

Coursework Report

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Abstract

The aim of this project was to expand on the previous coursework given for the graphics module of year two of Edinburgh Napier University. The scene shown has taken visual inspiration from the game *Antichamber*, using a simplistic black and white style, with minimal colour. As well as this, inspiration was taken from the idea of a lava lamp, which would cast coloured light across the room, allowing for each of the different primary colours to be mixed on the black and white furniture.

Keywords – napier, 40206862, course work

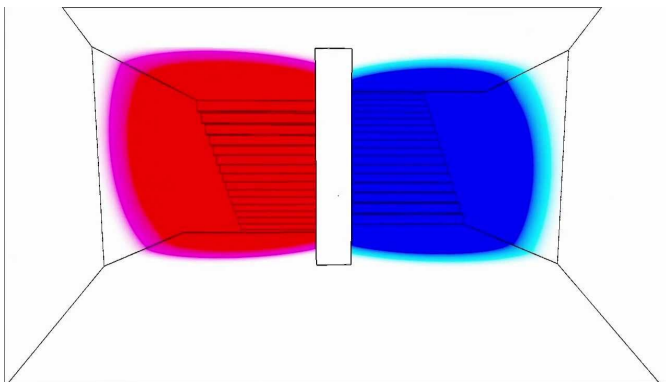


Figure 1: **Antichamber** -example of the game Antichamber(2013)

1 Introduction



Figure 2: **Example 1** - basic image of scene

Figure 2 shown displays the primary effects used within the project; multiple lights, texturing, and normal texturing. Not shown is the transforms being used to move the balls in the centre of the lamp.

The lighting being used is: multiple point lights based within the balls, a spotlight used to emphasise the centred lamp, and a directional light used solely for the normal mapping, in order to demonstrate it. All geometry within the program is textured, however the table found in the corner of the room is textured using a normal texture, giving a better depth to the wooden grain.

The shaders within the project are used to replicate how the light reacts to the objects, with the need to react to the three different colours coming from the centred point lights. The shading method used is phong shading, which gives a much more realistic look to it compared to gouraud shading.

The transforms used use delta time and sine and cosine waves in order to create rotations around the centre of the scene, as well as moving up and down on the y axis to add a further comparison to a lava lamp. An attempt was made to include two other features to the project; a real-time mirror, as well as an isosurface on the balls in the centre of the scene - or metaballs. However these were fruitless, as neither could be implemented, with some rendering issues affecting the mirror and a lack of conversion between theory and practice for the metaballs.

2 Implementation

The implementation process for the scene was relatively simple for the most part, however the complications came when the decision was made to use multiple light sources as well as having the three point lights being based within the balls that rotate around the centre. By inverting the normals of the balls it would allow the light to travel a lot farther from the balls, however it would mean the balls themselves could not receive light. Instead, the material of the balls were adjusted to allow for their colours to come through more vividly without taking away from the lighting being cast on them. Two different post processing effects were added to the scene to display how the scene may look in different scenarios - examples 2 and 3. These two effects are applying a sepia tone, removing all colour from the scene and replacing them with different intensities of beige and applying a blur effect to the scene, giving a less sharp feel to it. Several attempts were made at implementing metaballs to the centre of the scene based on tracking the two vertices of the two spheres. A line would be drawn between these two points

and compared to a set of 9 points within a grid and, using this, display a certain mesh depending on which points are on a given side of the mesh. The problem lay with implementing the theory of the process into a practical environment. Along with this a mirror was implemented within the scene, by using the frame buffer as a texture for a plane, using a secondary camera placed in the centre of the mirror plane and moving in an inverse direction to that of the freecam, or the set cameras. This would give the impression that the mirror was reflective, though some improvements would need to be made to take into consideration the distance the camera was from the mirror.

4 Conclusion

To conclude, the focus of the scene would be the balls in the centre, and the realistic style of lighting used in order to portray a lava lamp-esque feeling to the scenario. With more time and work put into the project, the lamp itself could be made to look more lifelike in terms of having a more realistic lava gel without losing any of the realistic lighting and shading effects.



Figure 3: **Example 2** - sepia tone applied to scene

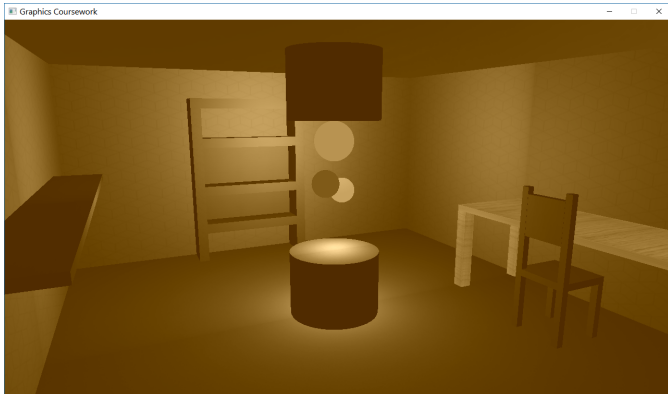


Figure 4: **Example 3** - blur effect added to scene

3 Future Work

The issues faced with the implementation of metaballs is the natural place to start for any future work going into the project, as well as fixing any rendering issues with the mirror. However, had these two factors been achieved then the next step forward would be to create a more realistic lava-lamp by causing a less fixed number of balls, as well as shape and textures to them.