CS1230 Graphics Final Project Plan

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Theme

The basic theme of my project is building a virtual roller coaster in the viewpoint along the camera which will be on the roller coaster cart. I expect my project to have some scenery.

Technical Features

- Moving the camera along a path defined as a piecewise Bezier curve

I'm going to be using Cubic Bezier curves because the roller coaster will be moving in a 3D space. The following is a Cubic Bezier curve equation which I can use directly to calculate the current point on the curve:

$$\mathbf{B}(t) = (1-t)^3\mathbf{P}_0 + 3(1-t)^2t\mathbf{P}_1 + 3(1-t)t^2\mathbf{P}_2 + t^3\mathbf{P}_3 \, , 0 \le t \le 1.$$

- Fractal Terrains

I will be creating fractal terrains using what I learned from Lab 5.

- Environment Mapping

I will refer to Ray project for mapping.

Github Repo link: https://github.com/linalim/Graphics-Final

Resources

- Lecture slides and Labs for fractal terrains and environment mapping
- Tutorials on bezier curve in cpp: https://www.youtube.com/watch?v=3y4JyG7-lNE&t=2s
- Shadertoy: https://www.shadertoy.com/view/wtV3RD

High-Level Overview

When the program is run, the user will be able to click a button / key to make the roller start. The roller coaster will go infinitely go along the tracks.

Plan of Action

I will first start by rendering the terrains and doing the environment mapping. I do this before creating the roller coaster because the railway should take into account its environment, and it will be more difficult to render the terrain after creating the rails (so that the terrain and rails are in harmony with one another). Then I will first create the curves in 2D to see how it looks like, then generate the roller coaster curves using cubic bezier curves, then render the rail shapes (probably using cubes, but need to look more into this). Once the rails are finished, I will set the view of the camera so that the camera is on the object (I can start out with a sphere or a cube and then later make it into a roller coaster car -- or use a pre-built roller coaster cart mesh) as it moves along the rails.