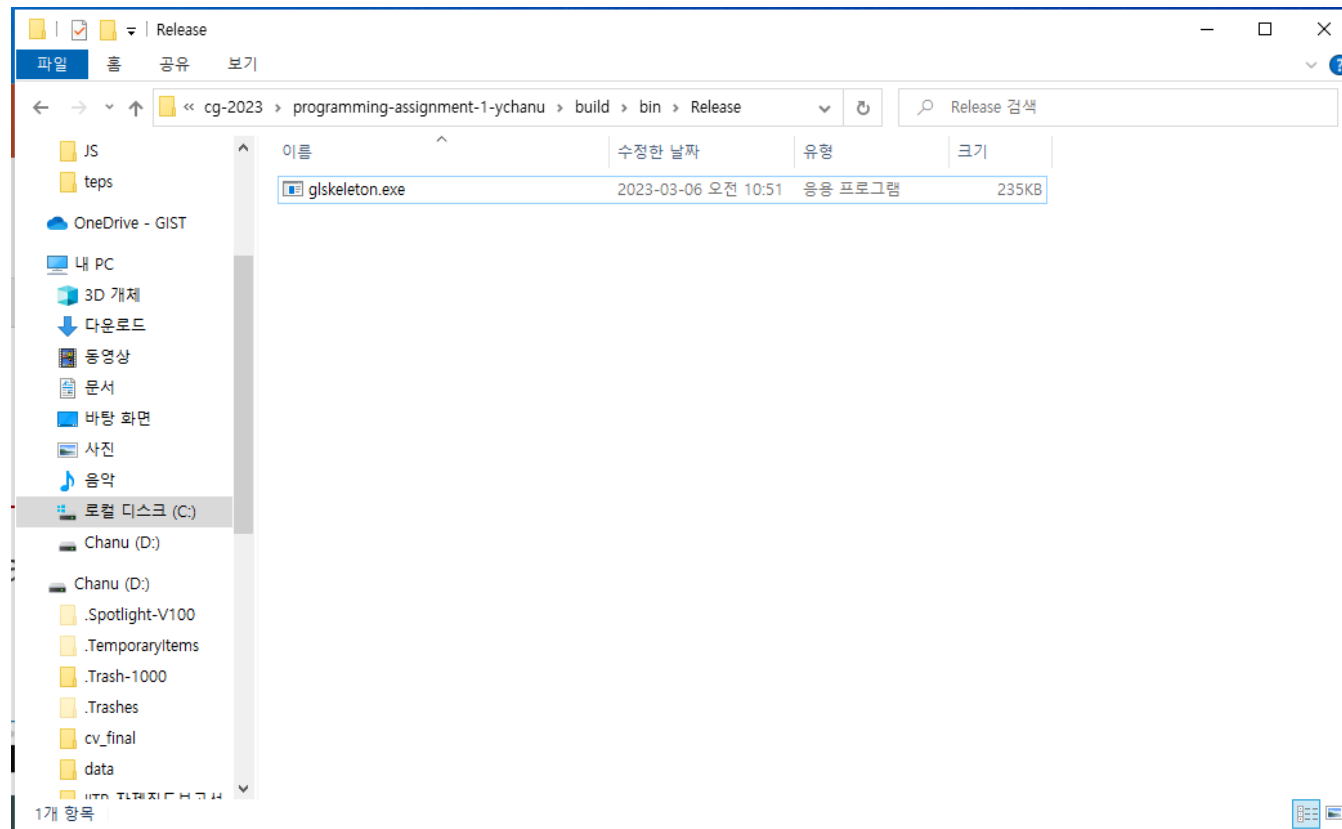
Open *glskeleton.sln* in your build folder and set glskeleton as startup project

After that, hit F5 then you will see the triangle!



Set Startup Project

You can find .exe file in bin folder



How to commit your repository

Open your git GUI (or terminal) and initialize your git states

1. git remote remove origin
2. git init

```
chanu@DESKTOP-1JDE06T MINGW64 ~/source/repos/cg-2023 (master)
$ git remote remove origin

chanu@DESKTOP-1JDE06T MINGW64 ~/source/repos/cg-2023 (master)
$ git init
Reinitialized existing Git repository in C:/Users/chanu/source/repos/cg-2023/.git/
```

How to commit your repository

Assign your project's URL to origin

1. `git remote add origin https://github.com/CGLAB-Classes/programming-assignment-1-YOUR_GIT_ID.git`
2. `git remote -v` (check your origin)

```
chanu@DESKTOP-1JDE06T MINGW64 ~/source/repos/cg-2023 (master)
$ git remote add origin https://github.com/CGLAB-Classes/programming-assignment-1-ychanu.git

chanu@DESKTOP-1JDE06T MINGW64 ~/source/repos/cg-2023 (master)
$ git remote -v
origin https://github.com/CGLAB-Classes/programming-assignment-1-ychanu.git (fetch)
origin https://github.com/CGLAB-Classes/programming-assignment-1-ychanu.git (push)

chanu@DESKTOP-1JDE06T MINGW64 ~/source/repos/cg-2023 (master)
$ git status
On branch master

No commits yet

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)
    new file:   programming-assignment-1-ychanu
```

How to commit your repository

Go to your assignment folder and type 3 Git commands

1. `git add .`
2. `git commit -m "any message"`
3. `git push`

```
chanu@DESKTOP-1JDE06T MINGW64 ~/source/repos/cg-2023/programming-assignment-1-ychanu (master)
$ git add .

chanu@DESKTOP-1JDE06T MINGW64 ~/source/repos/cg-2023/programming-assignment-1-ychanu (master)
$ git status
On branch master
Your branch is up to date with 'origin/master'.

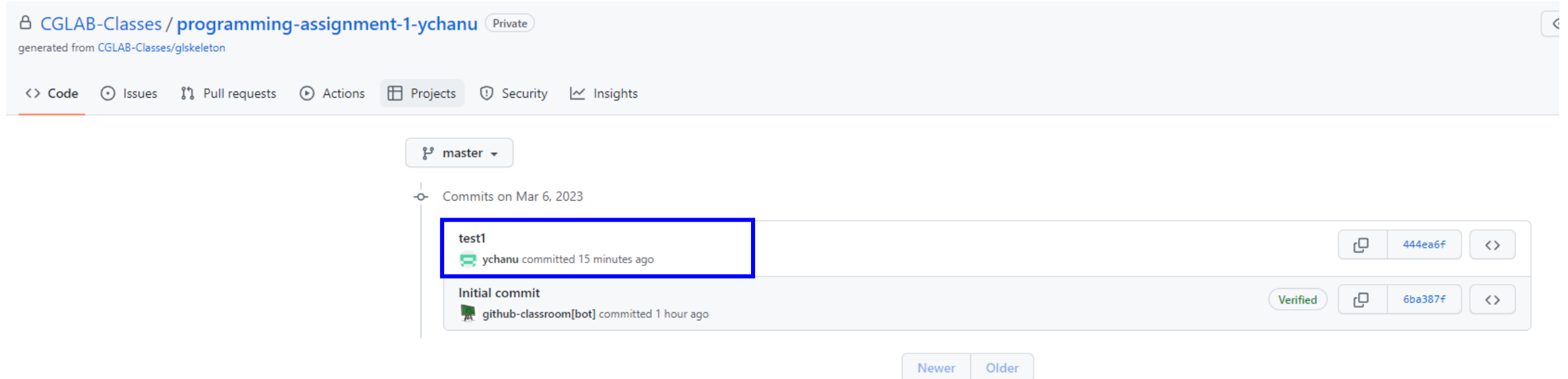
Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
        modified:   src/main.cpp

chanu@DESKTOP-1JDE06T MINGW64 ~/source/repos/cg-2023/programming-assignment-1-ychanu (master)
$ git commit -m "test1"
[master 444ea6f] test1
1 file changed, 1 insertion(+)

chanu@DESKTOP-1JDE06T MINGW64 ~/source/repos/cg-2023/programming-assignment-1-ychanu (master)
$ git push
Enumerating objects: 7, done.
Counting objects: 100% (7/7), done.
Delta compression using up to 24 threads
Compressing objects: 100% (4/4), done.
Writing objects: 100% (4/4), 377 bytes | 188.00 KiB/s, done.
Total 4 (delta 2), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (2/2), completed with 2 local objects.
To https://github.com/CGLAB-Classes/programming-assignment-1-ychanu.git
6ba387f..444ea6f master -> master
```

How to commit your repository

Check your commit in your github homepage



The screenshot shows the GitHub interface for a repository named "CGLAB-Classes / programming-assignment-1-ychanu". The repository is private and was generated from "CGLAB-Classes/glskeleton". The navigation bar includes links for Code, Issues, Pull requests, Actions, Projects, Security, and Insights. The current branch is "master". The commit history for "Mar 6, 2023" is displayed, showing two commits:

- A commit titled "test1" by user "ychanu" committed 15 minutes ago. This commit is highlighted with a blue border. It has a commit hash of "444ea6f".
- An "Initial commit" by "github-classroom[bot]" committed 1 hour ago. It has a commit hash of "6ba387f" and is marked as "Verified".

Navigation buttons for "Newer" and "Older" commits are visible at the bottom of the commit list.

There are additional explanations in your repo

Check README.md in your repository for further details

glskeleton

This is template OpenGL cmake project for project for [computer graphics course](#) in gist.

Due to the scope of the lecture, the OpenGL version is intentionally set to 3.1.

Dependencies

You should install CMake and Git on your system. Other libraries will be installed automatically.

- CMake, [Install it your self](#)
- Git, [Install it your self](#)
- [glfw](#) , Windowing library
- [glad](#), OpenGL function loading library
- [glm](#), Math library for OpenGL and GLSL shader
- [tinyobjloader](#), Minimal Wavefront .obj file loading library
- [python](#), Python(GLAD) use python to load opengl functions

Git/Markdown tutorials

GitKraken tutorials and tips

- <https://www.youtube.com/playlist?list=PLe6EXFvnTV78WqGmGSq8JPnafR3IAa55n>
- https://www.youtube.com/playlist?list=PLe6EXFvnTV7_8z5gjobbe9sMjEHNw8_GE
- https://www.youtube.com/playlist?list=PLe6EXFvnTV7-_41SpakZoTIYCgX4aMTdU

Git/github cheat sheet

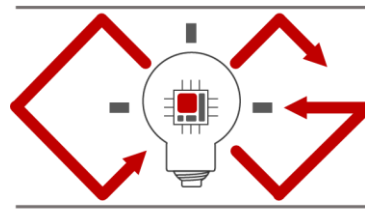
- <https://education.github.com/git-cheat-sheet-education.pdf>
- <https://services.github.com/on-demand/downloads/github-git-cheat-sheet.pdf>

Github flavored Markdown cheat sheet

- <https://enterprise.github.com/downloads/en/markdown-cheatsheet.pdf>

Programming Assignment 1

2023 Computer Graphics



Computer Graphics
Laboratory

Submission

Deadline : 23:59:59, Sunday, March 26th, 2023 (KST, +0900)

- Github server clock

To submit your assignment, you **must** do two things, **Both of them must be done BEFORE deadline.**

1. You should push your commit to your assignment repo before deadline.
2. You should comment the last commit (before deadline) id (SHA-1 hash) in github issue board. (See next slide)

The last commit **BEFORE** deadline will be considered as submitted assignment.

- Github server will track this for me.
- Timestamp in your commit (local time) will be ignored. (I will use github server timestamp instead)

Policy

In the following cases, your grade for this PA will be 0

- Late submission (Late push before deadline or Late last commit id comment on issue board)
- Build/execution failure
- Making public of your assignment repository

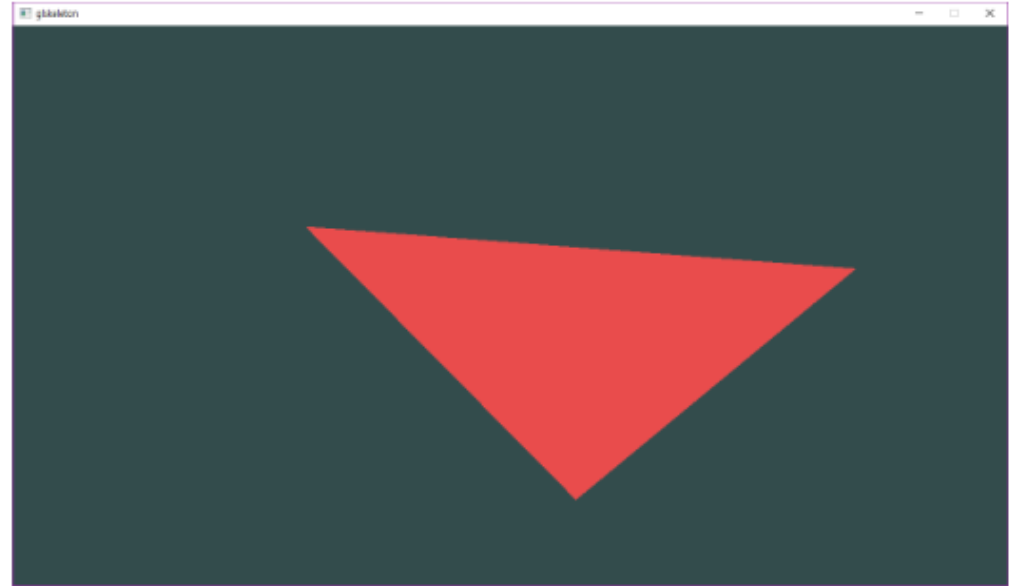
Your final grade will be "F"

- Copy

Task Lists

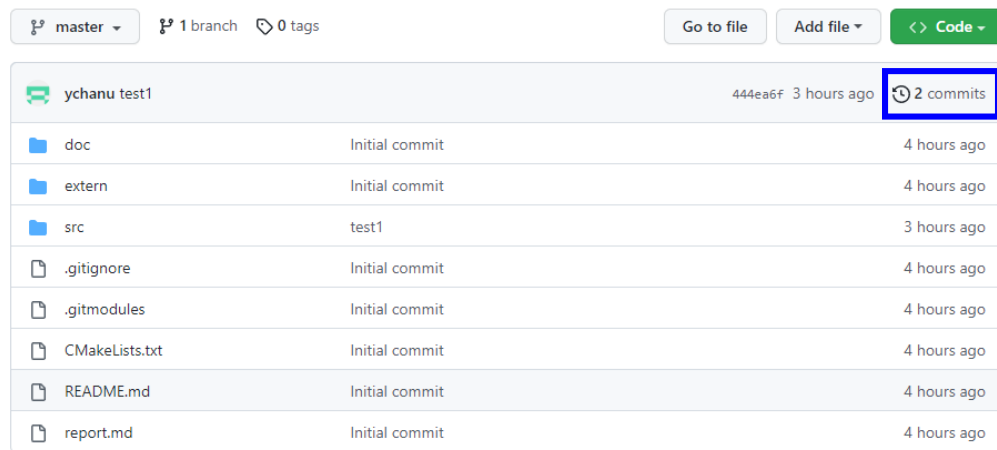
1. Practice how to use OpenGL basic gl* functions [8 Points]
 - Rotate your triangle with respect to time [4 Points]
 - Change your triangle color with respect to time [4 Points]
 - Hints
 - `glfwGetTime` function to figure out current time.
 - Use `sin` and `cos` function in `<cmath>` (or you can use `glm::sin`, `glm::cos` in `<glm/glm.hpp>`)
2. Report [2 Points]
 - Write your name, student id, github id in `report.md` [1 Points]
 - Attach at least two result images in `report.md` [1 Points]

Expected Results



Rotating and dimming triangle

Commenting Commit ID 1/2



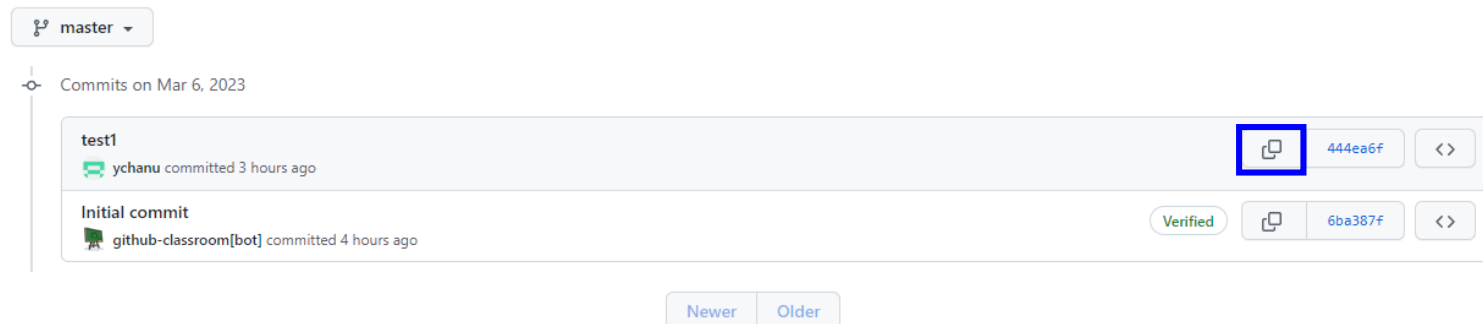
master 1 branch 0 tags

Go to file Add file <> Code

ychanu test1	444ea6f 3 hours ago	2 commits
doc	Initial commit	4 hours ago
extern	Initial commit	4 hours ago
src	test1	3 hours ago
.gitignore	Initial commit	4 hours ago
.gitmodules	Initial commit	4 hours ago
CMakeLists.txt	Initial commit	4 hours ago
README.md	Initial commit	4 hours ago
report.md	Initial commit	4 hours ago

1. Go to your assignment repository
2. Click commits
3. Click copy button of your last commit

<> Code Issues 1 Pull requests Actions Projects Security Insights



master

Commits on Mar 6, 2023

test1	ychanu committed 3 hours ago	444ea6f	<>
Initial commit	github-classroom[bot] committed 4 hours ago	Verified 6ba387f	<>

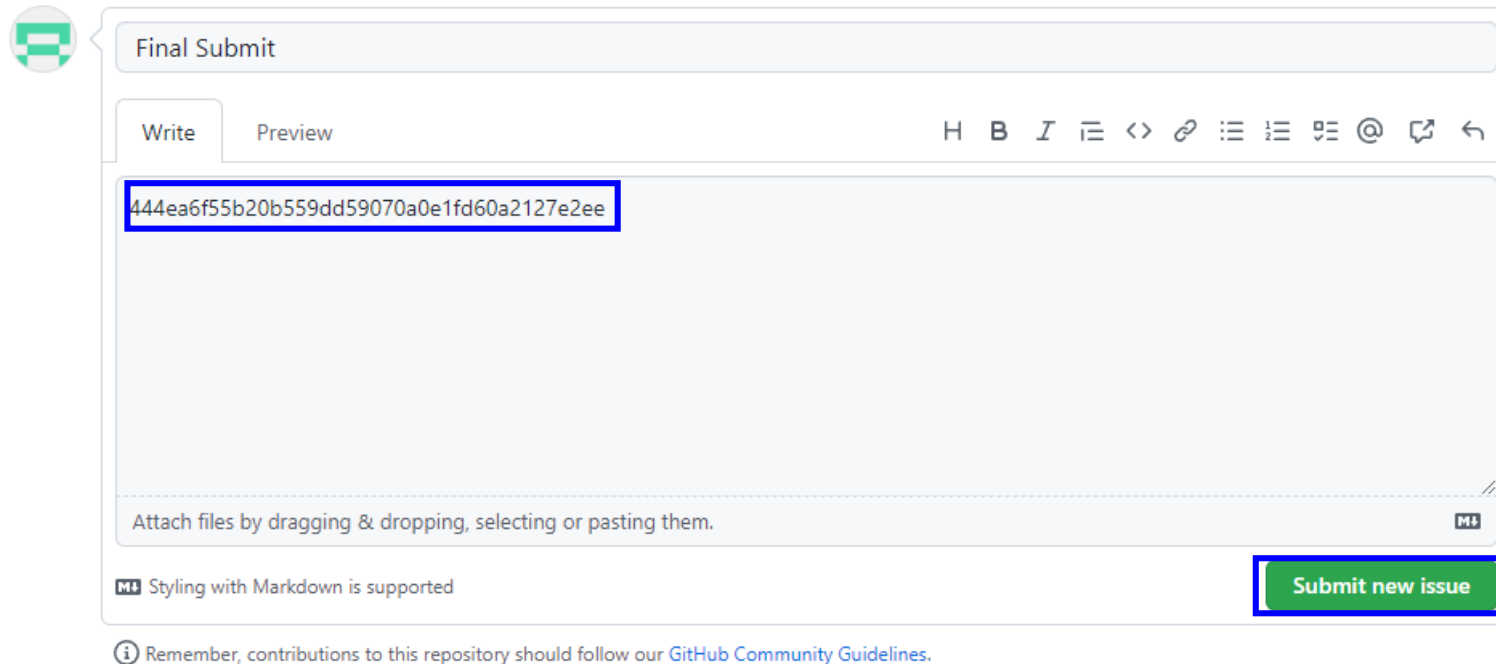
Newer Older

Commenting Commit ID 1/2

The screenshot shows the GitHub interface. At the top, the navigation bar includes 'Code', 'Issues 1', 'Pull requests', 'Actions', 'Projects', 'Security', and 'Insights'. The 'Issues 1' tab is highlighted with a blue box. Below the navigation bar, the repository name 'master' is shown. A section titled 'Commits on Mar 6, 2023' displays two commits: 'test1' by 'ychanu' (committed 3 hours ago) and 'Initial commit' by 'github-classroom[bot]' (committed 4 hours ago). Below the commits are 'Newer' and 'Older' buttons. At the bottom of the screenshot, the 'Filters' section shows a search bar with 'is:issue is:open', 'Labels 9', and 'Milestones 0'. A 'New issue' button is highlighted with a blue box. Below the filters, the interface shows '0 Open' and '1 Closed' issues, and a message: 'There aren't any open issues. You could search all of GitHub or try an advanced search.'









1. Go to issue tab
2. Click "New issue"

Commenting Commit ID 1/2





Final Submit

Write Preview


H B I       @  

444ea6f55b20b559dd59070a0e1fd60a2127e2ee

Attach files by dragging & dropping, selecting or pasting them. 

 Styling with Markdown is supported

Submit new issue

 Remember, contributions to this repository should follow our [GitHub Community Guidelines](#).

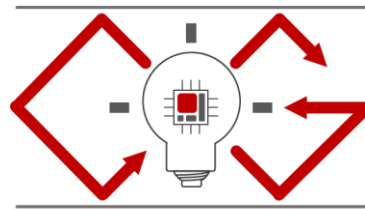
1. Paste your lastest commit id (Ctrl-v)
2. Click "Submit new issue"

Q&A

- Email: yangchanu@gm.gist.ac.kr
- Office: 104 Dasan Bldg.

Programming Assignment 1 (Mac)

2023 Computer Graphics



Computer Graphics
Laboratory

If Mac users have difficulty compiling

```
// test commit
std::cout << "Starting GLFW context, OpenGL 2.0" << std::endl;
// Init GLFW
glfwInit();
// Set all the required options for GLFW
glfwWindowHint(GLFW_CONTEXT_VERSION_MAJOR, 2);
glfwWindowHint(GLFW_CONTEXT_VERSION_MINOR, 0);
glfwWindowHint(GLFW_OPENGL_PROFILE, GLFW_OPENGL_ANY_PROFILE);
glfwWindowHint(GLFW_RESIZABLE, GL_FALSE);
```

- Please change the version lower. (in main.cpp file)

If Mac users have difficulty compiling

```
(base) yangchan-uyi-MacBookPro:programming-assignment-1-ychanu chanu$  
(base) yangchan-uyi-MacBookPro:programming-assignment-1-ychanu chanu$ mkdir build
```

- Open terminal (complete the prerequisites, "brew install cmake")
- Make build folder in your project directory

```
(base) yangchan-uyi-MacBookPro:programming-assignment-1-ychanu chanu$ cd build/  
(base) yangchan-uyi-MacBookPro:build chanu$ cmake ..  
-- Could NOT find Vulkan (missing: VULKAN_LIBRARY VULKAN_INCLUDE_DIR)  
-- Using Cocoa for window creation  
GLM: Clang - AppleClang compiler  
-- Configuring done  
-- Generating done  
-- Build files have been written to: /Users/chanu/chanu/repos/cg-2023/programming-assi  
(base) yangchan-uyi-MacBookPro:build chanu$ make -j 8
```

- type "cmake .." in build folder
- Then, type "make -j 8"

If Mac users have difficulty compiling

```
(base) yangchan-uu1-MacBookPro:build chanu$ ls
CMakeCache.txt          bin                    extern
CMakeFiles              cmake_install.cmake  lib
Makefile                compile_commands.json src
(base) yangchan-uu1-MacBookPro:build chanu$ cd bin
(base) yangchan-uu1-MacBookPro:bin chanu$ ls
glskeleton
(base) yangchan-uu1-MacBookPro:bin chanu$ ./glskeleton
```

- You can find glskeleton.exe in bin folder
- If it does still not work, please contact me!

