Computer Graphics: Project 1 Design

**Title:** Moveable Racecar Track

**Concept:** A flat ground with a racetrack on it, going through the center of many torus “hoops”.

**Racetrack:** The racetrack will be generated using a Bezier curve algorithm. The points given to this algorithm will be the following:

A

B

The points A and B are the endpoints of the curve, and the other points are the corner and midpoints of the sides of the rectangle created by A and B. The Bezier curve algorithm will use the 8-point algorithm with the order of points following the red arrows above. The racetrack boundary will be offset from this Bezier curve by an amount.

**Tori:** Tori will be algorithmically generated using different values for radii and precision. Different tori will have different materials applied to them and different transformations applied to them (anything but translations, see the ImGui section below).

**Lighting:** The scene will have a sun light and a moon light at least. They will rotate around the scene opposite of each other at a speed of one rotation per minute (subject to change). Stars may be added as instanced lights of varying intensity (if there is time).

**ImGui:** Each torus will be movable in the x and y directions along the ground plane. This will be done with ImGui. Let *a* denote half the side length of a square centered at the center of a torus. Then each torus can be moved as long as the distance between it and each torus next to it is less than or equal to (diagonal distance between center of two squares in which only share a corner vertex).

When a user moves a torus, the racetrack changes as well to follow the new center of the torus. This is the reason why the torus can only move so far, otherwise the racetrack gets elongated too much.

If time allows, using mouse input to click and drag tori would be an added feature.

**Racecar:** A racecar model will be loaded into the scene to travel along the Bezier curve in between each tori. (This is the other reason why the tori cannot move too far, otherwise the racecar will seemingly jump between points on the curve).

**Hierarchy:** A Scene Graph will be used to order the models in the scene.