

## A Large-scale Three dimensional Fluid Analysis by SPH method

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### ABSTRACT

The natural disaster caused by the flood or tidal wave by typhoon gives big damage to the citizens life. Therefore, it endeavors to make the crisis map and to minimize damage in the municipality. Recently, the methods of predicting by the numerical simulation has developed though making the hazard map has depended on the experience and the mathematical principle model experiment to a past case so far. In general, the numerical simulation in the river and the coast region analyzes the fluid behavior. Moreover, an analytical region of the numerical simulation deal with a large area from several km to several thousand km. Because the length of a perpendicular direction (depth) is very small compared with a size of analytical region in such a simulation, an analysis methods is executed by two dimensional analyses based on shallow water equation[1]. On the other hand, the numerical simulation of the interaction of the influence of the flow of the wave, the fluid and the bed of sea in the coastal region is calculated, and there is a method for assessment of the pressure to the structure or of the overbank of embankment. The wave direction and direction of depth in system of coordinate are set in this method and the analysis is calculated by two dimension finite volume method. In this case, the method of Volume of Fluid is applied to the treatment of the free surface flow[2].

It is very difficult to calculate a wide-ranging region by three dimensions analysis though the fluid behavior of the natural phenomena is three dimensional flow. Therefore, it is useful in the numerical simulation in a wide-ranging region to execute the analysis to a semi-three dimensions. it is possible that execution of limited analysis region by use the result of the numerical simulation of wide-range. However, it is possible that execution of three dimension analysis for the limited analysis region by used the result of the wide-range numerical simulation.

Authors developed three dimension fluid dynamics simulation system that called SMAC-SPH using Smoothed Particle Hydrodynamics [3]. This system has to treat a huge number of particles in the region of shallow water because it analyzes the influence of depth of water directly. Then, the simulation is executed by applying the parallel programming technology[4] to the composition of this system, and parallel calculating with a PC clustered parallel computer. The advantage of this system is to be

able to simulate it in the form that imitates actual three dimension fluid behavior almost completely. In this paper, the performance of developed this system is evaluated, about the parallel efficiency is discussed, and the effectiveness of this system is shown. Moreover, the result of the analysis of this system is compared with a past result, and the validity of the result is verified.

## REFERENCES

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