VR Modern Luxury House - Project Documentation

1. Design Choices

- Modular Structure: The house was designed using grouped entities in A-Frame to logically separate areas such as the living room, kitchen, and bedroom.
- Realistic Texturing: Multiple high-quality textures (marble, wood, tile, grass, roof tiles, etc.) were used to improve realism and create clear material distinctions between rooms.
- Texture Optimization: A custom repeat-texture component was implemented to prevent stretching and ensure materials tiled correctly across large surfaces.
- Physics Integration: The A-Frame physics system was integrated with gravity enabled (-9.8) to simulate realistic movement and collision detection.
- Lighting Design: Ambient and directional lighting were used together to balance scene brightness and create soft shadows for realism.
- Navigation System: Movement controls and a kinematic-body camera rig were implemented to allow the user to walk naturally through the house while respecting collisions.
- Functional Layout: The ground floor contains the living room and kitchen, while the bedroom is placed upstairs to reflect a realistic modern home layout.

2. Technical Challenges and Solutions

- Texture Stretching Issue: Large surfaces initially caused textures to stretch. This was solved by creating a custom repeat-texture component using THREE.RepeatWrapping.
- Physics Collision Problems: The camera initially passed through walls. This was fixed by applying static-body to structures and kinematic-body to the player rig.
- Lighting Balance: The scene appeared too dark or too bright at different stages. Adjusting ambient and directional light intensities created a balanced environment.
- Stair Navigation Difficulty: A standard staircase design caused collision glitches. This was temporarily solved by implementing a ramp for smoother movement.
- Asset Loading Errors: Some textures failed to load due to path mismatches and a minor filename typo (e.g., furniture texture). These were corrected in the assets section.

3. Future Improvements

- Replace the ramp with a properly modeled staircase including realistic step physics.
- Add animated elements such as a moving dog, flowing pool water, and interactive doors.
- Implement advanced lighting effects such as point lights and emissive materials for night scenes.

- Optimize performance by reducing polygon counts and compressing textures.
- Add sound effects (ambient house sounds, footsteps, water sounds) for immersive VR experience.
- Introduce interactive features such as opening cabinets, switching lights on/off, and movable furniture.
- Implement multiplayer functionality for shared VR exploration.