Karen Blukoo Dream House Project Reflection

1. Design Choices

This project was developed using a contemporary smart-home concept with clearly defined functional zoning. The environment consists of a living room, bedroom, kitchen, bathroom, and relaxation space. Each area was intentionally structured to maintain purpose, logical spatial flow, and visual harmony across the entire virtual environment.

The scene was built primarily using A-Frame primitive objects. This decision allowed for flexibility during development, faster iteration cycles, and better control over object dimensions and positioning. Instead of relying heavily on complex external 3D models, primitives were customized and combined to create furniture and structural components. This ensured performance stability while still achieving a realistic layout.

To maintain design consistency, shared textures and materials were reused strategically across the environment. Flooring materials were applied across multiple rooms to create continuity, wood textures were reused for cabinetry and furniture elements, and neutral wall finishes were applied to unify the interior design. This reuse of assets reduced loading overhead while strengthening aesthetic coherence.

The project structure emphasized modularity. JavaScript components were organized into clear functional units to manage animations, lighting adjustments, and environmental interactions. This modular approach improved debugging efficiency and allowed adjustments without affecting unrelated parts of the scene.

Performance optimization was considered throughout development. Geometry complexity was controlled, redundant assets were removed, and animations were implemented with efficiency in mind to maintain smooth rendering across devices.

2. Technical Challenges and Solutions

Challenge A: Managing Lighting Balance in the Scene

Initially, the environment appeared either too dark or overly saturated depending on light placement. Achieving realistic indoor lighting without flattening the visual depth proved challenging.

To address this, different light types (ambient and directional) were tested incrementally. Light intensity values were adjusted gradually while observing shadow behavior and object visibility. Instead of increasing brightness globally, lighting was layered strategically in each room to simulate natural distribution. This improved depth perception while maintaining performance.

Challenge B: Object Scaling and Proportion Consistency

Some objects initially appeared unrealistic in scale relative to room dimensions. For example, furniture proportions occasionally conflicted with ceiling height and wall spacing, affecting immersion.

To resolve this, a reference-based scaling approach was adopted. Real-world measurements were used as guidelines to adjust object proportions. Continuous testing in VR view helped refine size relationships. By standardizing unit measurements and applying consistent scaling ratios, visual realism improved significantly.

3. Future Improvements

• Introduce interactive smart-home features such as toggleable lighting systems and dynamic object responses.

• Implement performance profiling tools to monitor frame rate fluctuations in real time.

• Add optimized external 3D assets to increase environmental detail while maintaining balance with primitives.

• Integrate sound design elements to enhance immersion and environmental realism.

• Expand the outdoor environment with additional vegetation and interactive landscape elements.

Conclusion

This project reflects structured planning, iterative testing, and adaptive problem-solving. Through continuous refinement and practical adjustments, the final environment achieves a balance between architectural design, system modularity, and performance optimization. The experience strengthened both technical implementation skills and strategic development decision-making, laying a strong foundation for future immersive VR projects.