Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

A numerical scheme to simulate arbitrary shaped resolved particles in complex flows SOURABH APTE, Department of Mechanical Engineering, Stanford University, NEELESH PATANKAR, Department of Mechanical Engineering, Northwestern University — We present a numerical scheme for the simulation of freely moving rigid particles in complex flows. The approach is based on the work by Patankar (2001) and Sharma & Patankar (2004). The entire fluid-particle domain is assumed to be a fluid and the flow inside the particle domain is constrained to be a rigid body motion using an additional rigidity constraint in the context of a fractional step scheme. The particle is assumed to be made of material points moving on a fixed background mesh where the fluid flow equations are solved. The original scheme is further modified by introducing mollification kernels typically used in particle methods to interpolate between the particle material points and the fixed mesh. We evaluate the accuracy of the scheme together with the interpolation operator. This scheme is used to simulate a range of single and multiple particle problems in laminar flows. Some preliminary computations of particles in turbulent flows will also be presented. Application and extension of the scheme for the simulation of large number of resolved/deformable particles in complex turbulent flows will be discussed.

Sourabh Apte
Stanford University

Date submitted: 05 Aug 2005 Electronic form version 1.4