Introduction to 3D

In this exercise we will look at 3D using WebGL and Three.js. Refer to the lecture notes for code references.

Exercises

1. Create a blank HTML file.

```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="UTF-8">
    <title></title>
    <style type="text/css">
    </style>
  </head>
  <body>
    <script type="text/javascript">
    </script>
  </body>
</html>
```

2. Include three.js in your HTML file header (from a content delivery network).

3. Add a scene.

4. Create a sphere and add to the scene (See https://threejs.org/docs/index.html). Use MeshBasicMaterial as the the material of the sphere for now.

5. Add a camera (Set the field of view to be 80). Apply your canvas width and height parameters. Also set the camera z-position so that the camera is not inside the sphere.

6. Add a renderer. Apply your canvas width and height parameters.

7. Add and call a render() loop function. Have it rotate the sphere (as detailed below).

```
  //Code to rotate sphere
  sphere.rotateX(Math.PI/180);
  sphere.rotateY(Math.PI/180);
```

8. View your sphere.

9. Set the wireframe property in the MeshBasicMaterial parameter object to true, and view your sphere.

10. Reset the wireframe property to false, for the next few steps in the exercise.

11. Add a directional light.

```
var directionalLight = new THREE.DirectionalLight(0xffffff, 0.5);
directionalLight.position.set(0, 1, 2);
scene.add(directionalLight);
```

12. Change your material to a MeshLambertMaterial.

13. Now view your sphere.

14. Have your sphere move over back from left to right on the canvas (translation).

15. Have the sphere slowly change in colour.

Advanced exercises

1. Add a plane (flat surface) and have the sphere project a shadow onto the plane. For this exercise, use a SpotLight as well as a dim DirectionalLight. Remember not to use a MeshBasicMaterial. Add a camera helper (as detailed in the lectures) to display the light source

2. Have the sphere move towards the plane and bounce off it when it strikes the plane. Have the sphere cast a shadow on the plane as it moves slowly in the x, y and z directions.

3. On the sphere, have the wireframe displayed on top of the MeshLambertMaterial

Notes

- Creating a scene from threejs.org.