Abstract

The increasing of layers in shallow water equations (SWE) produces more dynamic model than the one-layer SWE model. The two-layer 1D SWE model has different density for each layer. This model becomes more dynamic and natural, for instance in the ocean, the density of water will decreasing from the bottom to the surface. Finite volume method with collocated grid is used to approximate equations. Here, the source-centered hydro-static reconstruction (SCHR) numerical scheme will be used to approximate the solution of two-layer 1D SWE model, since this scheme is proved to satisfy the mathematical properties for shallow water equation. The simulation of runup by under water avalanche is elaborated here. The results show that the runup is depend on the ratio of density of each layers. The implementation of numerical scheme in this final project will be parallelized. Shared memory architecture using OpenMP platform is chosen to parallelize it. Moreover by using grid sizes $N_x = 8000$, the speedup and efficiency by 2 threads are obtained 1.74779 times and 87.3896 % respectively. Nevertheless, by 4 threads the speedup and efficiency are obtained 2.93132 times and 73.2830 % respectively by similar number of grid sizes $N_x = 8000$.

Keywords: shallow water equations, finite volume, collocated grid, runup, source-centered hydro-static reconstruction, multicore, speedup, efficiency