Wave Particles with Interactive Vortices

CIS-565 GPU Programming Final Project

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This project is inspired by the demo created by Jean-Philippe Grenier from Ubisoft [1]. The demo uses wave particles to create water surface and generates flow map in real-time to advect the particles which enables the user to create some interesting vortices on the fly.

**Goals:**

1. Simple wave particle rendering.

2. Combine wave particle with flow map.

3. Update flow map in real-time.

\*4. Identify and solve the problems caused by advection of height, uv, normal.

\* = extra features

**Milestones:**

Milestone 1:

1. DX12 frame work

* Compute shader
* Tessellation shader
* Basic Interaction

1. Basic wave particle rendering

* Single particle

Milestone 2:

1. Advanced wave particle rendering

* Multiple particles
* Particle boundary interaction
* User interaction (create bump or dent)

1. Combine flow map with wave particle

* Find some interesting flow maps
* Use flow map to advect wave particle

1. Improve rendering method

* Foam
* Subsurface scattering

Milestone 3:

1. Update flow map in real-time

* 2D Fluid simulation
* Create blockers (rocks and etc.)
* Advect properties using simulation result

Final:

1. Finish unfinished work
2. Identify and solve the problems caused by advection of height, uv, normal

**References:**

[1] <https://80.lv/articles/river-editor-water-simulation-in-real-time/>

[2] <http://advances.realtimerendering.com/s2016/s16_ramy_final.pptx>