COSC3306_Final Project Report

Interactive 3D Architecture Environment

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Department of Computer Science

Introduction to Computer Graphics (COSC3306_F01)

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1. Peer Evaluation Form

Members	Roles
Olivia Alex	*Structure & Layout Designer*
Virpal Kaur	*Furniture & Materials Specialist*
Aastha Kaushik	*Camera & Navigation Developer*
Sahejpreet Kaur Brar	*Lighting & Animation Lead*
Deepasree Meena Padmanabhan	*Integration & Quality Checker*

No.	Date	Members	Project Steps
1	*10/20/2025*	*Deepasree, Olivia, Virpal, Aastha, Sahejpreet*	*We had a meeting to talk about the project and plan for what to do and how to do it.*
2	*10/20/2025*	*Deepasree*	*Created a WhatsApp group for the discussion of the project.*
3	*10/21/2025*	*Deepasree*	*Made a sample report.*

4	*10/22/2025*	*Deepasree, Olivia, Virpal, Aastha, Sahejpreet*	*We me and shared some ideas.*
5	*10/24/2025*	*Deepasree*	*Showed the report format to the professor and got it checked.*
6	*10/26/2025*	*Olivia Alex*	*She designed the apartment layout.*
7	*10/28/2025*	*Sahejpreet Kaur Brar*	*She added lighting and animation to the apartment.*
8	*10/30/2025*	*Aastha Kaushik*	*She set up the camera and navigation for the apartment.*
9	*10/31/2025*	*Deepasree, Olivia, Virpal, Aastha, Sahejpreet*	*We met and shared some ideas.*
10	*11/01/2025*	*Virpal Kaur*	*She added furniture and materials to the apartment.*

12	*11/05/2025*	*Deepasree, Olivia, Virpal, Aastha, Sahejpreet*	*We met and shared some ideas and fixed it.*
13	*11/06/2025*	*Deepasree*	*Checked the final project for the final working integration and quality check.*
14	*11/07/2025*	*Olivia, Virpal, Aastha, Sahejpreet*	*Send their working portion description and sent through WhatsApp.*
15	*11/09/2025*	*Deepasree*	*Added all details and edited the final report and work finished.*
16	*11/12/2025*	*Deepasree, Olivia, Virpal, Aastha, Sahejpreet*	*Showed our final project to professor work for the verification.*
17	*11/28/2025*	*Deepasree*	*Submitted the final project report and output html file on Brightspace.*

2. Project Overview

2.1 Introduction

The name of our project is "Interactive 3D Two-Room Apartment." It is an interactive interior space made with Three.js. The model consists of a living room and a bedroom that are separated by a wall with doors.

A web browser shows the whole scene as it happens.

The project teaches some important things about computer graphics, like how to build shapes.

- *Creating textures and materials*
- *adding light and shadows*
- *adding motion and interactivity*
- *Using OrbitControls to move the camera smoothly.*

We made all the textures and materials in JavaScript, which made them one of a kind and met the course criteria. We did not utilize any pictures from outside.

2.2 Project Objectives

- *Make a whole two-room apartment setting with simple 3D shapes.*
- *Use materials and textures that look real and were generated by programs.*
- *Use ambient, point, and directed lighting to make the shading look real.*
- *Move things that are interactive, such as doors and ceiling fans. Provide users the ability to change the camera's angle and movement.*
- *Show a functioning HTML/CSS user interface with buttons that let people go around.*
- *Meet all the rules and marking points listed in the COSC3306 final project guide and rubric provided by professor.*

3. Instructions to run the application.

3.1 Setup & System Requirements

- *Use a browser such as Google Chrome, Mozilla Firefox, Microsoft Edge, or Safari.*
- *To load Three.js libraries, internet access is needed.*
- *Text editor like Visual Studio Code (VS Code) for Live Server needed.*

3.2 Steps to Run the Project:

1. *Create a folder named **COSC3306_Final Course Project Report** on computer.*
2. *Save the project file as "TwoRoomApartment.html" in the folder.*
3. *Open the folder in **Visual Studio Code**.*
4. *Right-click on the HTML file and select **"Open with Live Server** to launch.*
5. *This 3D apartment scene will open in your browser automatically.*
6. *If Live Server is unavailable, double-click the HTML file to open it in a browser.*

4. Implemented Features Description

4.1 Structure and Rooms

The apartment model consists of two real rooms: a bedroom and a living room. A hallway and a wooden door connect the two rooms. We utilized BoxGeometry to create the walls, floors, and ceilings of each room, ensuring they are the right size and shape.

There is a wall that separates the rooms, gaps in the wall, and a door that swings open and closed, allowing individuals to travel freely between the rooms. Textures, such as wood floors, brick walls, and painted ceilings, added depth and variation.

The layout reveals that the architecture is correct since it ensures that both rooms look balanced and make sense together, providing a complete, usable, and realistic two-room apartment.

4.2 Lighting & Animation

The apartment looks more real and lively with lights and animation. AmbientLight gives the whole room a soft glow, DirectionalLight makes it look like sunlight, and SpotLights above the sofa and bed bring out the best in the space.

Animated parts include a ceiling fan that spins and a door that swings on a pivot hinge, both of which add realistic interactivity.

We carefully changed the angles and intensity of the lights to make shadows and reflections that moved.

The lighting and animations work together to make the indoor space feel comfortable and real, adding depth, realism, and user engagement to the 3D environment.

4.3 Camera & Navigation

We used OrbitControls to let the camera rotate, pan, and zoom in and out of the 3D apartment. This allows people to see the whole scene from different points of view.

The navigation buttons on the sidebar let users quickly switch between preset viewpoints such as the Living Room, Bedroom, and Home View, making it easier to explore the apartment layout and lighting conditions. These controls ensure smooth, intuitive movement without abrupt transitions, offering a comfortable viewing experience.

The navigation system was further enhanced with WASD keyboard controls, enabling smooth first-person walking movement throughout the apartment.

- *W / S move forward and backward*
- *A / D move left and right*

Integrated collision detection prevents the camera from passing through walls or furniture, maintaining spatial realism. The bedroom and entrance door safe zones remain functional, allowing users to walk freely between rooms. The sidebar interface was also updated to display the new WASD movement guide, providing a clear reference for all available navigation methods.

4.4 Furniture & Materials

4.4.1 In Living Room

The floor in the living room is made of light cream ceramic tiles that make it look clean and shiny. The walls have a procedural beige-orange brick texture that was made entirely in code. This makes the room feel warm. The door to the house is made of a brown wood-like material with a subtle grain pattern and a gold knob to make it look real.

Next to the door is a shoe rack made of light pine wood. There are red, blue, green, and pink shoes inside that add detail and life. In the middle is a TV unit with a flat black screen panel that gives off a little light and a gray metal base. There is a tall brown vase with a spiral pattern next to the wall. It has pink flowers with green stems that were made with Three.js shapes and MeshStandardMaterial to make the colors and lighting look authentic.

The ceiling fan in the room has gray metal blades and a white motor body that spins all the time to make it look like air is moving. The two windows are made of clear glass with a blue tint to make it look like it's daytime. On the right side, there is a soft brown sofa on a light pink carpet. This makes a cozy corner. There is a small black side table with a matte finish next to the couch. A tall black cabinet with smooth matte metal is next to that.

This makes the whole thing look even. The brick walls, ceramic floors, wooden furniture, and glass windows all work together to make the inside look real and balanced.

4.4.2 In Bedroom

The bedroom has a light blue carpeted floor that makes the room feel calm and peaceful. The walls have the same procedural beige-brick texture as the living room, which keeps the look the same. The ceiling is a plain white surface with a matte finish that reflects light well. The bed has a light brown wooden frame and a white floral-patterned bed sheet made of a smooth, diffuse material.

There are two gray pillows on the bed that are soft and matte. A yellow-wood nightstand is next to it. On top of it is a pink table lamp with a glossy plastic pink base and a semi-transparent light pink shade that makes it look like it glows. There is a study table made of light wood across from the bed, and a blue metal chair next to it. There is a laptop on the desk with a dark gray metal body and a black screen that gives off some light.

A tall black cupboard with a matte metal finish is used for storage, and a white air-conditioning unit mounted on the upper wall uses smooth plastic material with small gray vent lines. There is another There is a tall brown vase with a spiral pattern next to the wall.

It has pink flowers with green stems that were made with Three.js shapes and MeshStandardMaterial to make the colors and lighting look authentic. This goes with the living room decorations and keeps the look consistent.

The window uses the same clear, blue-tinted glass to make it look like light is coming in from outside, which gives the whole apartment a consistent lighting tone.

4.4.3 Summary of the materials used.

- ***Procedural Brick Wall Texture:*** *Canvas made warm orange-beige bricks with gray mortar.*
- ***Floors made of tile and carpet:*** *light-colored ceramic tiles and soft, patterned carpets.*
- ***Wood:*** *Used for tables, beds, nightstands, doors, and racks.*
- ***Fabric Materials:*** *Used on pillows, sofas, and sheets.*
- *Plastic and metal are used in fan blades, knobs, lamp bases, and electronic devices.*
- ***Glass Materials:*** *Windows that are clear but have a blue tint.*

5. Libraries, Assets & Limitations

5.1 Libraries Used

- ***Three.js (r128)*** *used to build and render the 3D apartment including lighting, materials, and animations.*
- ***OrbitControls.js*** *makes easy for people to explore the 3D world by letting the camera zoom and move around.*

We used the ***jsDeliver CDN*** *to load these packages so that they would be easy to find and work with in all browsers.*

5.2 Assets

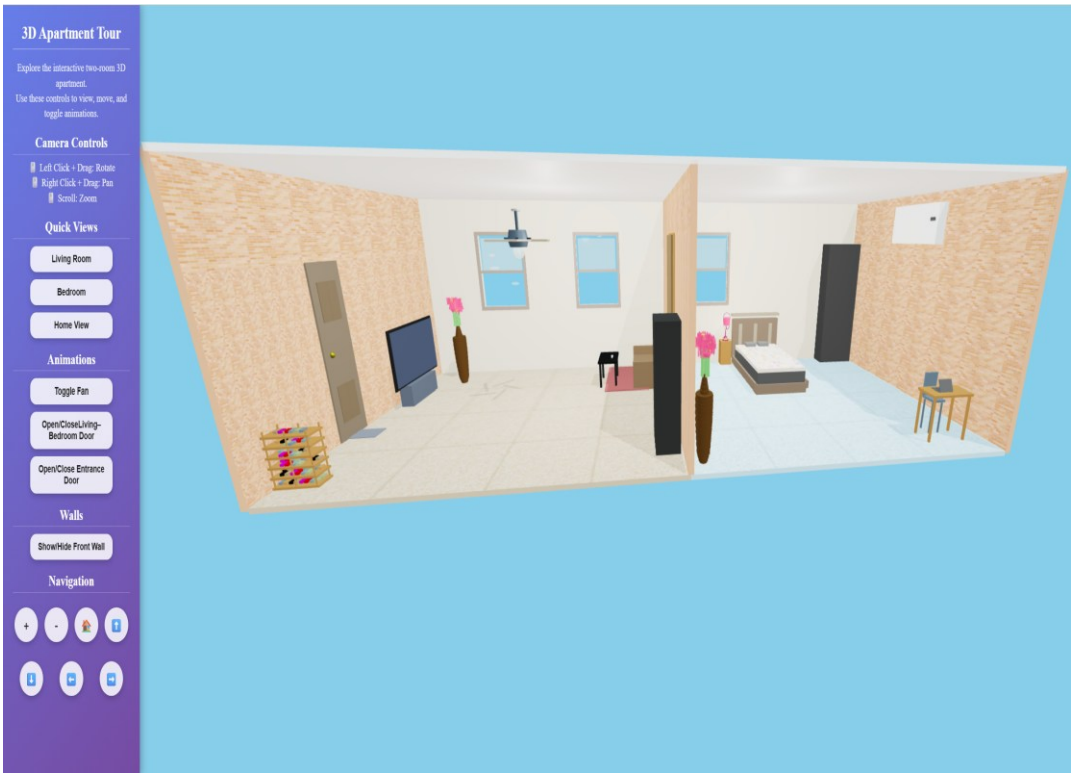
- *No images or 3D models from outside sources were used.*
- *HTML Canvas and JavaScript were used to make all the textures, such as brick, wood, and carpet.*
- *To make floors, walls, furniture, and other things, people used shapes like BoxGeometry, CylinderGeometry, and PlaneGeometry.*
- *To light the apartment, AmbientLight, DirectionalLight, PointLight, and HemisphereLight were added.*
- *The ceiling fan and the doors that open and close were animated with JavaScript code.*

5.3 Known Limitations or bugs.

- ***Shadows:*** *The shadows work, but based on the angle, they may look a little softer or sharper.*
- ***Door Pivot:*** *The door opens, but the pivot isn't exactly in the middle.*
- *Real-time lighting and high-detail images may cause the scene to lag on computers that aren't fast.*
- ***Reflections:*** *For reflections, there are no real maps; materials only show fake reflections.*
- *Use the WASD keys to move around. When making quick turns, the action may lag a bit.*

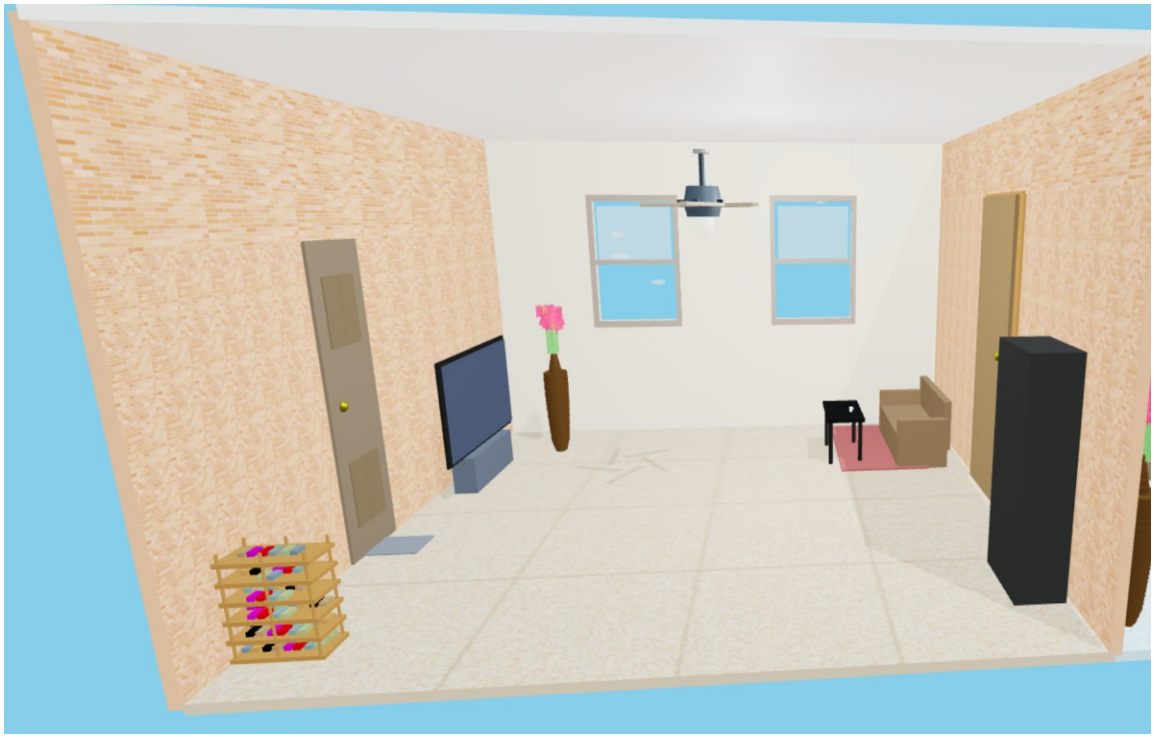
6. Screenshots or Screen recordings

6.1 Screenshot 1 - Complete Apartment View



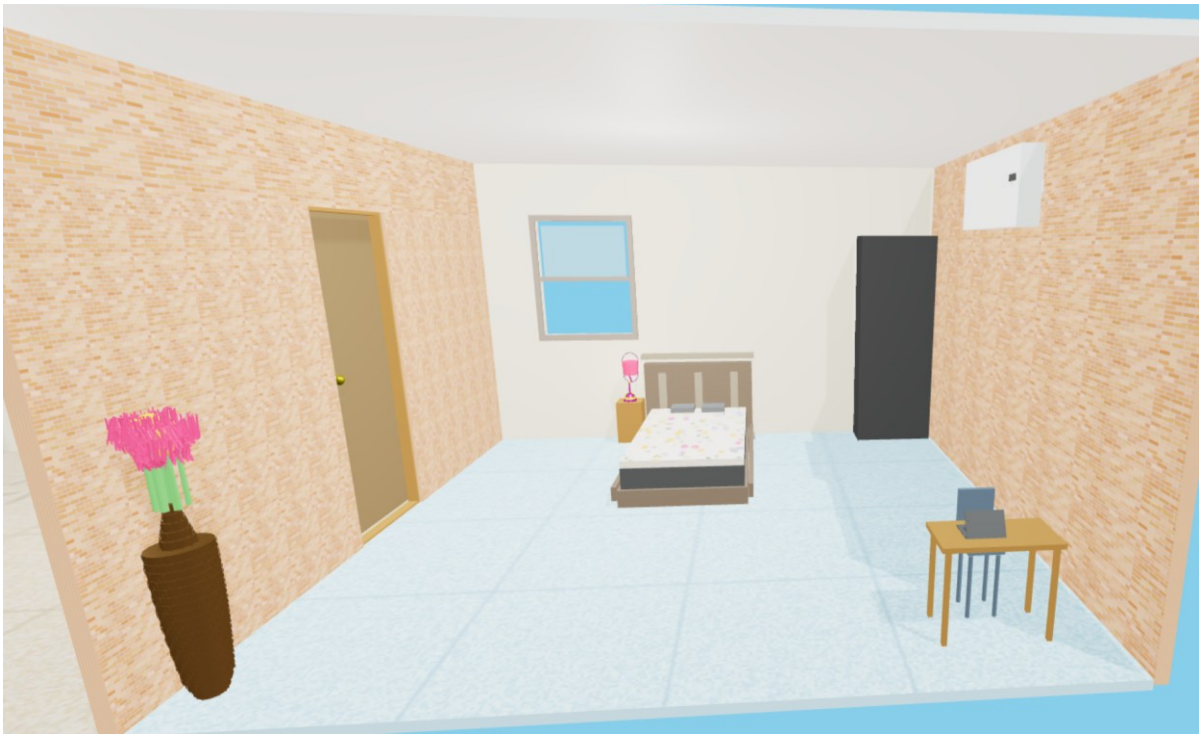
This picture shows the whole two-room flat, with a wall separating the living room from the bedroom. The interface on the left shows how the UI tools for moving the camera, quick views, and animations work.

6.2 Screenshot 2 - Living Room View



There is a TV set up, a sofa, a fan, doors, and a colorful vase against the wall in the living room. For a more immersive watching experience, the design focuses on realistic sizes, textures, and arrangements of space.

6.3 Screenshot 3 - Bedroom View



The bedroom has a bed, side tables, a closet, a flower vase for decoration, and the right amount of light and space. The scene shows how procedural modeling and materials can be used to make things feel good and look good.

7. Conclusion

This project, which is based on Three.js, shows how 3D modeling, texturing, lighting, and animation work. "Interactive 3D Two-Room Apartment" makes an inside world that is real and interactive, and people can explore it by moving around and turning around freely.

The building, the furniture, the camera, and the animation were just some of the important parts that everyone on the team worked on. They all worked together to make sure the result looked good and worked well. Everyone in the group worked together to make a model that works well and looks good. Over time, they fixed bugs and made it better. The COSC3306 course rubric says it's good enough. We learned more about how 3D computer graphics can be used to make web browsers show real-life rooms through this project.

8. References

8.1 Course Materials and Guidelines

- *The professor provided the project guidelines and grading rubrics for the course COSC3306 – Introduction to Computer Graphics (Fall 2025) through Brightspace.*
- *The professor also shared course lecture notes and tutorial materials to work as a part of the COSC3306 module.*

8.2 AI Assistance Disclosure

- *We used ChatGPT and Claude Sonnet to help us write the program for "Interactive 3D Two-Room Apartment" project from October to November 2025.*
- *We used them to fix bugs, fix syntax mistakes, explain and improve code, and make our report writing sound better.*
- *As a group, we made, changed, and tested all the code, textures, materials, and 3D objects.*