

# Motion Sphere FunC Explain



# realtime function theory

- A quaternion consists of a real part ( $w$ ) and imaginary parts ( $x, y, z$ ).
- A unit quaternion refers to a quaternion with a magnitude of 1. The identity quaternion is a quaternion of the form  $(1, 0, 0, 0)$ .
- The quaternion inverse refers to a quaternion  $q'$  that, when multiplied by a given quaternion  $q(w, v)$ , results in the identity quaternion.
- In OpenAI's motion sphere, quaternions are used to represent the rotation of trajectories on a sphere with a radius of  $r = 1.5$ .

# ImGui<sub>(+VTK)</sub>

ImGui (Immediate Mode Graphical User Interface) is a type of graphical user interface system where the UI is rendered directly each frame, as opposed to retained mode GUIs, where widgets are stored and updated. In an immediate mode GUI, when a frame is rendered, the UI code explicitly draws the UI elements at that moment, without retaining the state of each UI element between frames.

**Immediate Mode:** Each time the screen is refreshed, the UI elements are redrawn from scratch, meaning the state of the UI is defined and processed on every frame.

**No Retention:** Unlike traditional GUIs, ImGui does not store widgets or manage their lifetime across frames. The UI is completely recalculated each frame, allowing for simpler state management.

**Ease of Use:** Developers can directly embed the UI code within their rendering or game loop, reducing the need for complex UI frameworks.

**High Flexibility:** ImGui allows quick changes and updates to the UI during runtime, making it ideal for debugging, tools, and real-time applications.