Smoothed particle hydrodynamics method for elastic-plastic analysis

-Application of multi-linear constitutive equation-

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Abstract

The smoothed particle hydrodynamics (SPH) method [1] is applied to many problems of fluid dynamics, solid mechanics and fluid-structure interactive problems. It is sometimes difficult for the finite element method (FEM) to simulate failure phenomena and fracture phenomena such as impact problems. SPH methods can calculate complicated fluid-structure interaction problems. In fluid-structure interaction analyses, if the structures are subjected to the large loadings, the stress may exceed the yield stress in the structures. The elastic-plastic effects in fluid-structure interaction analyses have to be taken into account for the large deformation of the structure under the natural disasters or the large scaled earthquakes.

In the present study, the Marcal method [2] which is explicit method of the elastic-plastic procedure for the multi-linear constitutive equation are applied to the SPH method. The method is expected to shorten the computational time for the SPH method of the elastic-plastic problems. The problems of punches pushing to plates are calculated by the elastic-plastic SPH method to evaluate the computational precision. It is successful to apply the Marcal method to the SPH method which is applied to the multi-linear constitutive equation because the sufficient precisions of elastic-plastic problems are obtained. The SPH method with the Marcal method can be applied to the structural analysis of the fluid-structure interaction problems.

Keywords: Particle Method, Smoothed Particle Hydrodynamics

References

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