Cristina DeLisle
Student number 190390475

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Report for An Interactive Physics Scene
3D Graphics & Animation

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The scene 'Restaurant' has as aims the following aspects: 1/ to create a 3D scene where at least one object acts under physics; 2/ to create a control scheme that controls the movement of an object using forces, based on user input; and 3 / to create a compound physics object using joints.

The scene presented is formed by a Room Structure containing the floor, ceiling, and the four walls. The setting is displaying six booths created as prefabs, aligned on the left and right side of the setting. Each booth is formed by two benches (formed by two cubes) and a table, with a cube as a support. In terms of lighting of the scene, there are multiple sources of light:

- 14 points of lights displayed under capsules representing light sources;
- The directional light;
- A spotlight which follows the main character, having a 179 Spot Angle and a Range of 100, which creates significant light in the room, especially where the character is found. It also influences the colors of the objects presented in the Scene, with the color of the light setted for the spotlight.

In terms of cameras present in the Scene, there is one camera which is found in the Player structure, as a child. It follows the Player and displays its back, with the aim to offer to the user the perception of following the main character. Also, it moves in the direction of the character and there is a controlled coordination between movement and what the camera is displaying, with the possibility to also look up / down and in any direction the user wishes to look.

The main character is shown in the scene as a red capsule, being displayed from its back using the camera controls setted for the scene. However, it does have two frontal eyes. It holds what is supposed to be a tray, on top of which there is a box with round chocolates of different colors. The tray is positioned in the right side of the player as it is shown during the Play mode, which makes it possible for the user to see partially what is on the tray.

Overall, the user in play mode has the experience of a waiter that walks around tables and can look around the scene. The colors are selected in such a way to complement the color of the spotlight following the player.

The control scheme that controls the movement of the player (a Rigid Body) is using forces and is based on user input. What determines the movement of the character is a Player movement script and what determines the sensitivity to look up / down / around is determined by a Player look script. Both have the following main source: https://www.youtube.com/watch?v=LqnPeqoJRFY&list=PLxWnfLOoHOJaNaMDb2ZiDzWtVAMNXrKn4&index=10&ab_channel=Plai , tutorial created by the user Plai, last checked on 10/01/2022 . Regarding the camera movement, the main source is: https://www.youtube.com/watch?v=E5zNi_SSP_w&list=PLxWnfLOoHOJaNaMDb2ZiDzWtVAMNXrKn4&index=9&ab_channel=Plai , by the same author, last checked on 10/01/2022.

Figure 1 shows that moveDirection is setting the direction where the player is looking:

```
moveDirection = transform.forward * verticalMovement + transform.right * horizontalMovement;
```

Figure 1

In the MovePlayer method, a force is added to the rigid body, in the movement direction, using Rigidbody.AddForce (https://docs.unity3d.com/ScriptReference/Rigidbody.AddForce.html). To RB.AddForce, we pass the moveDirection, for the move direction, multiplied by moveSpeed, which ensures that the Player is moving at a certain speed and ForceMode.Acceleration for the force mode. Normalize is used to ensure that the magnitude is having an adequate value 1, ensuring the smoothness of the movement. This part of the script is shown in Figure 2:

```
rb.AddForce(moveDirection.normalized * moveSpeed, ForceMode.Acceleration);
```

Figure 2

For the purposes of the report, the camera movement controller script, though present, is not covering the requirements of the assignment or the extension chosen to make, being a feature added to the user experience.

The use of joints is contributing to the effect of the player holding a tray and with a box of chocolates on top. The tray is a Fixed joint added as a Component to the Player. On the tray there is the box which is added as a Component to the tray and the candies are Fixed joints added to the box of chocolate. The use of fixed joints was doubled by a Mass Scale adjustment in such a way that the Player's movement is not affected significantly while having the other objects added to it. The gravitational force contributes to having everything stick together while the Player is moving with a certain speed or looking around. There was a choice which involved the option of using Hinge joints as well, for the candies. However, this would have contributed to complicate the Player's movement and there were issues when the object added as a Hinge joint was falling from the box, which caused an unnatural movement in the way the Player manifests during the game. The fixed joints are contributing to the cohesion and the impression that the waiter is holding a solid tray, with a box of colored candies that don't fall, given the fact that the support they are found on is solid enough.

Project links:

Project Link: https://hub.labs.coursera.org:443/connect/sharedhbibghku?forceRefresh=false

Project Link with the complete path:
https://hub.labs.coursera.org:443/connect/sharedhbibghku?forceRefresh=false&path=%2FvMBxTIyvUcM5DXb37Upsye6EhaJPW4z7oTLHiHdIrBJcLsAIkbpg8LFmKA6qdMB0%2F