

Say No to Reality:

Using the Virtual World to Explore Geometry

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What We Want Do?!

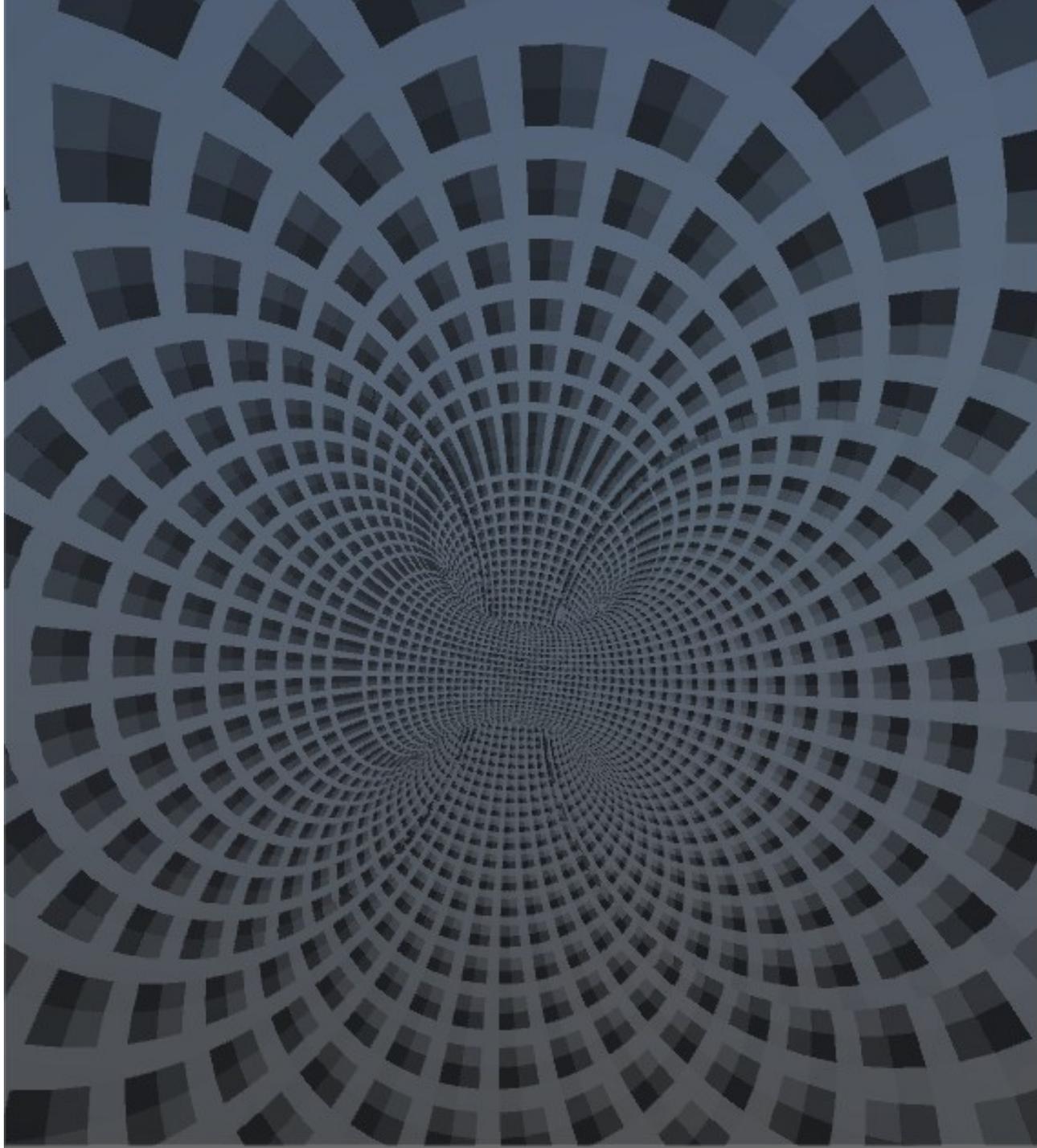
Eventually, we want to adapt Dr. Jeff Weeks' program which renders a simulation of moving in a 3-manifold. In order to do this, we first wanted to complete a simpler objective, which in this case was rendering a 2-torus and generating structures on it. This became a larger project in which we wanted to create a program similar to GeoGebra to create user-made structures in \mathbb{R}^2 and map those structures into the 2-torus.

Torus Mesh

- We wanted to make sure that we could actually render a torus in Unity. We considered the flat torus as the Cartesian Product of a circle with itself (. We then embedded it into the 3-sphere. From here, we stereographically projected it into the 3 dimensional hyperplane of $x_4 = 0$. This gave us a shadow of a torus that lived in three dimensional space, rather than in four dimensional space where the torus naturally exists.

Torus Mesh (cont.)

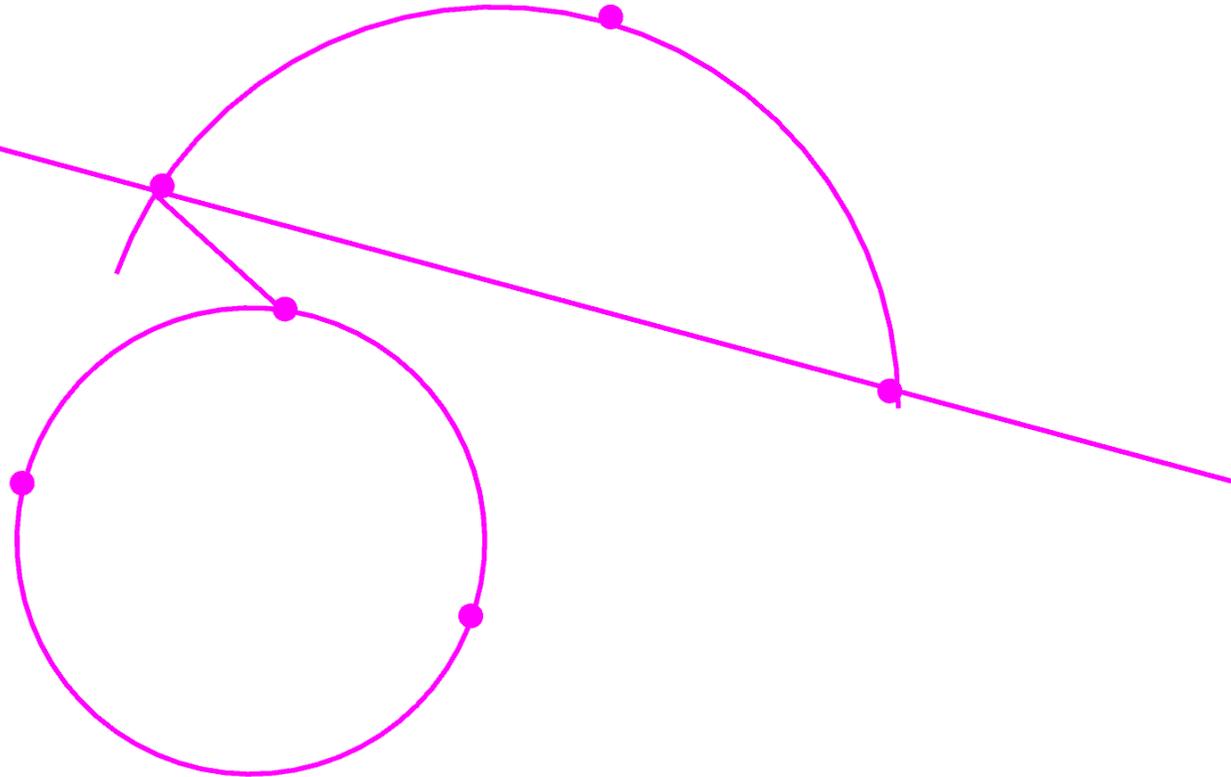
- In order to render this, we created a mesh that corresponded to points on the projection of the torus.
- In addition, we wanted to include a group action to show more of what the torus actually is. There is a natural group action on the 3-sphere, specifically through the group SO_4 . Using this, we projected the corresponding image of the torus again into the aforementioned hyperplane.



Structures in R2

- Free Draw
- Draw Circle
- Place Point
- Draw Line Seg
- Draw Line
- Draw Parallel
- Draw Perp
- Draw Ray
- Connect Circle
- Circle Arc
- Draw Angle

Back



Select 3 Points. Use the Arrow Keys to Adjust the Arc Length

Future Goals

- We would like to integrate the GeoGebra clone with the torus mesh to create R2 structures on the torus itself.
- Also, we want this further integrated with VR, so that the user can physically interact with the program and see their R2 structures deforms as the torus rotates.

Questions?