EWU CSCD445 Project

Conway games of life on a cubes surface

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Conway games of life on a cubes surface

Each face of a cube will have a 2d grid of Conway games of life and their edges will interact with the connected face's

Functions

1. OpenGL Cube
2. CPU Conway games of life but for cube surface
3. CUDA Conway, games of life but for cube surface

Min Goal

At min, a cube with each face running Conway games of life on CUDA that has the edges interact with some start state to see it run (Ex have some Glider's)

World Start (Test data)

In `void GameOfLifeCube::cpuCreate(int size)` (file GameOfLifeCube.cpp) for the CPU Code and in `__host__ void cudaMainInitialize(int size_set)` (file cudaMain.cu) for the GPU Code

```
for (int i = 0; i < column; ++i) {
    board[(3 * column) + i] = 1;
}
```

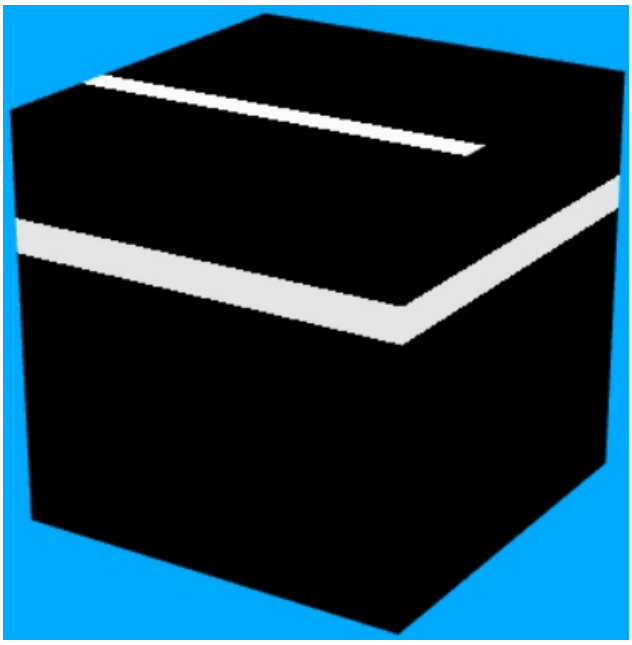
Making a Line 3 from the top of all faces of the cube

> TODO: add example

Example

> World size of 12

Cube



3d Cube

Data of all faces (front, right, back, left, top, bottom)

all faces data

Report

How to run/use

Start

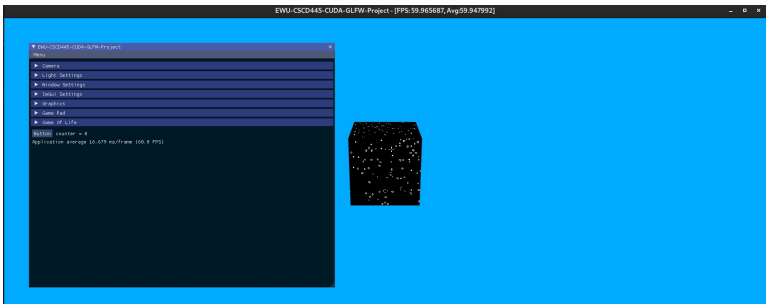
Need the project executable (TODO: is dll's needed?) and res folder to run

> Take no arguments

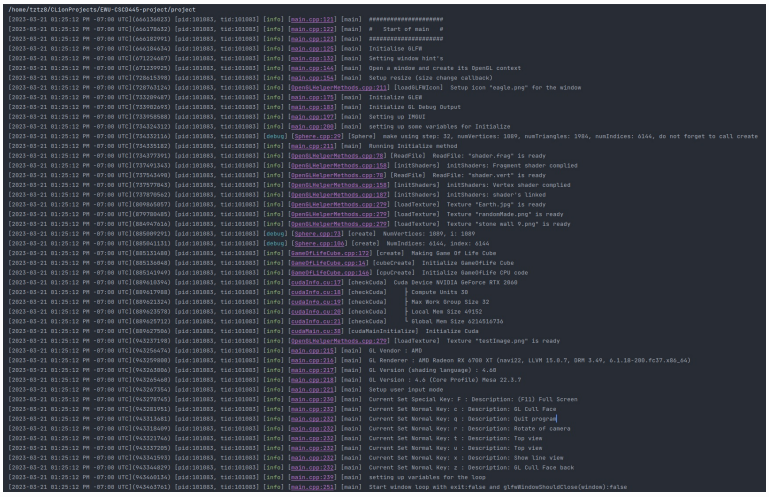
The program will log to console and log files in logs folder using spdlog

A imgui state file will also be made to remember somethings about GUI last state (Ex where within the window GUI is at)

Recommend using a game pad (Microsoft Xbox Series S|X Controller) to look that the game of life cube



Ruing after a bit

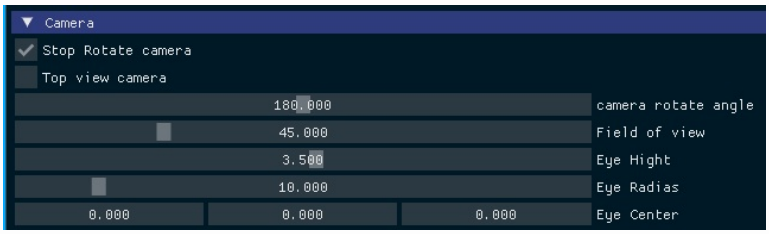


The console of the Ruing after a bit imgage

Using GUI

Using ImGUI give you menus to control the program from.

Camera

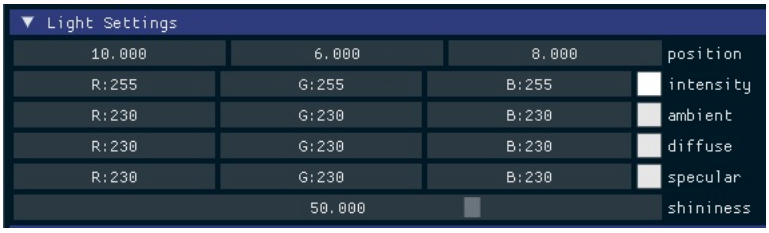


Camera GUI Menu

Gives control over the camera.

- Check box `Stop Rotate Camera` Auto rotate the camera (`camera rotate angle value`)
- Check box `Top view camera` when in default values move the camera to look from the top
- Slider `camera rotate angle value` rotate the camera around the `Eye Center` + `Eye Hight` at the `Eye Radias`
- Slider `Field of view` the “extent of the observable world seen at any given moment”
- Slider `Eye Hight` the hight of the eye above the `Eye Center`
- Slider `Eye Radias` the diastase the camera is from `Eye Center`
- Drag `Eye Center` where the camera looking at

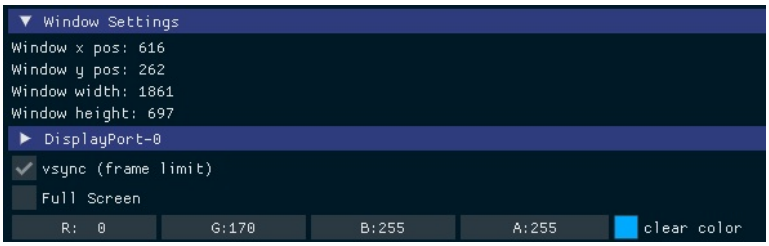
Light Settings



Light GUI Menu

No need to use from the project (Leave at defaults)

Window Settings

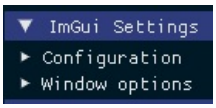


Window GUI Menu

Gives control and info over the window

- Show info about the window and displays
- Check box `vsync (frame limit)` let you trune on and off the frame limit to the frame rate of your display.
- Check box `Full Screen` set the screen full screen
- Color Edit `clear color` set the background color

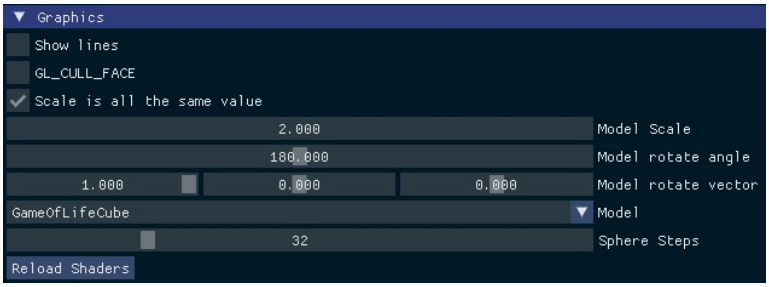
ImGui Settings



ImGui GUI Menu

No need to use from the project (Leave at defaults)

Graphics



Graphics GUI Menu

Gives control over the graphics settings

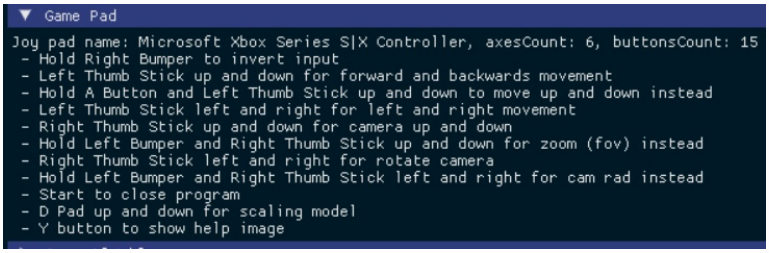
- Check box `Show lines` No need to use from the project (Leave at defaults)
- Check box `CL_CULL_FACE` No need to use from the project (Leave at defaults)
    - Check box `CL_CULL_FACE back` No need to use from the project (Leave at defaults)
- Check box `Scale is all the same value` Has the `Model Scale` be the same value for all axis

- Drag `Model Scale` scale of the model
    - Drag 3 `Model Scale` scale of the model x, y, z

> Note: when change the scale using game pad will have all (x, y, z) be the same value

- Slider `Model rotate angle` the angle the model is rotated about (`Model rotate vector`)
- Slider 3 `Model rotate vector` the vector used when rotating the model
- Combo `Model` No need to use from the project (Leave at defaults of `GameOfLifeCube`)
- Slider `Sphere Steps` No need to use from the project (Leave at defaults) (used for the sphere model)
- Button `Reload Shaders` No need to use from the project (Leave at defaults)

Game Pad



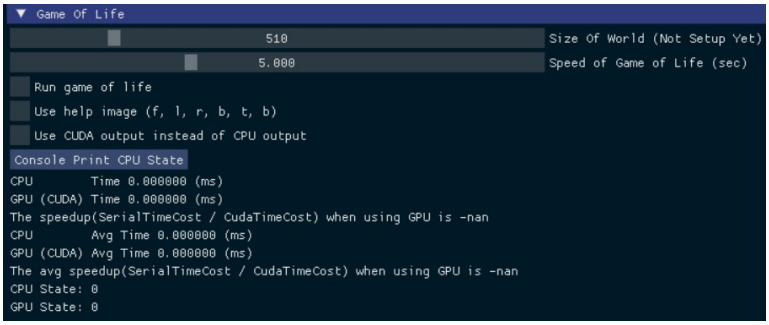
Game Pad GUI Menu

Give info about use the game pad and how to use it

> Note: only test with Xbox Series Controller over usb c cable on Linux

Game Of Life

> TODO: replace with update GUI screen shot



Game Of Life GUI Menu

Gives control and info over the Game Of Life

- TODO: add about reset
- Slider `Speed of Game of Life (sec)` how much time need to pass before next state of current game of life (run update)
- Check box `Run game of life` if the game of life is ruining or not (Use to stop the game of life and look at it without changing)
- Check box `Use help image (f, l, r, b, t, b)` to use the help image to know what face we are looking at
- Check box `Use CUDA instead of CPU` to use CUDA or CPU code
  - Text `Warring, Using Help Image` when using the help image
  - Text `Cuda not available` when no Nvidia CUDA device found
- Button `Console Print CPU State` to print all 6 sides of Game Of Life from CPU to console and log files
- TODO: world info
- Time info
  - Time need to run last update
  - The speed up of the last update in cpu and gpu
  - Continuous average of time need to run update
  - The speed up of the Continuous average time in cpu and gpu
  - What state each are at (number of time update is called)

Sample run

BLANK

SpeedUp

BLANK

Video

TODO Video Link

Making the program

We only test on linux

For the program

Need OpenGL lib and dev

Need GLEW lib and dev

Need GLU lib and dev

Need GLM dev

Need `git` clone sub modules

For Makefile

Need `CMake`

Need `pandoc` and `wkhtmltopdf`

Need `nvcc`

Wants `clang`

May Need `gcc`

Fedora install commands

```
sudo dnf group install "C Development Tools and Libraries"
        "Development Tools"
sudo dnf install cmake
sudo dnf install libXi libXi-devel
sudo dnf install glew glew-devel libGLEW
sudo dnf install clang clang-devel clang-libs clang-tools-extra
sudo dnf install glew glew-devel glfw glfw-devel glm-devel
sudo dnf install pandoc wkhtmltopdf
```

Notes

- OpenGL Code base off