Dispersion Kernels for Water Wave Simulation: Abstract

Problem Statement:

The objective of the paper is to demonstrate a wide range of behaviors of fluid, which include capillary waves, gravity waves, and interactions with static and dynamic obstacles, all from within a single simulation.

Challenges In Solving The Problem:

Simulating dispersion effect (propagation of waves on water surface) of waves and interacting with obstacles at the same time.
Previous approaches have successfully simulated the different kinds of height field waves in the frequency domain.However, handling obstacle boundaries in the frequency domain is computationally expensive.
Other approaches such as height field method in spatial domain can handle obstacle interaction efficiently, but they only approximate or even neglect the dispersion effect.

Key Idea:

In the paper, height field water simulation is used.The solution they proposed for above challenges is to compute dispersion in frequency domain and compute obstacle interaction in spatial domain.

Result Summary:

The result shows multiple simulations of water waves in various domains.In all these scenes a combination of short gravity waves and capillary waves can be seen.These waves are reflected efficiently on both static and dynamic objects.
The average simulation cost is of roughly 200 ms per time step for a 1024×1024 grid. 64% of this simulation cost was induced by the shadowed convolution operations and 28% by Fourier transform and Inverse Fourier transform operations.

Implementation Approach:

- **Tools/libraries used:**
    - C++
    - OpenGl

- **Implementation Steps:**
    1. Implement height field water simulation .

2. Add compact pyramid kernels for updating height fields to simulate wave dispersion.
3. Incorporate shadowed convolution for obstacle interaction.