1024-65-234 **Jim E. Jones*** (jim@fit.edu), Department of Mathematical Sciences, Florida Institute of Technology, 150 W. University Blvd., Melbourne, FL 32901. *Multigrid Methods for Systems of PDEs.*

Many simulations require the solution of large-scale models based on a system of coupled partial differential equations (PDEs). We discuss the performance of the multigrid solvers on a variety of system PDEs.

Discretizing a system of linear PDEs results in a linear system which must be solved to generate a numerical solution to the PDE. Since the problem comes from a system of PDEs, the discrete unknowns can be grouped by variable type. If the coupling between variables types is very weak, and certainly if no coupling is present, one can solve the system by applying multigrid separately to the blocks corresponding to each variable type.

When coupling is present in the system matrix, there are several places in the multigrid algorithm where this cross variable coupling can be taken into account. Options include: handling the coupling only in an outer Krylov iteration, handling it in the relaxation process, and handling it in the intergrid transfer operators within the multigrid cycle.

In this talk, we present results for several approaches and investigate what characteristics of the system PDE effect multigrid perfomance. (Received January 09, 2007)