Script 02

- Instantiating primitive models.
- Illumination and shadows.
- Animation.
- Window resizing

1.1 Instantiating primitive models

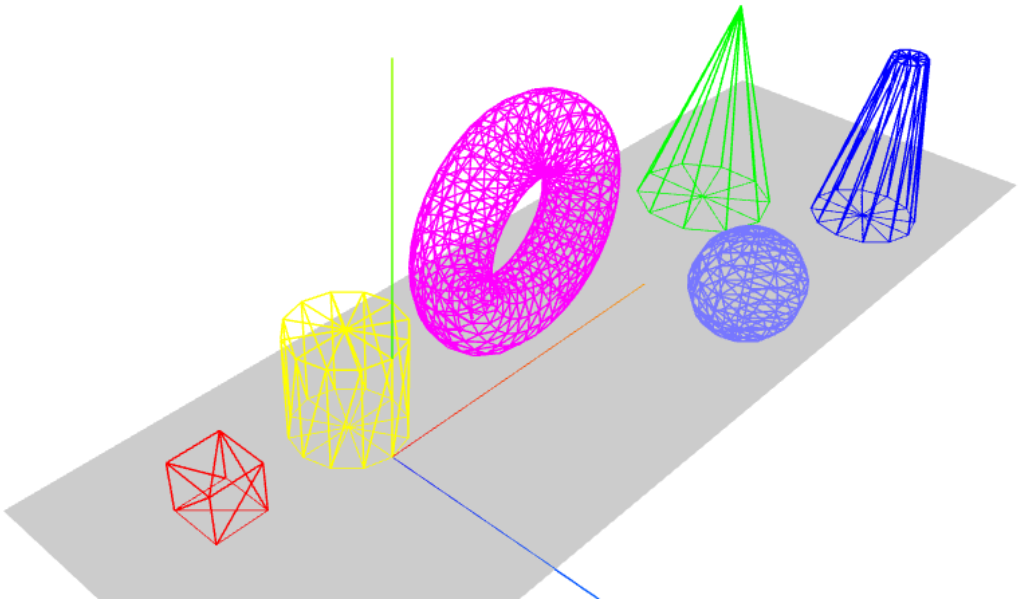
Open the file **threejs_ex_02_01.html**

Analyze the **init()** function:

- How many **models** are defined in the scene?
- Where are they placed? Are any **rotations** applied? Why?
- How is the **camera** looking at the scene?

Tasks:

- Check the **code comments** and carry out the **suggested tasks**.
- Add **four models** to the scene – with appropriate features – to obtain the scene displayed below.



1.2 Illumination and Shadows

Simple illumination effects are easily obtained by **adding a spotlight** to the scene, assigning proper **materials** to the models, and **enabling the rendering of shadows**.

Tasks:

- Change the material defining the models to **Lambert Material**, which computes shading using the Gouraud model..

- Add a **spotlight** to the scene, placed **at (-40, 60, -10)**.

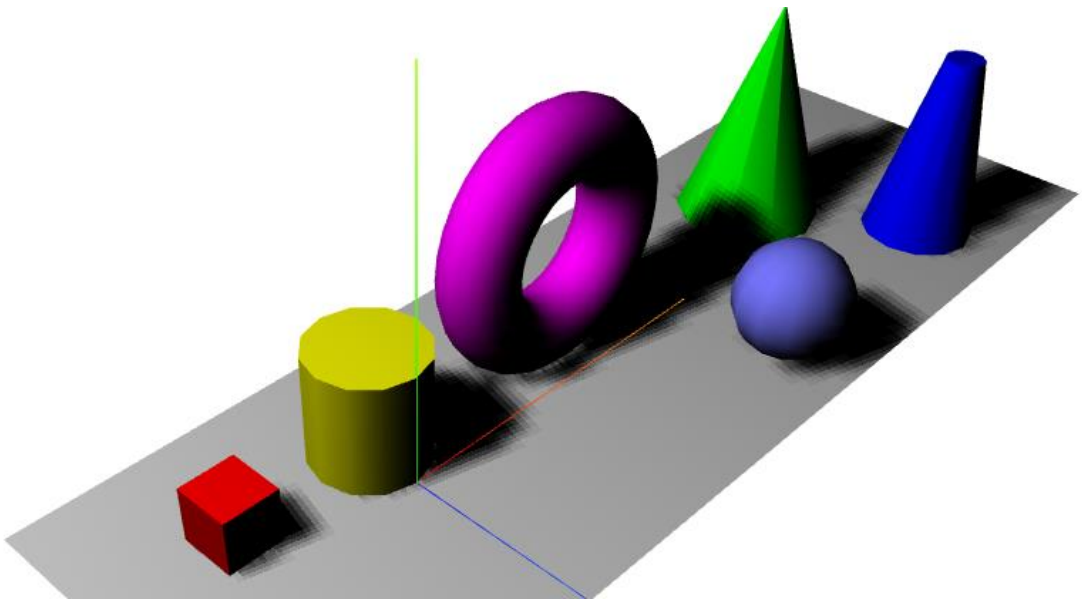
- Enable the rendering of shadows:

```
renderer.shadowMap.enabled = true;
```

- Enable the models to cast shadows on each other and to receive shadows:

```
plane.receiveShadow = true;

cone.castShadow = true;
cone.receiveShadow = true;
```



- Change the material defining the models to **Phong Material**, which computes shading using the Phong model and simulates the reflection of shiny surfaces.

- Do you spot **any difference**s?

1.3 Animation

Simple animation effects are easily obtained by **updating model position or rotation angles** just before rendering each frame, and by rendering an appropriate number of frames per second.

Tasks:

- Add the following code at the end of the init() function:

```
var step = 0;
// Update model features and render the scene
renderScene()

function renderScene() {
    // Rotate the cube around its axes
    cube.rotation.x += 0.02;
    cube.rotation.y += 0.02;
    cube.rotation.z += 0.02;

    step += 0.04;
    // Bounce the sphere up and down
    sphere.position.x = 20 + (10 * Math.cos(step));
    sphere.position.y = 3 + (10 * Math.abs(Math.sin(step)));

    // Render using requestAnimationFrame
    requestAnimationFrame(renderScene);
    renderer.render(scene, camera);
}
```

- What happens?

- Add code to **rotate the torus** around its XX axis and to **shuffle the cylinder** back-and-forth in the ZZ direction.

1.4 Adding an event listener to handle browser window resizing

Updating the display whenever the browser window is resized can be easily done by registering the corresponding event-handling function:

```
window.addEventListener('resize', onResize, false);
```

In this onResize() function, camera aspect ratio and renderer window size are updated as follows:

```
function onResize() {
        camera.aspect = window.innerWidth / window.innerHeight;
        camera.updateProjectionMatrix();
        renderer.setSize(window.innerWidth, window.innerHeight);
}
```

Tasks:

- Add the event-handling code to your example file.
- Declare the camera and renderer variables as **global variables**.
- Resize the browser window and see what happens.
- Run the example on your smartphone!