



# ***COSC3306\_Final Project Report***

## ***Interactive 3D Architecture Environment***

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***Introduction to Computer Graphics (COSC3306\_F01)***



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# 1. Peer Evaluation Form

Members	Roles
<b>Olivia Alex</b>	<i>Structure &amp; Layout Designer</i>
<b>Virpal Kaur</b>	<i>Furniture &amp; Materials Specialist</i>
<b>Aastha Kaushik</b>	<i>Camera &amp; Navigation Developer</i>
<b>Sahejpreet Kaur Brar</b>	<i>Lighting &amp; Animation Lead</i>
<b>Deepasree Meena Padmanabhan</b>	<i>Integration &amp; Quality Checker</i>

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



4	10/22/2025	Deepasree, Olivia, Virpal, Aastha, Sahejpreet	We met 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.



<b>12</b>	11/05/2025	Deepasree, Olivia, Virpal, Aastha, Sahejpreet	We met and shared some ideas and fixed it.
<b>13</b>	11/06/2025	Deepasree	Checked the final project for the final working integration and quality check.
<b>14</b>	11/07/2025	Olivia, Virpal, Aastha, Sahejpreet	Send their working portion description and sent through WhatsApp.
<b>15</b>	11/09/2025	Deepasree	Added all details and edited the final report and work finished.
<b>16</b>	11/10/2025		Showed our final project to professor work for the verification.
<b>17</b>	2025		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 displays the entire scene in real time.

The project shows some of the most important ideas in computer graphics, such as

- making geometry,
- Creating materials and textures,
- lighting and shadows,
- animation and interactivity, and
- smooth camera navigation with OrbitControls.

All the textures and materials were made in JavaScript without using any outside image files, ensuring that they were original and fit with the course rubric.



## 2.2 Project Objectives

- *Use basic 3D shapes to make a full two-room apartment scene.*
- *Use realistic materials and textures that were made by a program.*
- *Use ambient, point, and directional lighting to make the shading look natural.*
- *Make interactive things like doors and ceiling fans move.*
- *Let users control the camera's movement and point of view.*
- *Show a clear and working HTML/CSS user interface with buttons for navigation.*
- *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

Before running the project, ensure your system meets the following requirements and follow these setup steps:

1. **Browser:** Use a modern browser such as Google Chrome, Mozilla Firefox, Microsoft Edge, or Safari.
2. **Internet Connection:** Required to load external Three.js libraries.
3. **Software Needed:** A text editor like Visual Studio Code (VS Code) with the Live Server extension.

#### 3.2 Steps to Run the Project:

1. Create a new folder named **COSC3306\_Final\_Group\_Project** on our computer.
2. Save the project file as "TwoRoomApartment.html" inside 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 will automatically open the 3D apartment scene in your browser.
6. Alternatively, you can double-click the HTML file to open it directly in a browser if Live Server is unavailable.



## 4. Implemented Features Description

### 4.1 Structure and Rooms

The apartment model comprises two real rooms: a bedroom and a living room. A hallway and a wooden door join the two rooms. We utilized *BoxGeometry* to make the walls, floors, and ceilings of each room so that the size and shape were right.

There is a wall that separates the rooms, gaps in the wall, and a door that swings open and closed so that individuals can travel freely between rooms. Textures that were made procedurally, such as wood floors, brick walls, and painted ceilings, gave depth and variation.

The layout reveals that the architecture is right since it makes sure 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. GSAP animations helped the camera move smoothly between views, taking it to preset spots for the Living Room, Bedroom, and Overview views.*

*These changes make it easier for the viewer to look around the model without sudden changes in motion. Extra buttons make it easy to go back to the home view or change the zoom level. The navigation design is all about making it easy to move around, making it comfortable, and making it easy to see how the space is arranged and how the lighting works in each scene.*



## 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 matches the decor in the living room 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)** - The main JavaScript library used to build and render the 3D apartment including lighting, materials, and animations.
- **OrbitControls.js** - This library makes it 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

There are no external image files or 3D models used in the project.

Using JavaScript and Three.js procedural materials, we made all the materials and textures.

- **Procedural Textures:** HTML canvas was used to make brick walls, timber flooring, and carpet surfaces.
  - **Geometries:** BoxGeometry, CylinderGeometry, and PlaneGeometry were used to make walls, furniture, and other things in the room.
  - **Lighting Assets:** AmbientLight, DirectionalLight, PointLight, and HemisphereLight were utilized to make the inside of the house look like it was lit by natural light.



- **Animation Assets:** JavaScript logic and Three.js routines were used to make object animations like the ceiling fan that spins and the doors that open

### 5.3 Known Limitations or bugs

*There are still a few minor limitations to the final product which is still a success:*

- **Shadow Accuracy:** Overall shadows are correctly rendered, although there may be minor inconsistencies in the softness of shadows relative to the light angle, distance, and intensity and material balance.
- **Door Pivot:** The door pivot animation works, but it is a little off from its actual pivot point, which may look unbalanced from certain perspectives.
- **Performance:** On older browsers and low-end computers, performance may suffer, but this is mostly because of high-resolution procedural textures and real-time light calculations.
- **Reflection:** The only things that make a real simulated reflection are the color and brightness of the material. There are no full HDR or reflection maps.



## 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.



## 6.4 Screen recording 1 – Toggle Fan Animation

### Demonstration

**The video is included in a zipped folder titled "Screen Recordings" as part of this submission.**

A screen recording of the 3D Apartment project's Toggle Fan feature. The ceiling fan rotates smoothly using Three.js animation logic in the render loop when the "Toggle Fan" button is clicked. The video shows the project's interactivity and visual realism with OrbitControls lighting and camera navigation.

## 6.5 Screen recording 2 – Entrance Door Open & Close Navigation

**The video is included in a zipped folder titled "Screen Recordings" as part of this submission.**

A screen recording of the 3D Apartment project's Entrance Door feature. The door opens and closes smoothly using Three.js rotation logic when the "Open/Close Entrance Door" button is clicked. The video shows the project's interactivity



and camera navigation using OrbitControls for different viewing angles.

## *6.6 Screen recording 3 – (Living Room–Bedroom) Door Open & Close Navigation*

***The video is included in a zipped folder titled "Screen Recordings" as part of this submission.***

A screen recording of the 3D Apartment project's Living Room–Bedroom Door feature. The door opens and closes smoothly using Three.js rotation logic when the "Open/Close Living–Bedroom Door" button is clicked. The video highlights the project's interactivity and camera movement using OrbitControls, allowing viewers to observe the door animation from multiple angles.

## *6.7 Screen recording 5 – Show/Hide wall*

***The video is included in a zipped folder titled "Screen Recordings" as part of this submission.***

A screen recording of the 3D Apartment project's Show/Hide Wall feature. The video demonstrates how the wall can be



toggled on or off using a button, enhancing room visibility. It highlights the project's interactivity and smooth rendering in Three.js, allowing better viewing of connected spaces through camera navigation.

## 6.8 *Screen recording 6 – Full Apartment Rotation & Room Views*

**The video is included in a zipped folder titled "Screen Recordings" as part of this submission.**

A screen recording of the 3D Apartment project showing a full 360° rotation of the apartment layout, including both rooms. The video demonstrates smooth camera transitions between the bedroom and living room, showcasing each area with zoomed-in views. It highlights the project's realistic navigation, lighting effects, and use of Three.js OrbitControls for fluid camera motion.



## **7. Conclusion**

*The main ideas behind 3D modeling, texturing, lighting, and animation using Three.js are shown in this project. "Interactive 3D Two-Room Apartment" makes a realistic and interactive inner world that people can explore by moving around and navigating easily.*

*Each member of the team worked on important parts like the structure, the furniture, the camera, and the animation, making sure that the final product was both technically correct and aesthetically pleasing. The group made a model that works well and looks good by working together, fixing bugs, and improving it over time. It meets the standards of the COSC3306 course rubric.*

*Overall, this project helped us learn more about how 3D computer graphics can be used to make web browsers simulate realistic interior places.*



## 7. References

### 7.1 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.*

### 7.2 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.*