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COURSE TITLE – COMPUTER GRAPHICS
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Virtual Reality Dream House Project Report

This report presents the design rationale, technical challenges, and prospective enhancements of a Virtual Reality (VR) villa developed using A-Frame, a WebXR framework for immersive 3D environments. The project aims to demonstrate the practical application of web-based VR technologies in creating a realistic and interactive residential environment.

1. Design Choices

The villa was designed following a modern residential architectural layout to enhance realism and user immersion. A modular design approach was adopted, where the exterior structure and interior layout were modeled as separate 3D assets. This separation simplified scene management, allowed independent scaling and positioning, and supported future extensibility of the project.

The spatial arrangement of the compound places the house at the center of the environment, with supporting elements such as the swimming pool, driveway, vehicle, and pet strategically positioned around it. This layout mirrors real-world residential planning principles and improves navigational clarity for users.

Lighting design was carefully implemented to balance realism and performance. Ambient lighting ensures overall scene visibility, while directional lighting simulates natural sunlight. Interior lighting was added to improve visibility within enclosed spaces. Subtle animations, including idle movements and animated water effects, were incorporated to enhance realism without compromising performance.

2. Technical Challenges and Solutions

A significant challenge encountered during development was the inconsistent scale and origin points of imported GLB models. This resulted in issues where objects such as the vehicle, swimming pool, and pet appeared inside the house structure. These issues were resolved through iterative adjustment of position, rotation, and scale attributes within the A-Frame scene.

Another technical challenge involved simulating realistic water movement within the

swimming pool. Since the pool model itself was static, an animated, semi-transparent plane was placed slightly above the pool surface to mimic the appearance of moving water. This approach provided a visually convincing solution while remaining computationally efficient.

Aligning the interior model with the exterior house structure also posed challenges, particularly with floor clipping and wall overlap. This was addressed by applying minor positional offsets and consistent rotational alignment to ensure accurate placement.

3. Future Improvements

Future enhancements to the project could include the implementation of interactive elements such as doors and windows that respond to user input. Improved collision detection could also be introduced to prevent users from passing through walls or furniture.

Additional improvements may involve the integration of a dynamic day-and-night cycle, environmental sound effects, and background ambient audio to further enhance immersion. More advanced lighting techniques and optimized textures could also be explored to increase visual fidelity while maintaining smooth performance.

4. Conclusion

In conclusion, this project successfully demonstrates the use of web-based virtual reality technologies to create a realistic and interactive residential environment. Through careful design planning, effective problem-solving, and thoughtful implementation of animations and lighting, a functional VR villa was achieved. The project highlights the potential of A-Frame and WebXR as viable tools for developing immersive VR applications and provides a strong foundation for future expansion and refinement.

NOTE:

I do acknowledge that I used imported models from poly.pizza.com and later on I used Maya to add some features to the imported models to suit the look and feel of what I wanted to achieve in my project