

## Augmented Reality

### Lab 4

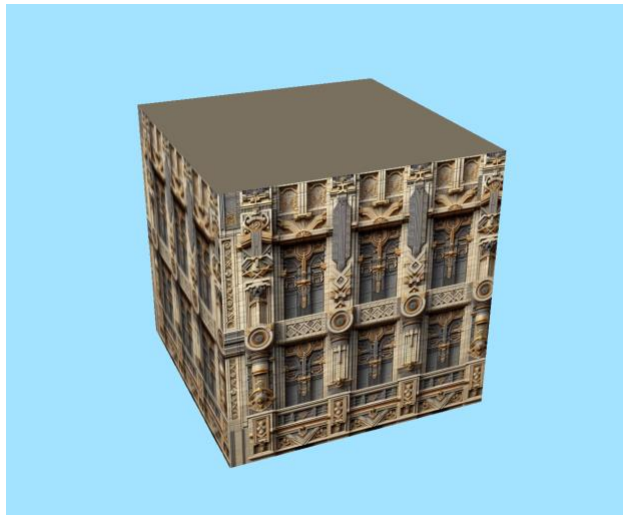
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In this lab, you will explore and implement anaglyph rendering, one of the simplest and economical method for stereo rendering. We will do our implementation in OpenGL, based on what we have learnt in Lab 1 and Lab 2.

The goal of the lab is:

- Implement the toe-in method to position the left and right eye
- Implement the asymmetric view frustum method to position the left and right eye
- Implement two-pass rendering to output the anaglyph
- View and evaluate your rendering and depth perception with a red-cyan glass

A template C++ project is provided, which renders a textured cube at the world origin. For simplicity, we assume that we will look at a virtual screen position at the world origin for anaglyph rendering.



You can navigate the scene by the arrow keys, which moves the camera on an imaginary sphere centered at the world origin. Press space bar to activate automatic camera rotation. Press R to reset the camera view.

To help you develop your code in the lab, a more complex scene with flying cubes is also available. You can activate it by pressing 0. Press 1 to switch back to a single cube scene.

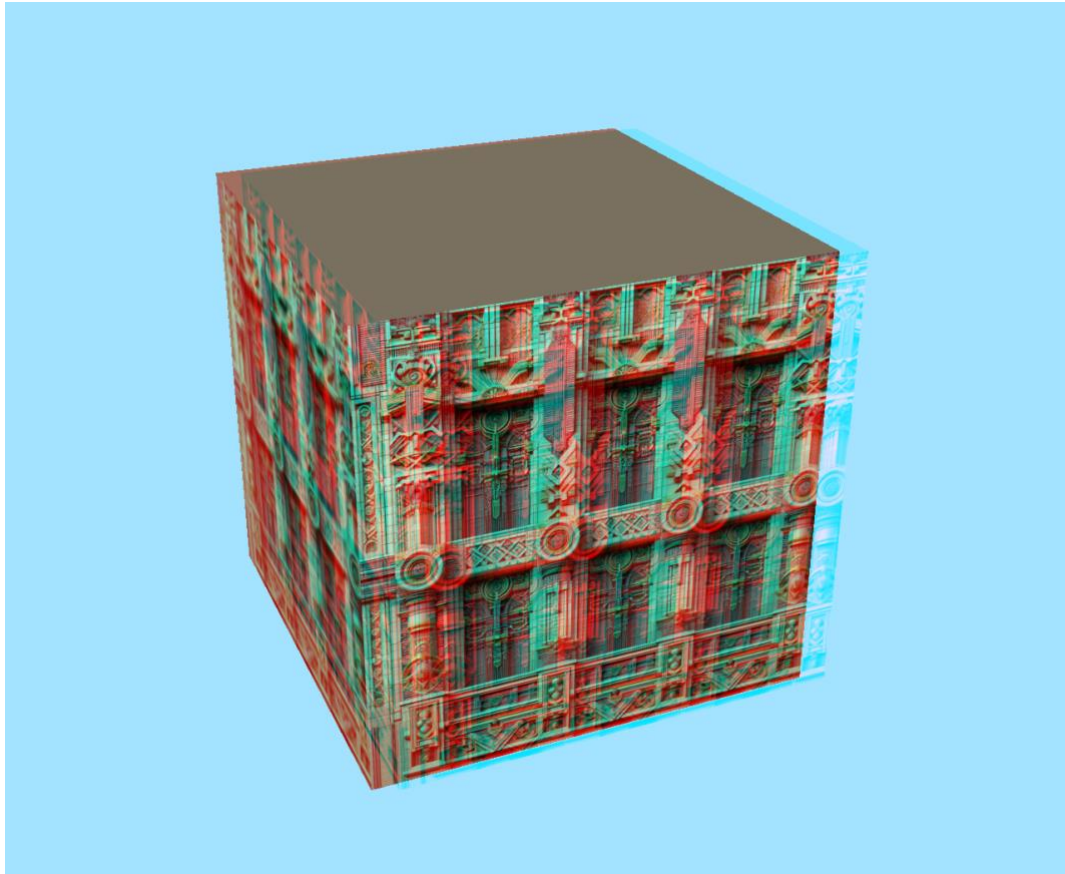


You will work on **anaglyph.cpp**. You will need to implement the following parts:

- Part 1: Implement the toe-in method
- Part 2: Implement the asymmetric view frustum method
- Part 3: Implement two-pass rendering
- Part 4: Create a new scene

Press M to switch between different rendering methods. By default we render without anaglyph. If you press M without implementing anaglyph, you will see a blank screen. It is recommended that you implement toe-in and two-pass rendering first, and leave the asymmetric view frustum for later. For Part 4, you can create a scene of your choice, instead of building cubes.

An example screenshot of the anaglyph rendering of the cube looks like the image below. If you implement correctly, you will sense some 3D effect when viewing your rendering through the red-cyan paper glass. As a further note, viewing through the glass is just for the 3D perception and not mandatory for the development of this lab. Most of your time for this lab should be spent on thinking, creating, and programming.

**Submission:**

Package (1) your **anaglyph.cpp** and any dependencies if needed, (2) a **high-resolution image** of your anaglyph, (3) an **mp4 video** that captures the anaglyph rendering of your scene into **lab4\_results.zip**. On Blackboard, go to Submissions -> Lab 4 and upload your zip file.

**Deadline:** Monday, Feb 24, 2025, at 11:59am (noon).

**Marking:**

You will get 1% from this programming lab if you demonstrate successful anaglyph rendering in your submitted code.