Project Goals and Enhancements in the CesiumJS-Based 3D Simulation Application

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Project Goal

The primary goal of this project was to use CesiumJS to simulate marine animal noises within a 3D environment. This simulation enables marine biologists, wildlife personnel, and general biologists to test whether their sensors can accurately pick up these frequency signals at specified locations, assess if their hardware is up to date, and evaluate the overall performance of their technology.

Enhancements in the CesiumJS-Based 3D Simulation Application

Implemented Features:

Integration of Marine Animals

- **New Models Added:**
    - Marine Animal Models: Custom 3D models for Fin Whale, Gray Whale, Blue Whale, Right Whale, and Sea Lion have been integrated. These models are used to simulate marine animal noises.
- **Asset ID Assignment:**
  Each new model is assigned a unique identifier—either via a Cesium Ion asset ID or by referencing local glTF files in the /static/models/ folder—to load its 3D representation.
- **Custom Orientation Settings:**
    - **Satellite:** Rotates around the Z-axis to simulate realistic orbital movement.
    - **Drone:** Maintains a neutral hover position with no predefined orientation changes.
    - **Marine Animals:** Positioned and scaled appropriately to represent actual marine life within the simulation.

Enhanced Drag-and-Drop Mechanics

- **Dynamic Placement:**
  Models can be dragged from a toolbar and dropped onto the Cesium globe, with the application converting screen coordinates to accurate globe positions.
- **User-Friendly Interface:**
  The drag-and-drop system has been refined for smoother manipulation, ensuring that models appear where users intend them to.

Sonar Wave Animation for Marine Sensors

- **Sonar-Like Ring Formation:**
  Instead of a continuously expanding and contracting solid green circle, the application now spawns multiple expanding rings that mimic sonar waves.
- **Animation Behavior:**
  Each ring expands from a defined minimum radius to a maximum radius over a fixed duration, then fades out, creating a realistic sonar pulse effect.
- **Color Update:**
  The animation has been updated to use a green outline (rgba(0,255,0,1.0)) to reflect the desired visual style.

Conclusion

The enhancements significantly improve the simulation's functionality, usability, and interactivity. By integrating advanced features such as dynamic object rotation, precise model placement, enhanced drag-and-drop mechanics, and realistic sonar wave animations, the application offers marine biologists and related professionals a powerful tool to test sensor capabilities in a virtual environment. These updates not only lay the foundation for further development—including real-time data streaming and sensor-based interactions—but also create a dynamic user experience that closely mirrors real-world conditions.