Research Process Document: Dynamic Product Carousel Feature

Project Overview:

Task:
Design and develop a dynamic product carousel feature for a website showcasing various 3D models of products.

Tools & Technologies:

- HTML
- CSS
- JavaScript
- Three.js for 3D model integration
- Free Low Poly 3D models from online resources

Problem-Solving Process:

1. Carousel Design Research:

Problem: I needed to create a dynamic carousel to smoothly transition between product models while rotating them around their own axes.

Links Explored:

- Three.js Documentation (Installation – three.js docs (threejs.org))
- Various website links for Three.js model loading and rendering.
- W3Schools - HTML Carousels (https://www.w3schools.com/howto/howto_js_slideshow.asp)

Methodology:

- **Step 1:** Research different carousel implementations in JavaScript (traditional image carousels vs. 3D model carousels).
- **Step 2:** Test various Three.js scene loading techniques and 3D model rendering to ensure smooth animation and performance.

Key Decisions:

- I decided to use a simple and clean transition with arrow navigation for a smooth user experience.
- Implemented smooth rotation using the rotation.x and rotation.y properties in Three.js.

2. Model Loading with Three.js:

Problem: The models needed to be loaded dynamically into the carousel and rendered in a Three.js scene.

Links Explored:

- Three.js GLTFLoader Documentation (https://threejs.org/docs/#examples/en/loaders/GLTFLoader)
- Low Poly Models Websites - Sketchfab (https://sketchfab.com/feed)
    - https://sketchfab.com/3d-models/nissan-gt-r-ps1-low-poly-d1f8a458410c410284be5f152a76eba0
    - https://sketchfab.com/3d-models/generic-heavy-off-roader-low-poly-model-dd4a4752aa254249990882159a01468
    - https://sketchfab.com/3d-models/city-compact-95-racemod-low-poly-model-e1213e8029bf40738987f3f3230d542e
- StackOverflow discussions on Three.js scene rendering.

Methodology:

- **Step 1:** Research methods for loading low-poly 3D models into the carousel.
- **Step 2:** Integrate GLTFLoader in Three.js to load models from URLs dynamically.
- **Step 3:** Render models into the carousel slots, ensuring each model is centered and appropriately scaled for viewability.

Key Decisions:

- I chose to use GLTFLoader for loading models since it's lightweight and supports modern formats.
- Decided to preload models to minimize any lag when rotating the carousel between products.

3. Popup with Product Details:

Problem: The task required each product to be clickable and display details in a simple popup.

Links Explored:

- JavaScript Popup Modals (https://www.w3schools.com/howto/howto_css_modals.asp)
- Three.js Object Picking Documentation (https://threejs.org/docs/#api/en/core/Raycaster)

Methodology:

- **Step 1:** Research ways to implement a simple popup that triggers upon clicking the 3D model.
- **Step 2:** Integrate a click event with Raycaster in Three.js to detect when a user clicks on a specific product model.

- **Step 3:** Create a basic modal popup using HTML and CSS that shows hardcoded product information.

Key Decisions:

- Decided to use a lightweight popup design for simplicity and responsiveness.
- I used Raycaster to detect object clicks in Three.js, ensuring users can interact with each product model directly.

4. Model Rotation and Animation:

Problem: The 3D models should rotate around their own axis smoothly within the carousel view.

Links Explored:

- Three.js Animation Loops (AnimationAction – three.js docs (threejs.org)

Methodology:

- **Step 1:** Explore the best methods to rotate 3D models within the Three.js scene.
- **Step 2:** Implement an animation loop that smoothly rotates each model while it is in the carousel view.
- **Step 3:** Ensure that the rotation speed is slow enough for users to appreciate the model details without causing distractions.

Key Decisions:

- I implemented a continuous requestAnimationFrame loop that rotates each model on its y axis.
- Adjusted the rotation speed to ensure optimal user experience.

Conclusion:

This project involved creating an interactive product carousel that smoothly rotates 3D models and allows users to interact with each model by clicking for more details. During the process, I strengthen my understanding of Three.js, dynamic model loading, and responsive UI design.