WebGPU Flowing Shallow Waves

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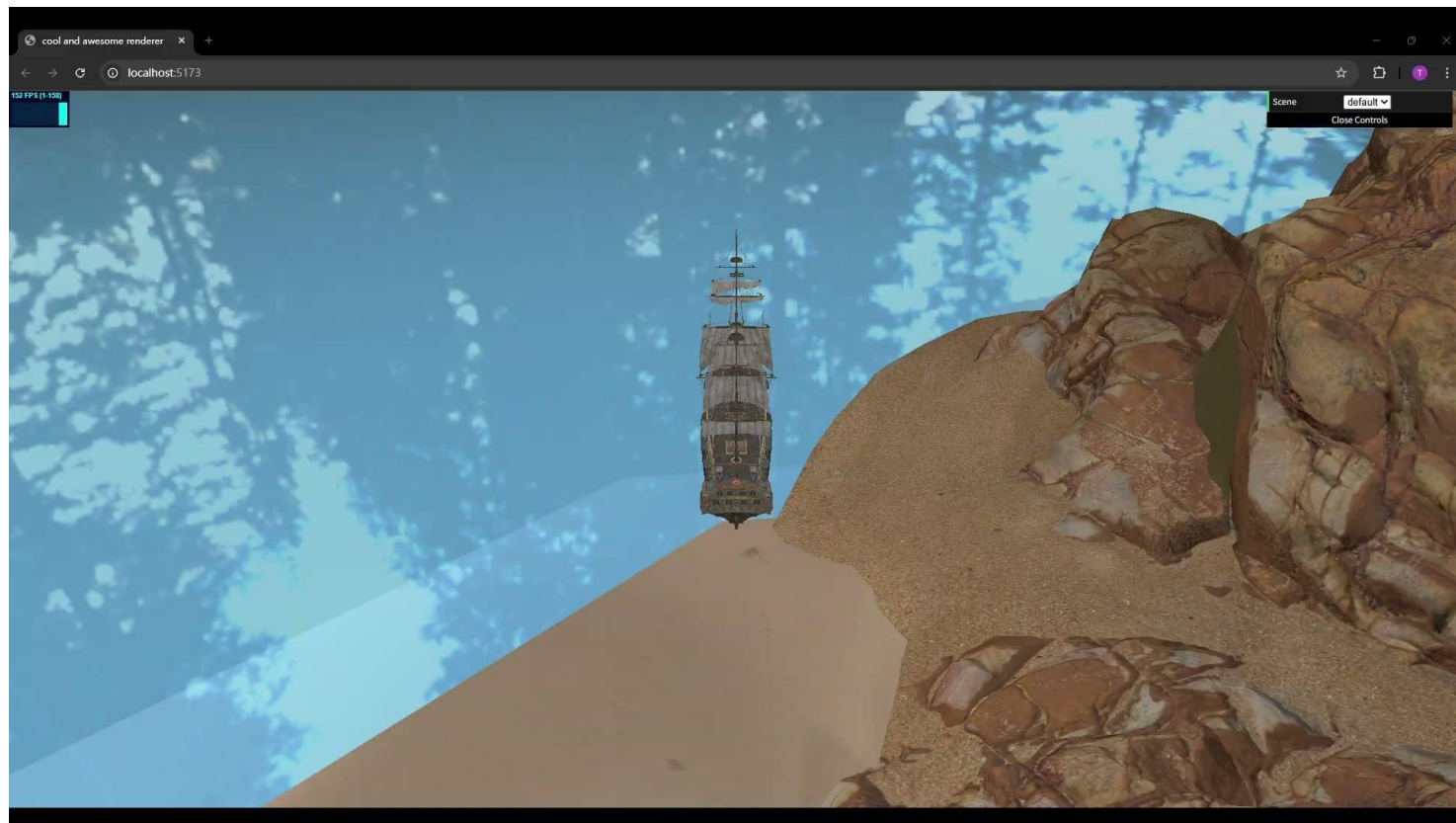https://www.linkedin.com/in/tianhong-zhou-b559aa159/
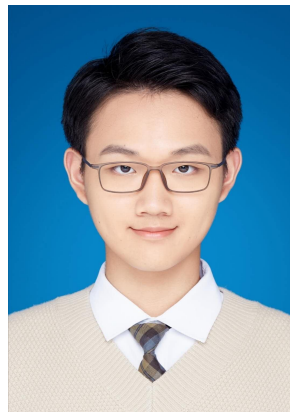
Project Overview
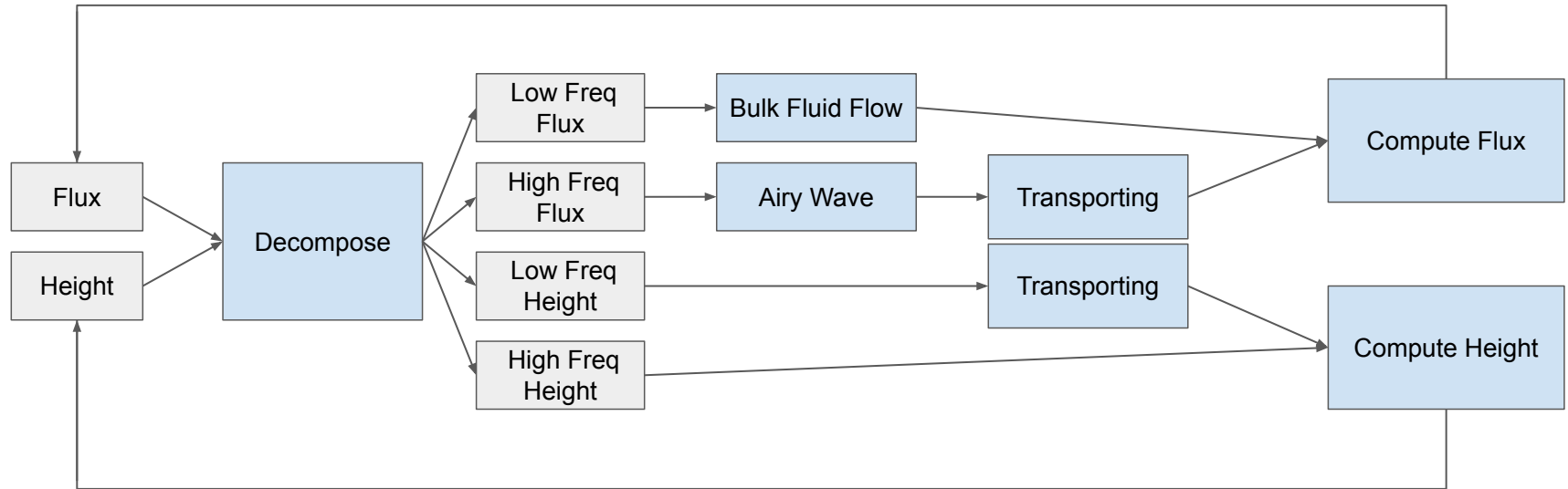
- Reproduce *Generalizing Shallow Water Simulation with Dispersive Surface Waves* (SIGGRAPH 2023)
- Real-time, large-scale water wave propagation
- Build a **tiny sample game**
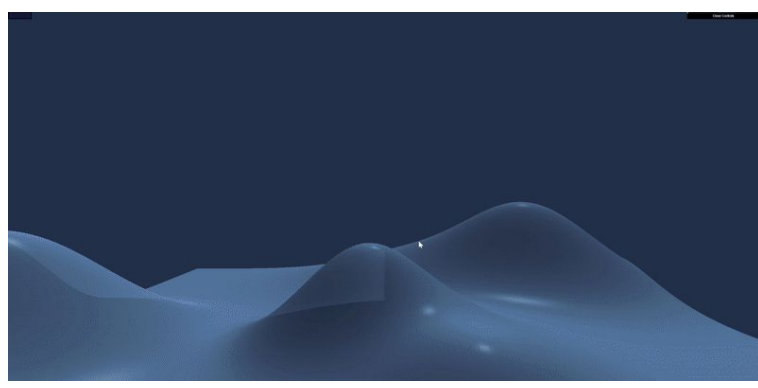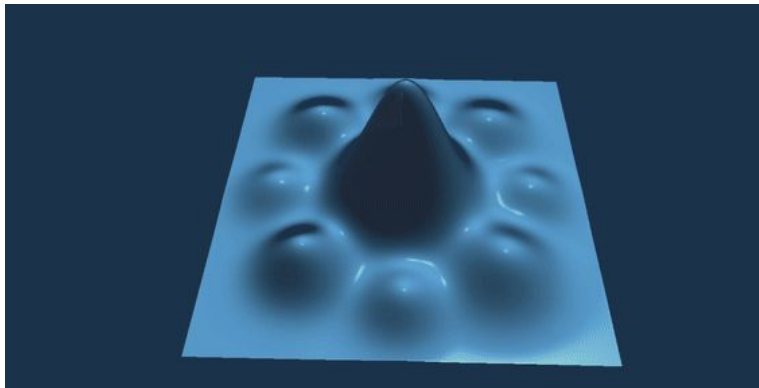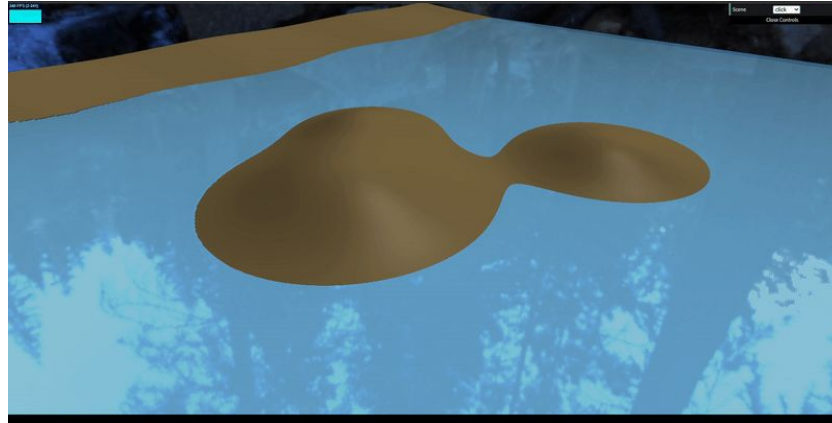- Interactive control features
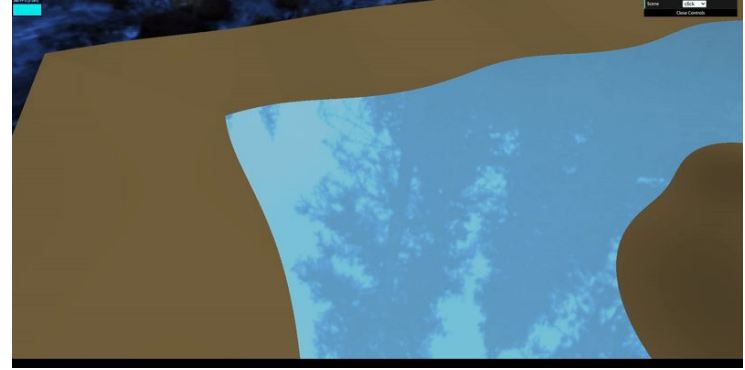- Platform: **WebGPU**

Demo Video

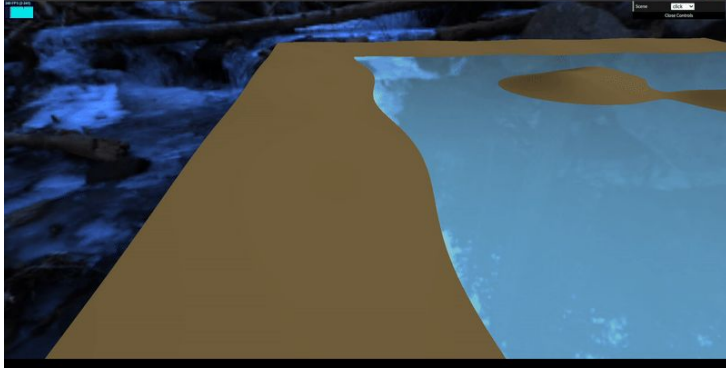# Shallow Water Simulation - Algorithm
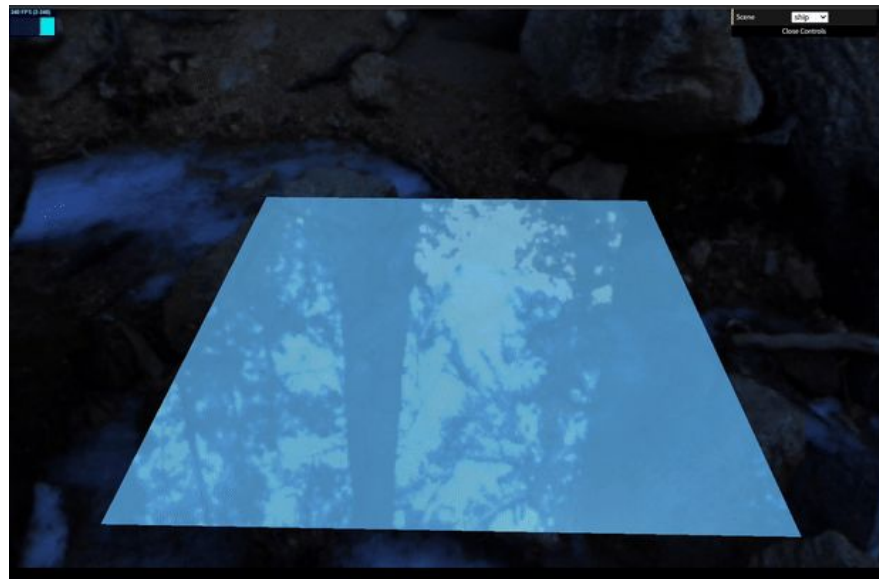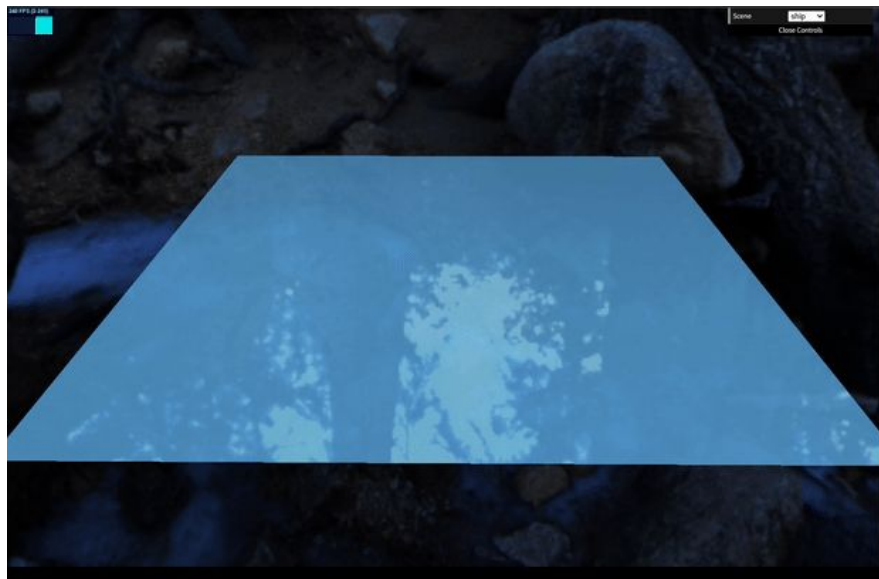
Shallow Water Simulation - Examples
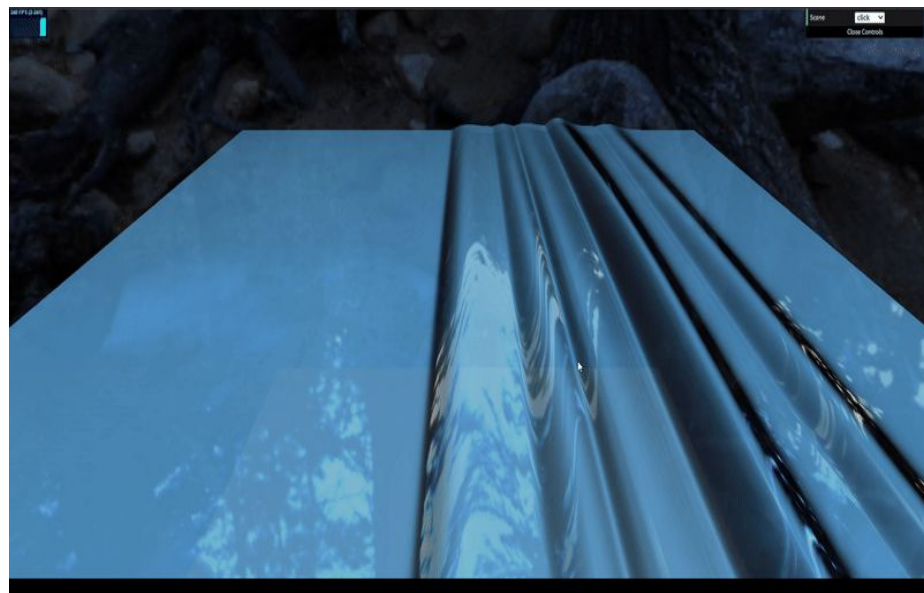
Interactions - Terrain
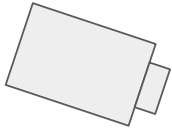
Interactions - Ships
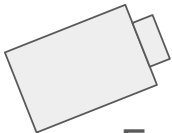
Interactions - Create Waves

Rendering - Planar Reflection

Main Camera

Water Surface
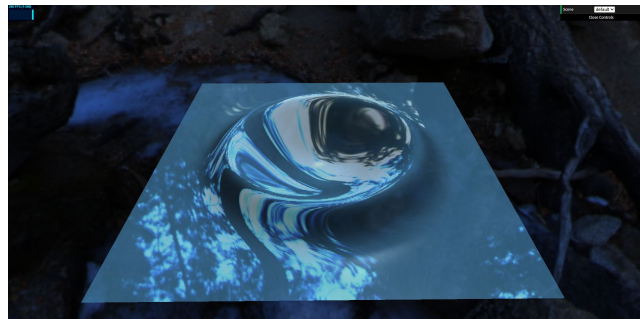
Fake Camera (Reflection Texture)

Planar Reflection + Normal Distortion

Rendering - Other Parts

Environment mapping

Original
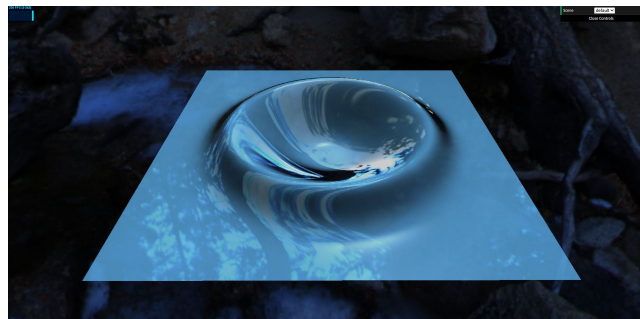
With Fresnel

Future Work

- **Water rendering**
    - Add **foam/whitecap and shoreline blending**
    - **Screen-space reflections** for non-planar content
    - Better **BRDF** for fresnel/specular.
- **Simulation**
    - Couple shallow water with **spray/particle splashes**
    - **Wind**-driven waves
    - More **stable time stepping** or adaptive dt
- **Performance & UX**
    - **GPU profiling** and async compute/graphics overlap
    - **UI toggles** for quality/perf modes
    - **Save/load** scene presets and camera paths for demos.

References

Stefan Jeschke and Chris Wojtan. 2023. Generalizing Shallow Water Simulations with Dispersive Surface Waves. ACM Trans. Graph. 42, 4, Article 83 (August 2023), 12 pages. https://doi.org/10.1145/3592098

Stefan Jeschke, Tomáš Skřivan, Matthias Müller-Fischer, Nuttapong Chentanez, Miles Macklin, and Chris Wojtan. 2018. Water surface wavelets. ACM Trans. Graph. 37, 4, Article 94 (August 2018), 13 pages. https://doi.org/10.1145/3197517.3201336

Thanks for watching!

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