Fluid sim is an interesting area of research and it has applications in many fields such as engineering, gaming. In this project, I simulate fluid based on weakly compressible smoothed particle hydrodynamics and build a simple surface reconstruction. The simulation is based on particles systems, and here are the important formulas for updating position, velocity and density for each particle. The momentum formula adds gravity to particles. The viscosity formula makes the fluid more stable so that it does not explode. The surface formula tension term pulls particles together. And the density formula reflects the pressure built inside fluid. All the quantities in the particles systems are updated using the forward Euler formula. I have also attempted to implement surface reconstruction using anisotropic kernel, but I have not finished debugging it due to time constraint, and I end up using isotropic kernel for surface reconstruction.

My implementation for weakly compressible SPH is mainly based on the paper Weakly Compressible SPH for Free Surface Flows by Markus Becker, and my implementation for surface reconstruction is based on the paper Reconstructing Surfaces of Particle-Based Fluids Using Anisotropic Kernels by Jihun Yu. In my initial implementation of SPH in 2 dimensions, I use Taichi, a programming language embedded in python. Later, I switched to C++ for 3 dimensions, and I use Eigen for vector and matrix calculation, Libigl for displaying and visualizing the particles and surface. I also use tbb to make my program run in parallel.