

A-FRAME FINAL PROJECT DOCUMENTATION

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PROJECT OVERVIEW

Project Topic: Building an interactive 3D villa with A-frame.

1. Project Objective: To demonstrate modeling of 3D objects, scene creation and basic interactivity within a web-based virtual reality environment.

2. Design Choices

- **Materials Used:**

- **GLB Models:** Bathroom unit, bedroom furniture, doors, kitchen unit, sofa, motorcycle, and trees.
- **Textures:** Photographic textures for the floor, grass ground, exterior walls, perimeter fence, and sky.
- **A-Frame Primitives:** Procedural boxes and planes for interior walls, ceilings, and glass. Cylinders and spheres for the staircase, railing, pool, and garden greenery.

- **Animations:**

- **Pool Water:** Oscillating Y-position and color shifts to simulate ripples.
- **Stair Elevator:** Custom JavaScript component that lifts the player rig when entering the staircase area.
- **Fog:** Linear distance fog to create depth and atmospheric fading.

- **Scene Layout:**

- **Ground Floor:** U-shaped plan containing two bedrooms, a living room, kitchen, and bathroom.
- **Second Floor:** Partial wing housing a music studio, photo studio, and lounge.
- **Exterior:** Swimming pool, patio, flower garden, and a fenced driveway with a parked motorcycle.

3. Technical challenges and solutions

- **Model Scaling:** GLB assets were imported in different sizes and had to be upscaled or downscaled to fit the environment.
- **Vertical Movement:** Moving vertically on the staircase posed a challenge so I wrote a stair-elevator script to interpolate the player's height when walking through the stairs.
- **Entity Conflicts:** Duplicate IDs caused rendering bugs. I audited the HTML to ensure every entity had a unique, authoritative ID.

- **Texture Stretching:** The fence and grass textures looked distorted over long distances. I applied the repeat attribute to tile the image proportionally.

4. Future improvements

- To add a raycaster system to make the doors more interactive.
- To better animate and display the sky and swimming pool.
- To implement physics bodies to prevent players from walking through walls.

5. References and tools

- **A-Frame v1.4.2**
- **Three.js**
- **Polypizza.com**
- **VS Code**