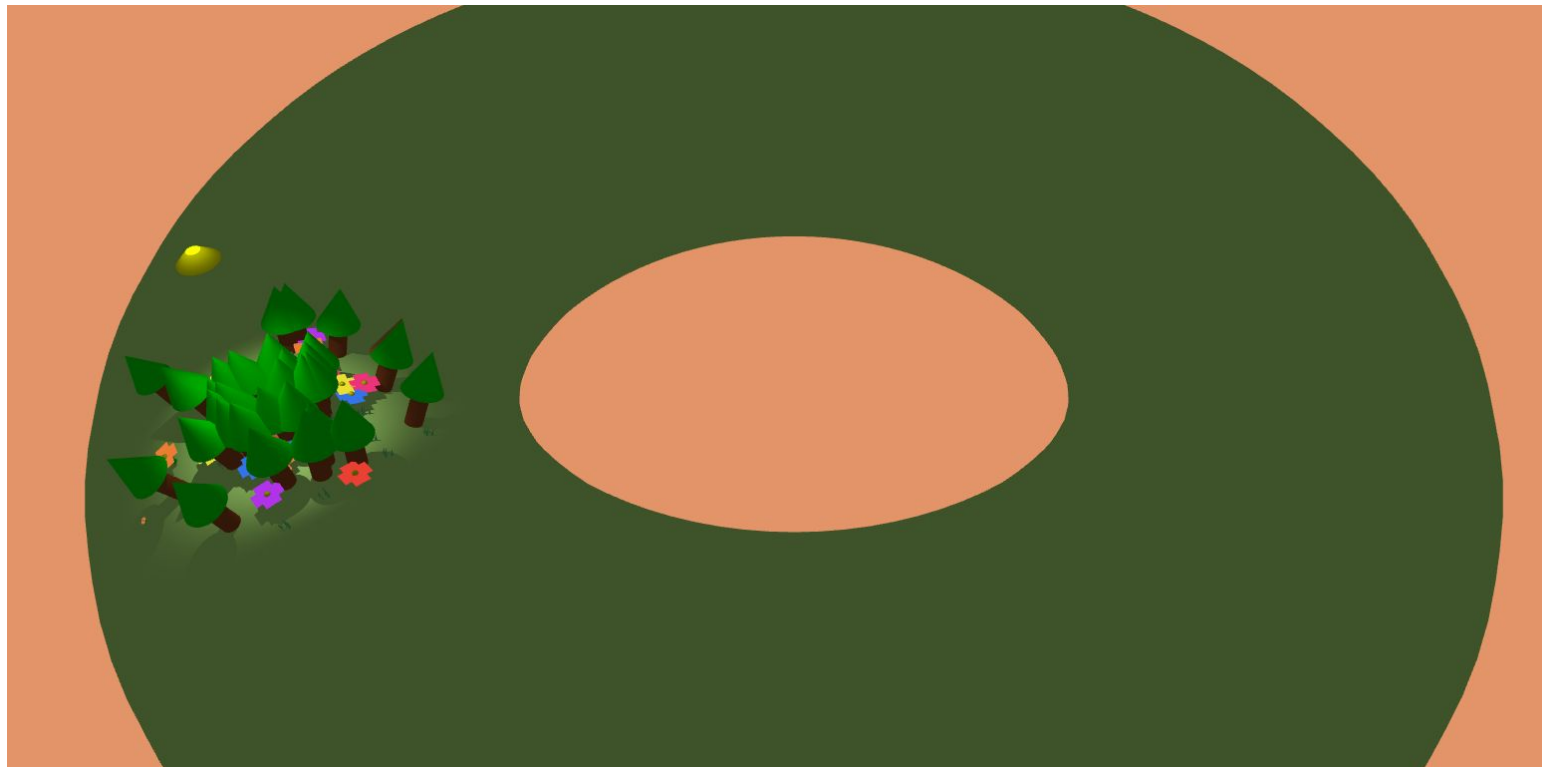# Torus Forest

Daniel João Francisco 98188
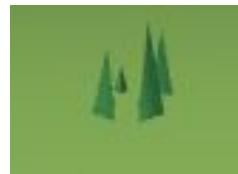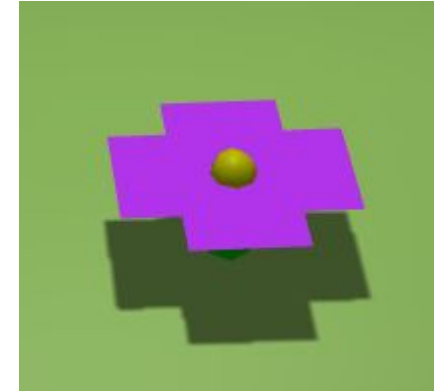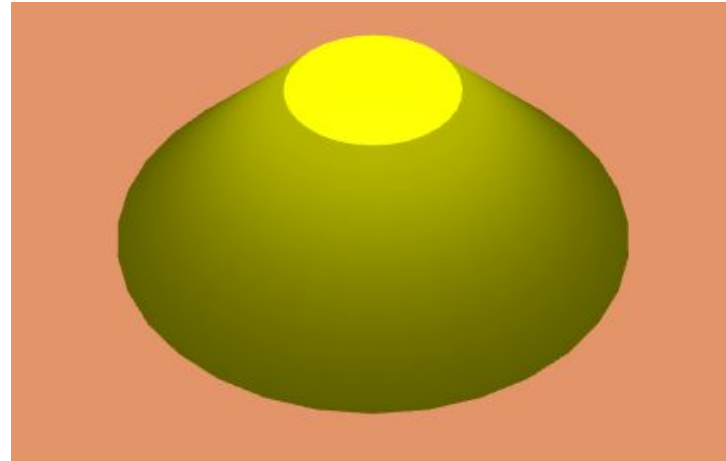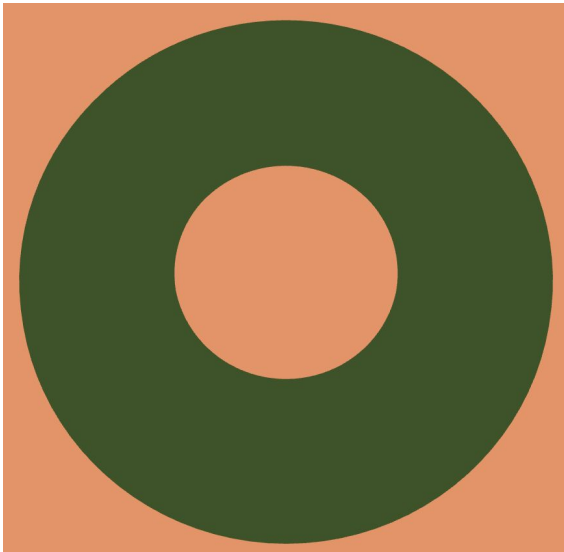
Introduction to Computer Graphics – 2021/2022 – Project 1
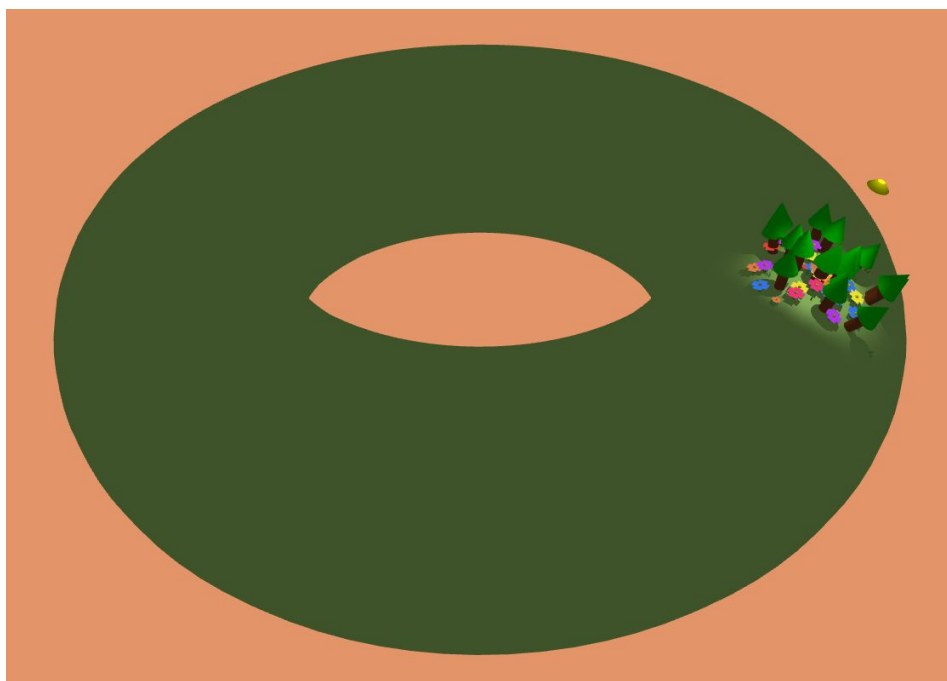
# What is Torus Forest
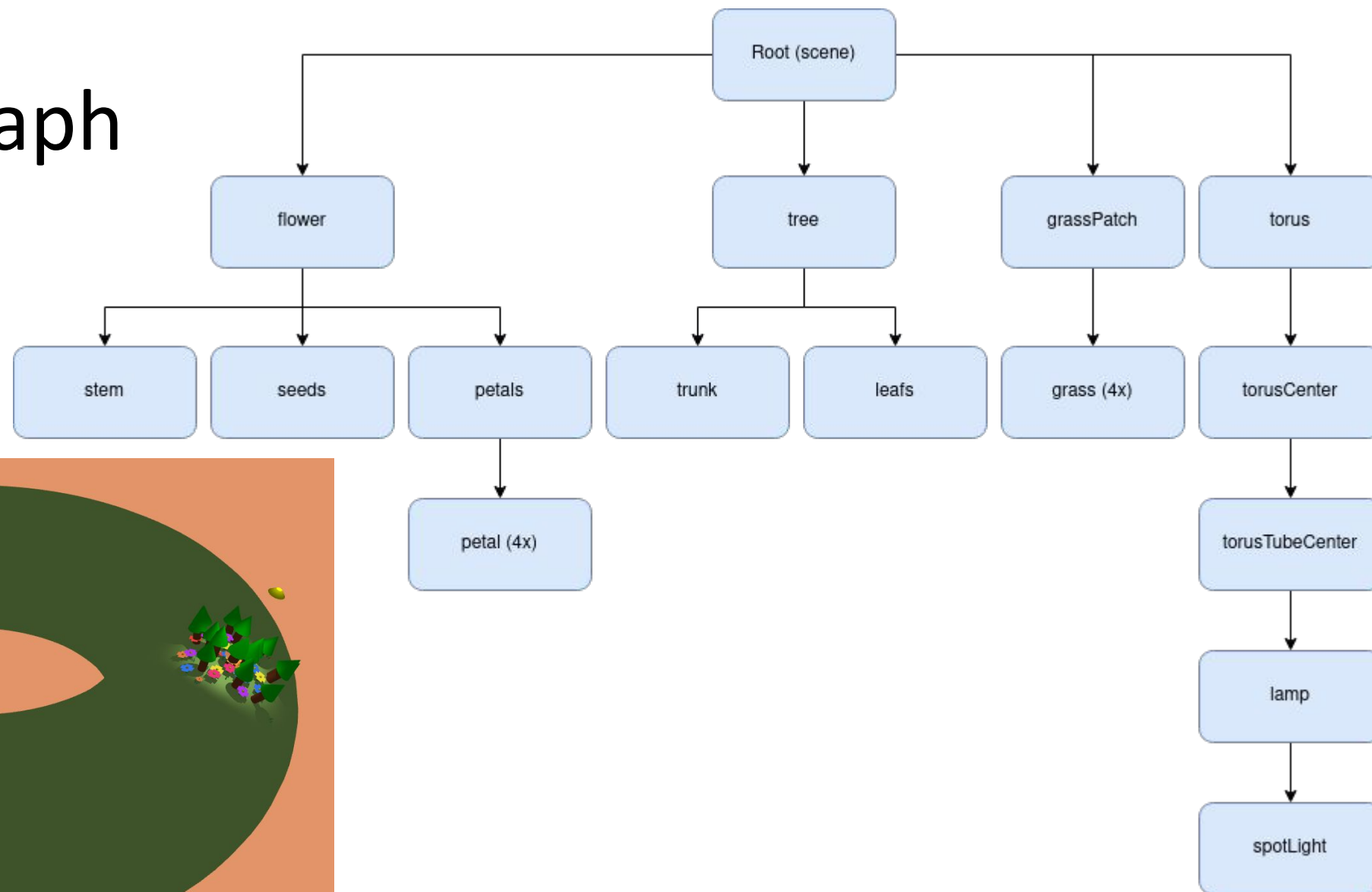
- Simulation where plants grow under lighted areas and die under unlighted areas
- https://torus-forest.herokuapp.com/
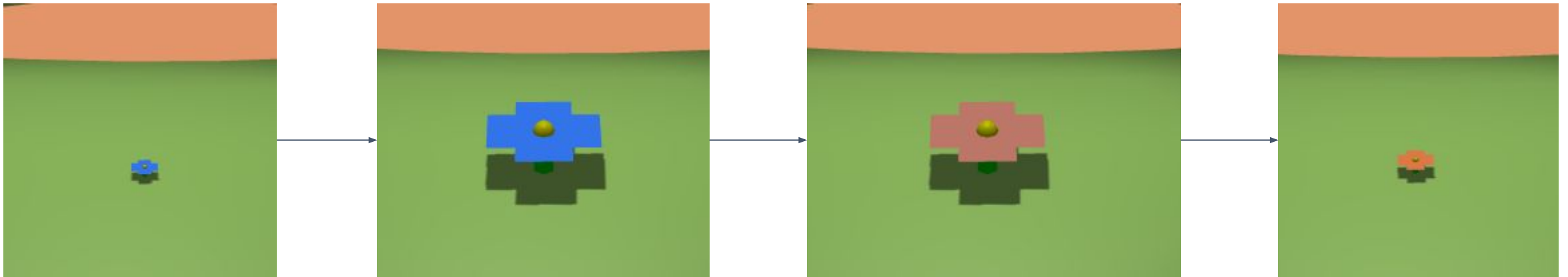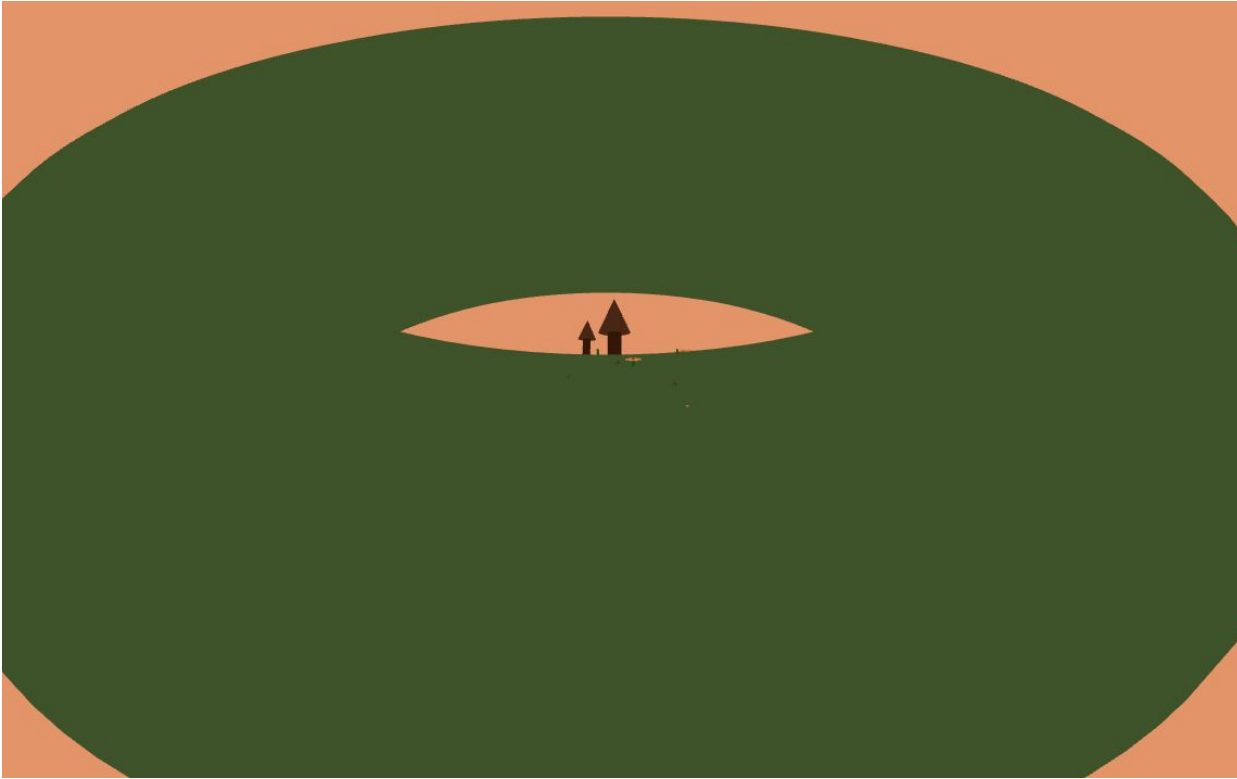
# Models

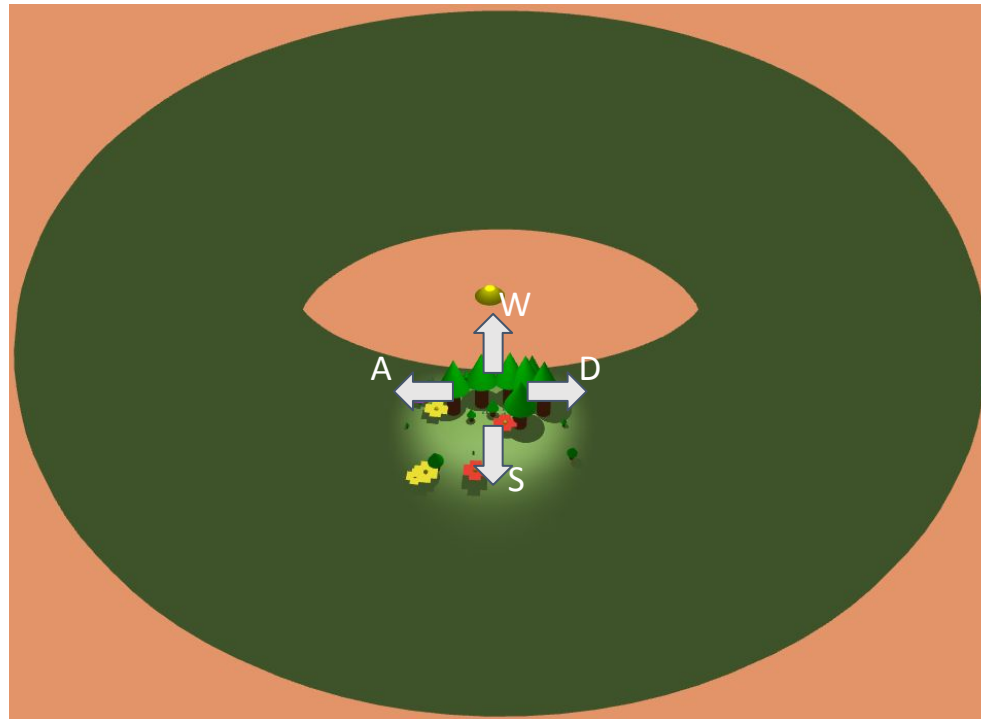# Scene Graph

# Animation

# Illumination

# User Interaction

- Rotate around the torus using WASD
- Orbit the camera around the center of the torus using the left mouse click
- Zoom in and out using the scroll wheel

# Code Organization

```
▼ lib
  (); OrbitControls.js
  (); three.js
(); helper.js
<> index.html
(); initializer.js
(); keys.js
(); objects.js
(); scene.js
{} style.css
```

```
(); keys.js > ...
  1    "use strict";
  2
  3    const keys = {
  4        W: false,
  5        A: false,
  6        S: false,
  7        D: false
  8    };
```

```
(); objects.js > ...
  1      "use strict";
  2
  3    const objects = {
  4        possibleObjects: ["flower", "tree", "grass"],
  5
  6 >      createFlower: function createFlower(posX, posY, posZ) {...
 85      },
 86
 87 >      createTree: function createTree(posX, posY, posZ) {...
126      },
127
128 >      createGrass: function createGrass(posX, posY, posZ) {...
186      },
187
188 >      createRandomObject: function createRandomObject(posX, posY, posZ) {...
198      },
199
200 >      createSpotLight: function createSpotLight(color, intensity, angle, penumbra) {...
212      },
213
214 >      createTorus: function createTorus(color, radius, tubeRadius, radialSegments, tubularSegments) {...
222      },
223
224 >      createLamp: function createLamp(color, radiusTop, radiusBottom, height, radialSegments) {...
230      }
231    };
```

# Difficulties

- Raycasting in a random direction
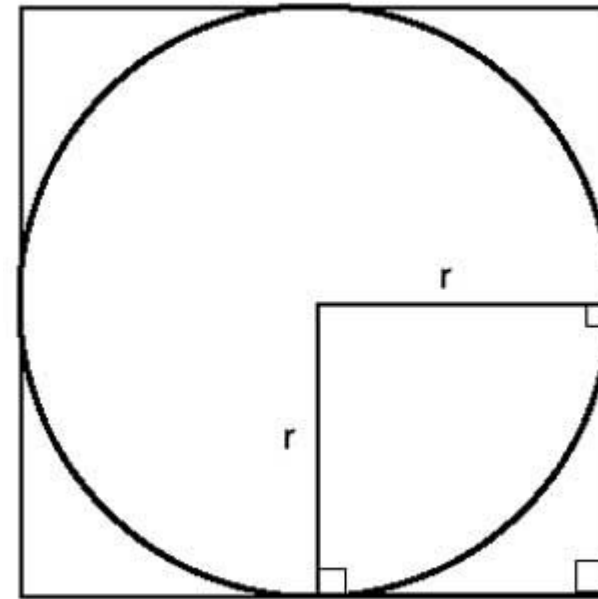
# Difficulties

- Detecting which objects are still under the light

Plane equation:
    x = x
    y = -1
    z = z

Line equation:
    x = t*dir.x
    y = t*dir.y
    z = t*dir.z

Coordinates of intersection:
    x = -1/dir.y * dir.x
    z = -1/dir.y * dir.z

# References

- https://threejs.org/docs/
- https://stackoverflow.com/questions/5837572/generate-a-random-point-within-a-circle-uniformly
- Slides from class