# Position Based Fluid

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## High Concept:

We would like to perform a real-time, physical- and particle- based water simulation as final project. Given the complexity, performance and difficulty for extending, we decided to implement the Position Based Fluid (PBF) system as well as extend and improve it.

## Background:

Position based fluid is inherited from the widely used, high performance and easy to extend simulation method -- Position Based Dynamics (PBD). Although PBD has been widely used and extended for diverse tasks in physical based animation such as cloth simulation, PBF is seldom extended for complicated tasks which it would be highly capable of. I have once extended the simulation by introducing only a constant point constraints, which is extremely easy in both concept and implementation while highly powerful for collision detection and resolving for user-specified object. Check the first stage of this project on GitHub.

There are still some limitations in this project. First of all, as this version is implemented as a serial version, the performance is relatively low where we can only use particles of 3K to 5K in our simulation. Secondly, we do not have a real-time surface reconstructor for the simulator. What is more, we are still eager to investigate various kinds of constraints for complicated interactivities. In this final project, we would like to improve the previous project in these aspects described above.

## Proposed Features:

- CUDA version of PBF
- Accelerated algorithms in density estimation
- Floating object like boats
- Multi-fluid interaction
- Real-time surface reconstruction