PHYSICAL MATHEMATICS SEMINAR

Numerical Simulation of Codimensional Surface Tension Flow on Simplicial Complexes

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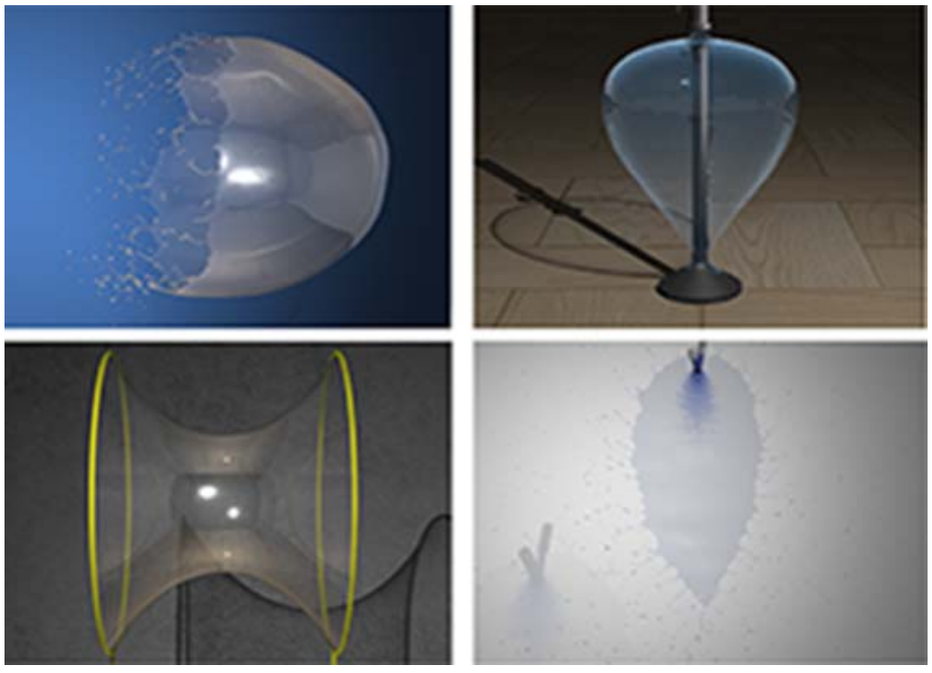
ABSTRACT:

Many visually interesting natural phenomena are characterized by thin liquid sheets, long filaments, and droplets. It is difficult to numerically simulate these codimensional surface tension phenomena using conventional volumetric methods due to these vanishingly thin features. We present a new Lagrangian-based numerical method to simulate these codimensional phenomena using non-manifold simplicial complexes. Tetrahedra, triangles, segments, and points are used to model the fluid volume, thin films, filaments, and droplets, respectively. We present a novel Poisson solver for enforcing fluid incompressibility on simplicial complexes along with a physically-guided meshing algorithm to provide temporally consistent information for interparticle forces. Our method naturally allows for transitions between codimensions, either from tetrahedra to triangles to segments to points or vice versa, regardless of the simulation resolution. We demonstrate the efficacy of this method by simulating various natural phenomena that are characterized by thin fluid sheets, filaments, and surface tension effects.

Bio:

Bo Zhu is a third year Ph.D. student and Ed Quigley is a first year Ph.D. student at Stanford University. Both are advised by Prof. Ron Fedkiw and work on fluid simulation and computer graphics research.



TUESDAY, MAY 6, 2014
2 :30 PM
Building E17, Room 136

Reception following in Building E17, Room 401A
(Math Dept. Common Room)

http://math.mit.edu/pms/

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