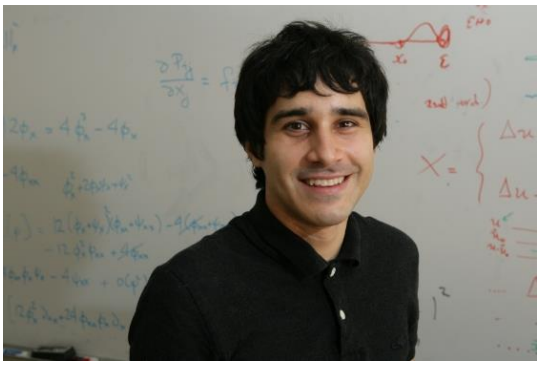
Portland State UNIVERSITY

Computer Science Colloquium

Drucker-Prager Elastoplasticity for Sand Animation

We simulate sand dynamics using an elastoplastic, continuum assumption. We demonstrate that the Drucker-Prager plastic flow model combined with a Hencky-strain-based hyperelasticity accurately recreates a wide range of visual sand phenomena with moderate computational expense. We use the Material Point Method (MPM) to discretize the governing equations for its natural treatment of contact, topological change and history dependent constitutive relations. The Drucker-Prager model naturally represents the frictional relation between shear and normal stresses through a yield stress criterion. We develop a stress projection algorithm used for enforcing this condition with a non-associative flow rule that works naturally with both implicit and explicit time integration. We demonstrate the efficacy of our approach on examples undergoing large deformation, collisions and topological changes necessary for producing modern visual effects



10:00 am, Monday
May 23, 2016
FAB 86-01
1900 SW 4th Ave.
Portland

Host: Feng Liu
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Joseph Teran is a professor of applied mathematics at UCLA. His research is focused on numerical methods for partial differential equations arising in classical physics. This includes computational solids, computational fluids, multi-material interactions, fracture dynamics and computational biomechanics. Exciting applications include computer graphics and movie special effects at Walt Disney Animation. Professor Teran was a recipient of a 2011 Presidential Early Career Award for Scientists and Engineers (PECASE) and a 2010 Young Investigator award from the Office of Naval Research. In 2008, Discover Magazine named him one of the 50 “Best Brains in Science” which lauded him and other young scientists as “young visionaries who are transforming the way we understand the world”.