Time & Location: November 20, 2009 at 4:00 PM in ENG1 288
Title: Numerical Solution of the Two-Phase Incompressible Navier-Stokes Equations Using a GPU-Accelerated Meshless Method

This project presents the development and implementation of a GPU-accelerated meshless two-phase incompressible fluid flow solver. The solver uses a variant of the Generalized Finite Difference Meshless Method. The Level Set Method is used for capturing the fluid interface. The Compute Unified Device Architecture (CUDA) language for general-purpose computing on the graphics-processing-unit is used to implement the GPU-accelerated portions of the solver. CUDA allows the programmer to take advantage of the massive parallelism offered by the GPU at a cost that is significantly lower than other parallel computing options.

Through the combined use of GPU-acceleration and a radial-basis function (RBF) interpolated meshless method, this project seeks to address the issue of speed in computational fluid dynamics. Traditional mesh-based methods require a large amount of user input in the generation and verification of a computational mesh, which is quite time consuming. The RBF meshless method seeks to rectify this issue through the use of a grid of data centers that need not meet stringent geometric requirements like those required by finite-volume and finite-element methods. Further, the use of the GPU to accelerate the method has been shown to provide a 14-fold increase in speed for the solver subroutines that have been accelerated.

Major: Energy Systems

Educational Career:
Bachelor's of Mechanical Engineering, BS, 09, UCF

Committee in Charge:
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Approved for distribution by Dr. Eduardo Divo, Committee Chair, on November 6, 2009.

The public is welcome to attend.