The Coupled Lattice Boltzmann and Discrete Element Method and Applications

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This talk will present the development of advanced numerical techniques essential for coupling the Lattice Boltzmann Method (LBM) and the discrete element method (DEM) to simulate particle transport problems in turbulent fluid flows encountered in many engineering applications. Key computational issues involved are: 1) the standard LB formulation for the solution of incompressible fluid flows; 2) the incorporation of large eddy simulation (LES) based turbulence models in the LB equations for turbulent flows; 3) the computation of hydrodynamic interaction forces of the fluid and moving particles; and 4) the DE modeling of the interaction between solid particles. A number of applications will be presented to demonstrate the capability of the coupling strategy.