HIGH VISOSITY FLOW ANALYSIS USING MOVING PARTICLE SIMULATION METHOD

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A semi-implicit algorithm is developed for incompressible flow in particle method [1]. Pressure Poisson equation is solved to evaluate the pressure gradient term implicitly, while the other terms are explicitly evaluated. This algorithm enables us to solve various engineering problems where the flow can be regarded as incompressible [2][3]. Since meshes are not necessary, the particle method is fitted to analyze free surface flow: for example, splashing made by a free-fall lifeboat [4] and large-scale analysis of tsunami inundation [5].

In the plastics manufacturing process, high viscosity fluid flow should be analyzed with free surfaces. With the standard MPS algorithm is used, the time step has to be very small due to the numerical stability condition represented by the viscosity number. This increases the calculation time. When the viscosity term is analyzed implicitly, the time step can be chosen arbitrarily to capture the phenomena. Non-Newtonian relationships in viscosity is also studied [6][7].

The algorithm should be improved when the force balance is mainly achieved by the viscosity term and the pressure gradient term. This is realized by evaluating the pressure term explicitly and solving the Poisson equation with respect to the pressure modification [8].

The present study shows the basic analysis as verification.

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