

CAFETERIA GRAPHICS DESIGN

Submitted By

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1. Introduction

1.1 Background

This project combines a creative and functional interior design that includes a cafeteria, theatre, kitchen, and more. The cafeteria is thoughtfully designed with essential furniture such as tables, chairs, sofas, mirrors, sinks, and well-placed lighting. The theatre offers a relaxing setup with comfortable sofas, torus-shaped lights, a ceiling fan, interactive features like a sliding door, a curtain that opens and closes, and a TV with dynamic content. Adding a playful touch, the sky is filled with colorful flying balloons made using spheres and Bezier curves. The compact kitchen is fully equipped with a sink, stove, microwave, and cabinets. A functional lift makes it easy to move between floors. Dynamic day modes like morning, noon, afternoon, evening, and night adjust the lighting to match the time of day. The design is simple, practical, and visually appealing, blending creativity with everyday functionality.

1.2 Objectives and Goals:

- To explore modern OpenGL features like shaders, transformations, and lighting.
- To create Complex 3D Objects like cubes, spheres, pentagons, hexagons, cylinders (polygons and hollow polygons), torus, cones, and curve objects using Bezier curves.
- To apply translation, rotation, and scaling to objects.
- To use point light, directional light, and spotlight.
- To implement ambient, diffuse, and specular lighting.
- To apply textures to objects for realism.
- To create motion for objects.

2. Project Description:

In this section we will discuss the features of our project:

2.1 Views

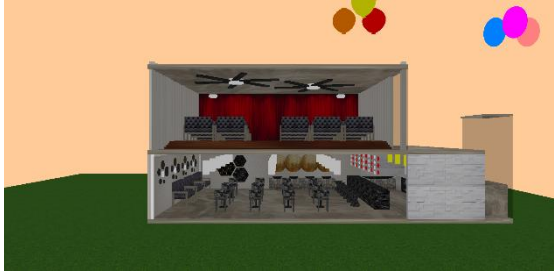


Fig 1.1: Front view

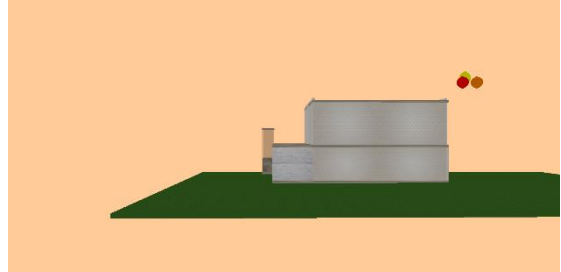


Fig 1.2: Back view

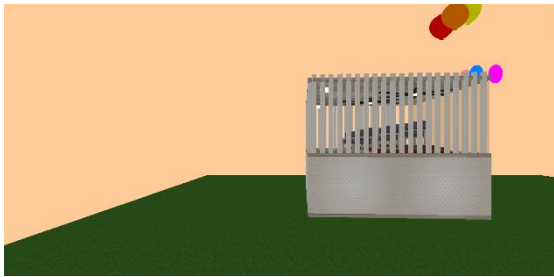


Fig 1.3: Left view

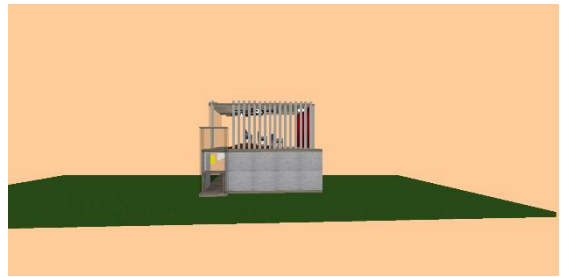


Fig 1.4: Right view

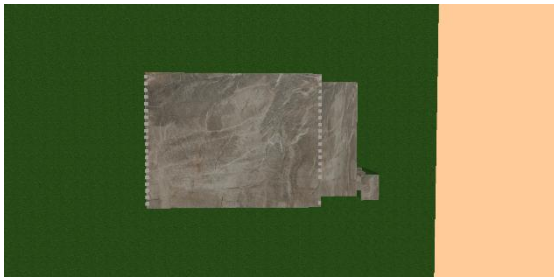


Fig 1.5: Top view

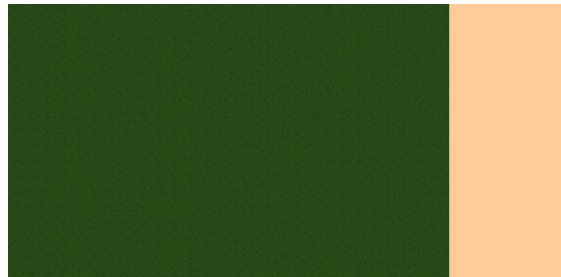


Fig 1.6: Bottom view

2.2 Spots

The cafeteria is a simple and cozy space designed to feel welcoming. It has tables, chairs, and sofas for seating, along with mirrors and sinks to keep things practical. The lighting, made with basic shapes like polygons and cones, adds a warm and pleasant feel. There's also a sliding door that makes moving in and out easy while adding a modern touch.

The kitchen is compact and designed with functionality in mind. It includes a sink for washing, a stove for cooking, a microwave for heating, and cabinets for storing essentials.

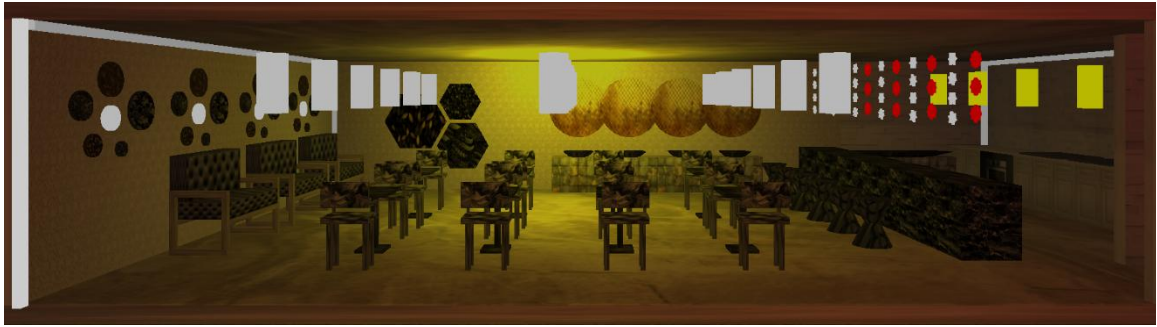


Fig 2.1: Cafeteria and kitchen

The theater is designed to be a relaxing and cozy space. It has comfortable sofas for seating, soft lighting made from torus-shaped lights, and a ceiling fan to keep the air fresh. There's a sliding door for easy access, and a curtain that can open and close to change the atmosphere. The TV displays dynamic content, adding to the entertainment.



Fig 2.2: Theatre

2.3 Daylights

The daylight feature uses directional light by adjusting the ambient light values to reflect different times of the day. As the day progresses, the lighting changes from morning to noon, afternoon, evening, and night, creating a natural shift in the environment.



Fig 3.1: Morning Scene



Fig 3.2: Noon Scene



Fig 3.3: Afternoon Scene

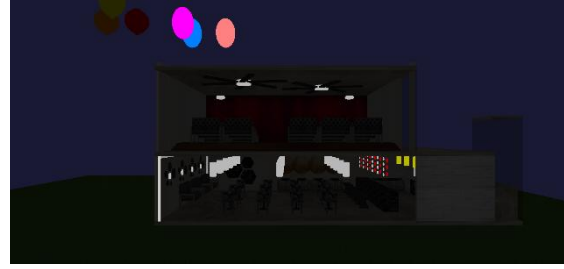


Fig 3.4: Evening Scene

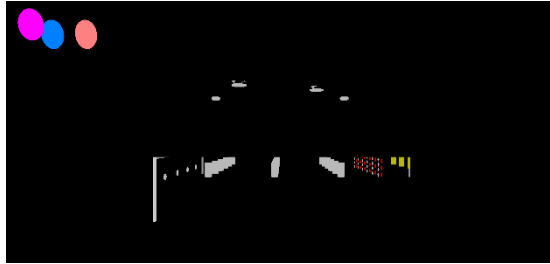


Fig 3.5: Night Scene

2.4 Lighting

In the cafeteria and theatre, spotlights and point lights are used to create a balanced lighting atmosphere. Spotlights highlight key areas, while point lights provide an even, warm glow throughout the space.

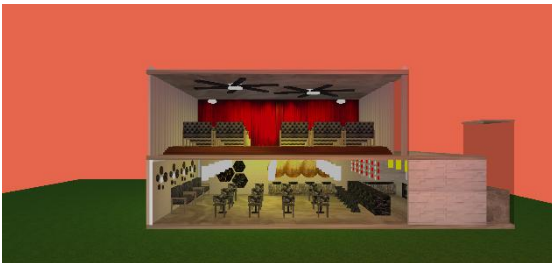


Fig 4.1: All lights on

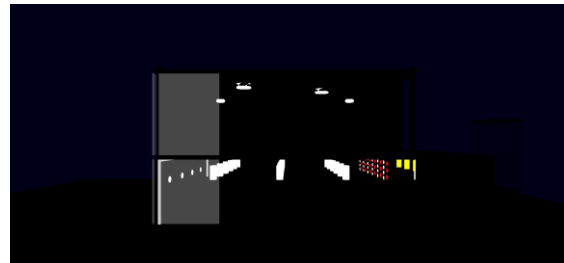


Fig 4.2: All lights off

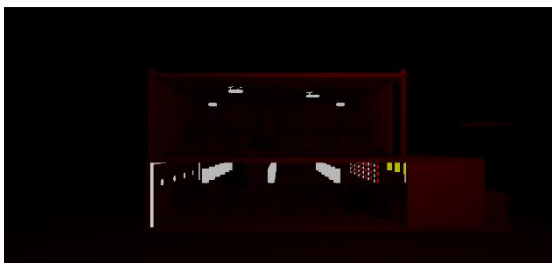


Fig 4.3: Only point lights on

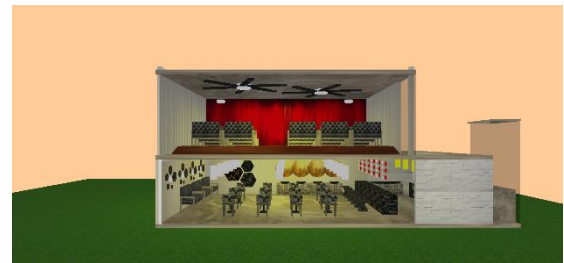


Fig 4.4: Only point lights off



Fig 4.5: Only directional light on



Fig 4.6: Only directional light off



Fig 4.7: Only spotlight on



Fig 4.8: Only spotlight off

2.5 Objects

The chairs in the cafeteria are created by scaling 10 cubes, and the tables are made by scaling 3 cubes to the right proportions. The tools are designed using 2 cones, rotated to create the desired shape. The chairs, tables, and tools are all textured to give them a more realistic appearance



Fig 5.1: Chair-Table

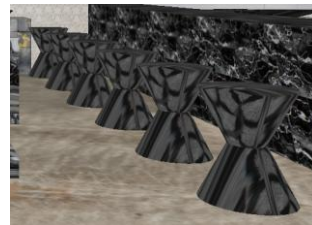


Fig 5.2: Tool

The interior design uses hexagons and cylinders, each with textures. Cylindrical white lights are placed around the space to give a soft and bright glow.

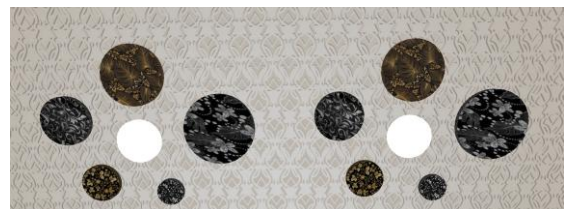


Fig 5.3: Interior design

In the cafeteria, the sinks are created from hollow hexagons with a textured surface, giving them a unique and functional design. The kitchen sink is made from a hollow pentagon, also textured for a realistic look. The mirrors are designed using cylinders, each with a texture.

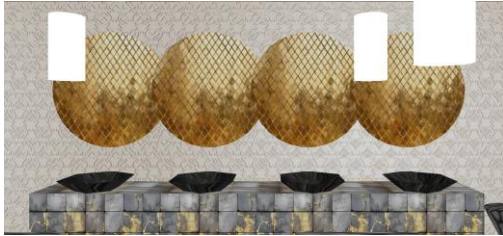


Fig 5.4: Mirror and sink



Fig 5.5: Kitchen sink

The sofas are made by scaling 12 cubes and texturing them to create a comfortable and realistic look. The stairs are constructed from cubes, which are scaled and translated to form each step, and are also textured to match the overall design.

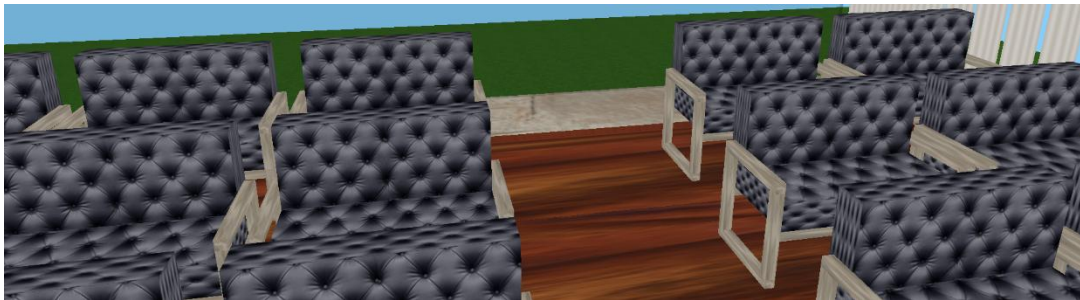


Fig 5.6: Sofa and stair

The cabinet, stove, and oven in the kitchen are made using textured cubes. The cubes are scaled and arranged to form the shapes of these items, with textures applied to make them look realistic.



Fig 5.7: Kitchen

The TV structure is made from a black cube, while the screen changes texture over time to display dynamic content.



Fig 5.8: Television

2.6 Light Objects

The lighting includes cylindrical yellow and white lights that provide soft illumination. White starlights are created using triangles, while yellow starlights are made from cubes. There's also a torus-shaped light made of cubes.



Fig 6.1: Cylinder light

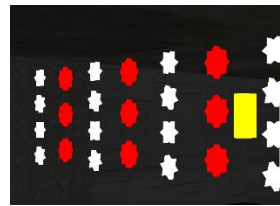


Fig 6.2: Star light



Fig 6.3: Torus light

2.7 Moving Objects: Translation

There are three colors of balloons made from Bezier curves, and three other colors of light balloons are created using spheres and are flying in the sky. The balloons are positioned using the translation method, giving them a floating, dynamic effect in the scene.

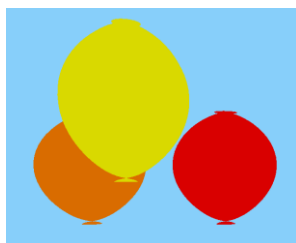


Fig 7.1: Balloon

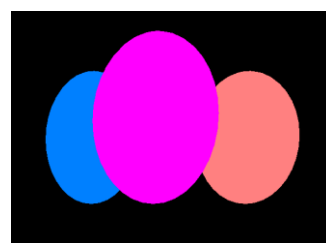


Fig 7.2: Light balloon

The lift, made of 4 textured cubes and 2 transparent cubes, moves between the ground and first floors with key interaction. Transparent cubes form the lift's space, and the lift shifts

up and down using the translation method when the user presses a key. This allows for easy control of the lift's movement between the two floors.



Fig 7.3: Lift on ground floor

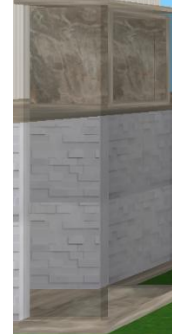


Fig 7.4: Lift on first floor

2.8 Moving Objects: Rotation

The fan is designed with a white light cylinder in the center, acting as the motor, and 6 fan blades made from cubes with textures. Using key interaction, the fan blades rotate in 60-degree angles, creating a realistic spinning effect when the corresponding key is pressed.



Fig 8.1: Fan off



Fig 8.2: Fan on

2.9 Moving Objects: Scaling

The cafeteria door is made of a transparent material. With key interaction, it scales negatively and positively, creating the effect of a bending door when opened. Similarly, the door scales positively and negatively to close, giving it a smooth, interactive motion that mimics a real-world bending door.

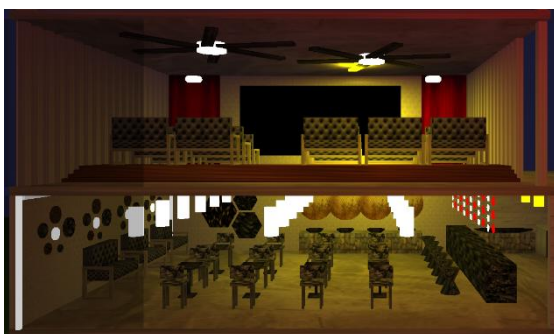


Fig 9.1: Cafeteria door opened

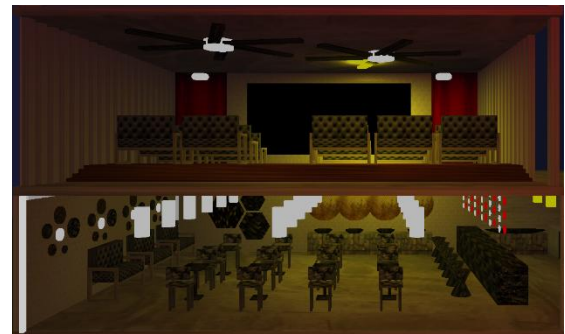


Fig 9.2: Cafeteria door closed

The two curtains are made of textured cubes, designed to slide open and close. With key interaction, the curtains scale negatively, revealing the TV behind them. When the curtains are closed, they scale positively, hiding the TV once again, creating an interactive effect that mimics real curtains.



Fig 9.3: Curtain opened



Fig 9.4: Curtain closed

The lift door is designed to open and close using key interaction. When the key is pressed, the door scales to open, revealing the lift inside. After a short time, the door automatically scales back to its original position.



Fig 9.5: Lift door opened



Fig 9.6: Lift door closed

3. User Interaction and Controls:

Keys	Actions
Left	Translate camera in x-axis (-1)
Right	Translate camera in x-axis (+1)
Up	Translate camera in y-axis (+1)
Down	Translate camera in y-axis (-1)
+	Translate camera in z-axis (+1)
-	Translate camera in z-axis (-1)
B	Daylight enabled
B+1	Morning
B+2	Noon
B+3	Afternoon
B+4	Evening
B+5	Night
R	Rotation enabled
R+X	Rotate camera in x-axis (+1)
R+U	Rotate camera in x-axis (-1)
R+1	Rotate camera in x-axis (+90)
R+Y	Rotate camera in y-axis (+1)
R+V	Rotate camera in y-axis (-1)
R+2	Rotate camera in y-axis (+90)
R+Z	Rotate camera in z-axis (+1)
R+W	Rotate camera in z-axis (-1)
R+3	Rotate camera in z-axis (+90)
L	Light enabled
L+1	All lights on
L+2	All lights off

L+3	All point lights on, directional and spot lights off
L+4	All point lights off, directional and spot lights on
L+5	All spot light on, directional and point lights off
L+6	All spot light off, directional and point lights on
D	Cafeteria door enabled
D+1	Cafeteria door open
D+0	Cafeteria door close
E+1	Lift goes to 1 st floor
E+0	Lift goes to ground floor
O+1	Lift door open
O+0	Lift door close
C+1	Curtain open
C+0	Curtain close
T+1	Television on
T+0	Television off
F+1	Fan on
F+0	Fan off

4. Discussion:

The system design is focused on creating an interactive and realistic environment with key features that respond to user input. The cafeteria and kitchen are designed with simple shapes like cubes, cylinders, and cones, which are textured to resemble real-world materials. These shapes are used to create furniture, appliances, and other elements, adding a sense of realism.

Lighting plays an important role in setting the mood, with various types of lights like cylindrical, star-shaped, and torus lights. These light sources help illuminate different areas of the space in a visually appealing way.

The lift system, curtains, fan, and door all incorporate key interactions, allowing users to control movements like opening, closing, and shifting between floors. The use of scaling and translation methods makes these interactions smooth and intuitive, adding a layer of dynamic functionality to the environment.

The daylight feature adjusts the lighting throughout the day to create a realistic atmosphere. It uses directional light by changing the ambient values, simulating the progression from morning to night.

Overall, the design combines simple geometric shapes with key interactions to create a space that is both functional and engaging, making it a unique and interactive experience.

5. Conclusion:

The design brings everything together by using simple shapes, textures, and interactive features to create a space that feels both real and fun to use. The lighting, with its natural shifts throughout the day, helps set the right mood, while interactive elements like the lift, curtains, and doors make the space feel dynamic. Overall, the design strikes a nice balance between being functional and visually appealing, making it an engaging and comfortable environment to experience.

References:

- Lab Provided codes
- Lab Slides
- Class Slides