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OceanMath: Paramount Achievement of Visual Aesthetics by Virtue of Lighting and Shading of Wacky Sea Creatures Debuted in FishMath for Benefit Glorious Subject Marine Biology

Long after the creation of AquariumMath, the developers of it and predecessor FishMath had only one question to ask themselves: how can FishMath be cemented in history as the greatest aesthetics-based webGL ocean simulation that includes fish with top hats ever created in 2020? AquariumMath paved the way for light and shading, and so naturally they were the next step.

Viewports and quaternions were great, but Marine Biologists deserve more. And now 'more' is here. OceanMath, the zenith of ocean simulations, moves to the forefront of the field now and forever (the makers of OceanMath are not responsible for any damage caused by the sheer beauty of OceanMath. Ray-tracing not supported, terms and conditions apply, results may vary. $4.95 shipping and handling).

Panopto Video Link (Final Demo Video)
https://northwestern.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=5a34cf02-bd08-49ac-83e0-ac89005130cc

Panopto Video Link (Browser Compatibility)
https://northwestern.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=10e40357-d65c-46ef-b9e7-ac890052e03a

User's Guide

Goals: To build on our previous project's functionality by adding in phong and blinn/phong lighting along with gouraud and phong shading. These lightning and shading modes can be switched between each other so that the effects and differences of each can be seen. Furthermore, special materials have been made in a separate folder to give each wacky sea creature a custom look and light interaction. A user adjustable light source is also added so that the light can be moved around.
User Instructions: Use the WASD keys to shift the aim of the camera. W tilts upwards, S tilts downwards, A turns to the left, and D turns to the right. Use the arrow keys to physically move the camera. The up arrow key moves the camera position forward in the direction it is looking in, the down arrow key moves the camera backwards, the left arrow strafes the camera leftwards, and the

right arrow strafes the camera rightwards. Below the viewport there are values that can be entered into OceanMath so that the light source location and attributes can be specified.

Results

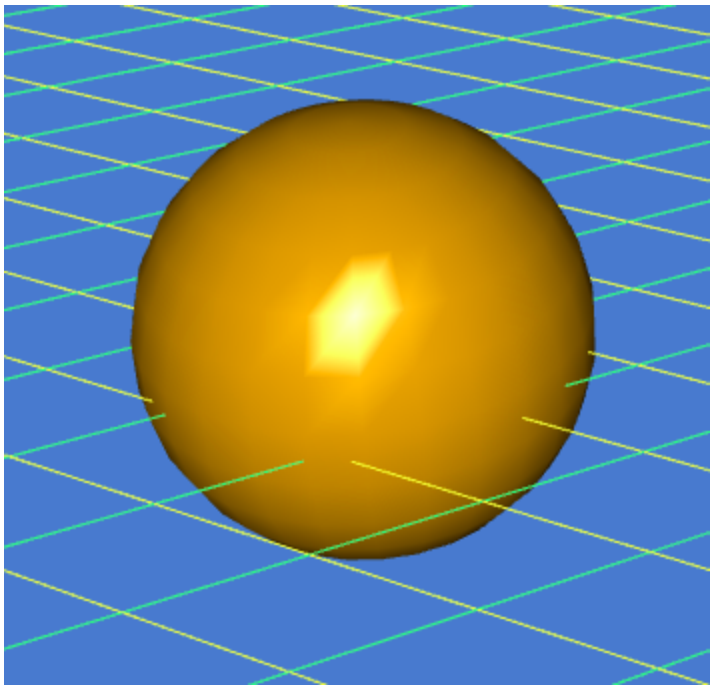


Figure 1. Gouraud Shading with Phong Lighting

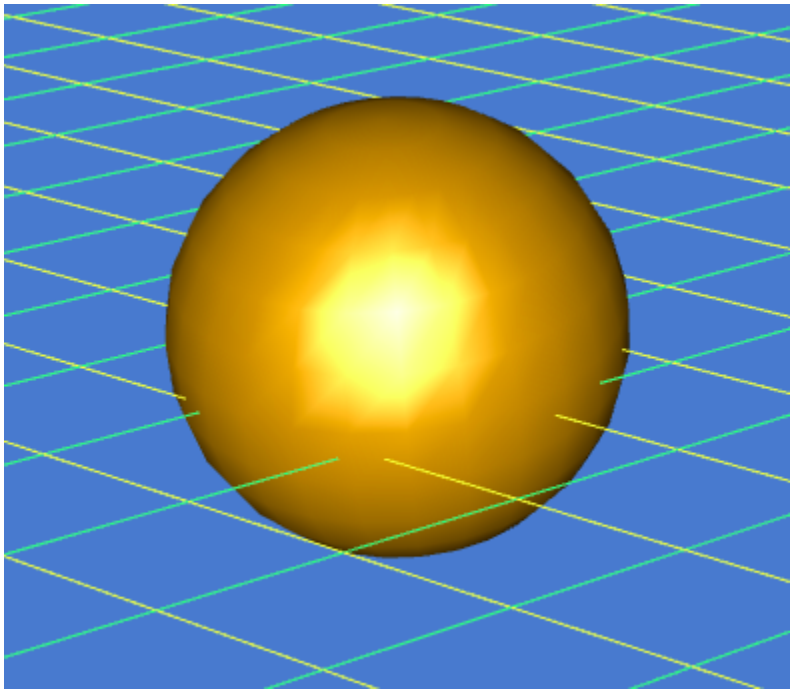


Figure 2. Gouraud Shading with Blinn-Phong Lighting

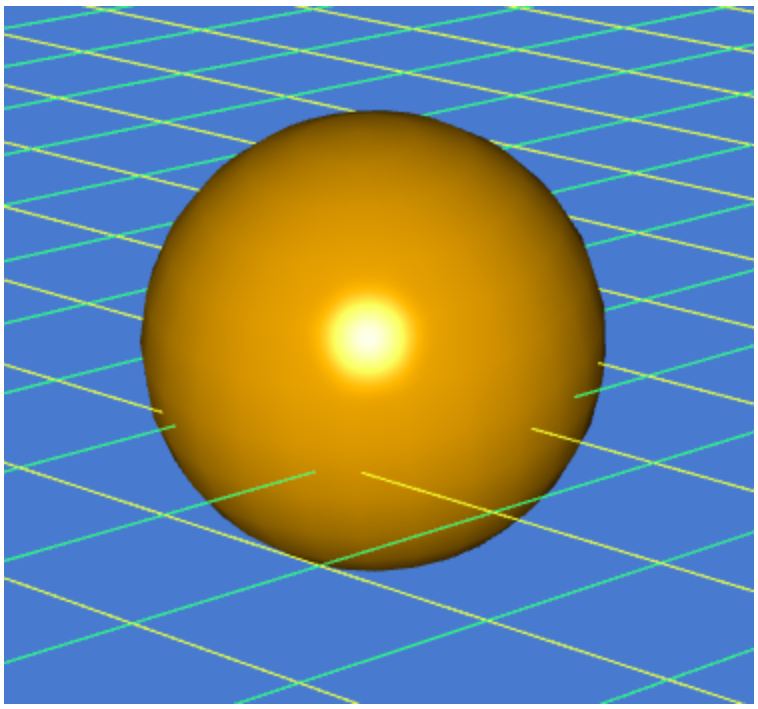


Figure 3. Phong Shading and Phong Lighting

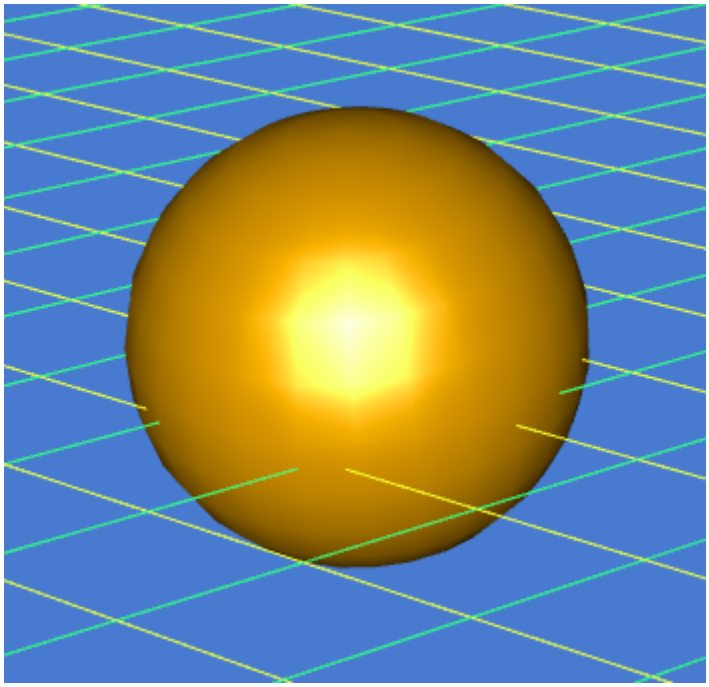
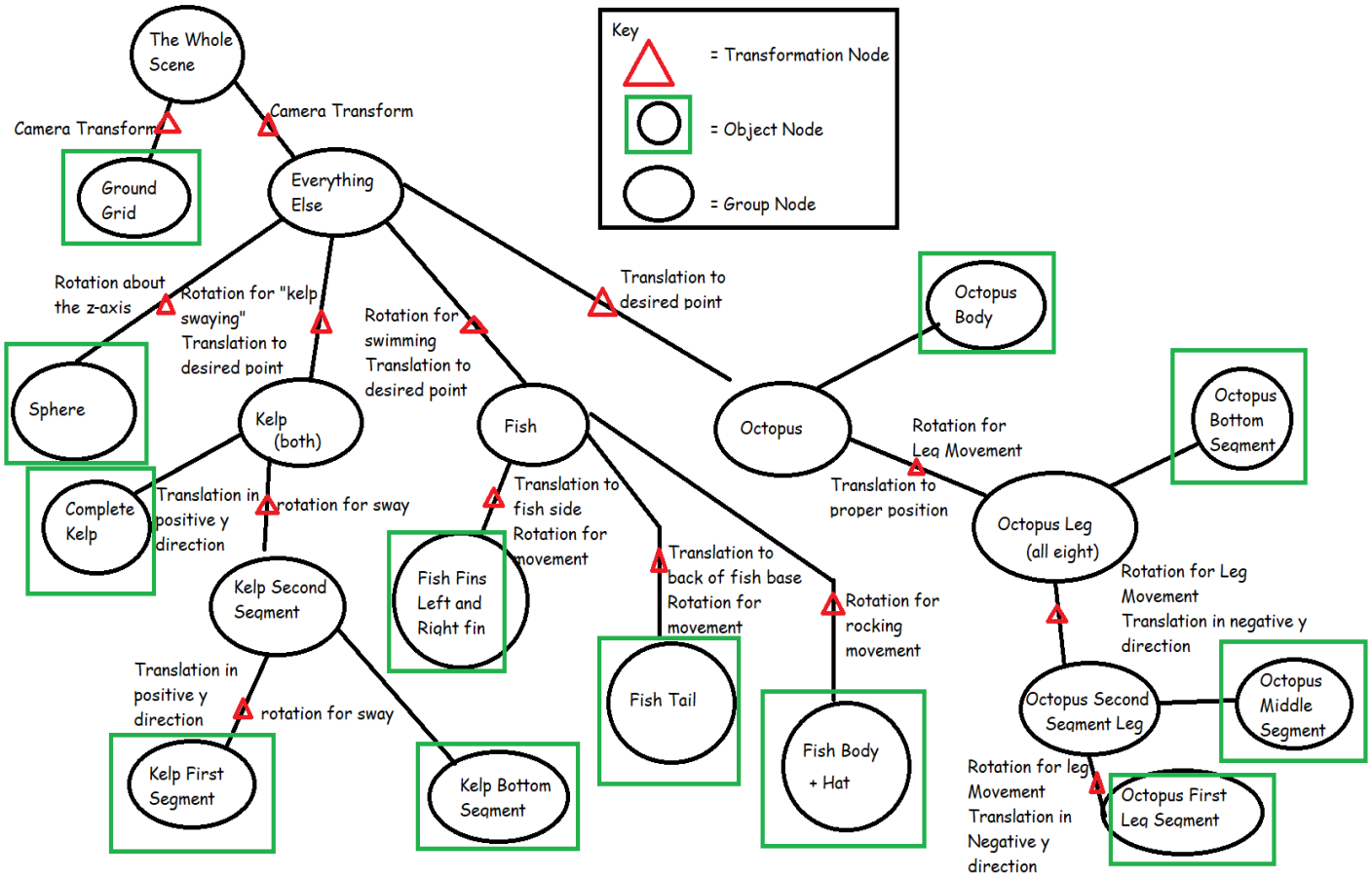


Figure 4. Phong Shading and Blinn-Phong Lighting

Scene Graph


Key
= Transformation Node
= Object Node
= Group Node
The Whole Scene
Camera Transform
Camera Transform
Ground Grid
Everything Else
Rotation about the z-axis
Rotation for "kelp swaying" Translation to desired point
Rotation for swimming Translation to desired point
Translation to desired point
Sphere
Kelp (both)
Fish
Octopus
Octopus Body
Complete Kelp
Translation in positive y direction
rotation for sway
Translation to fish side Rotation for movement
Translation to back of fish base Rotation for movement
Rotation for rocking movement
Rotation for Leg Movement
Translation to proper position
Octopus Bottom Segment
Octopus Leg (all eight)
Kelp Second Segment
Fish Fins Left and Right fin
Fish Tail
Fish Body + Hat
Rotation for Leg Movement Translation in negative y direction
Octopus Second Segment Leg
Octopus Middle Segment
Translation in positive y direction
rotation for sway
Kelp First Segment
Kelp Bottom Segment
Rotation for leg Movement Translation in Negative y direction
Octopus First Leg Segment