Preconditioning Techniques For The 2-D 3-T Energy Equations On Deforming Meshes

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The 2-D 3-T energy equations is a kind of strongly nonlinear systems that is used to describe the energy diffusion and exchanging between electron and photon or ion. In multiphysics simulations, the energy diffusion and exchanging process is coupled with some other physical processes, such as fluid dynamics, laser broadcast etc. Consequently, the 3-T energy equations should be discretized on the deforming meshes which is moved with dynamics. On deforming meshes, some nine-point scheme must be employed to discretize 3-T energy equations for two dimensional case. Because the energy diffusion and swapping coefficients have a strongly nonlinear dependence on the temperature, and some physical parameters are discontinuous across the materials interfaces, it is a challenge to solve the discretized nonlinear algebraic equations on multiple materials and multiple physics applications [1].

In this report, a Newton-Krylov method [3] will be used to solve the discretized 3-T energy equations, and a Picard type method will be employed to construct a preconditioner. The Newton-Krylov method is implemented on the KINSOL package [2] and the preconditioning system is solved by using HYPRE package [4].

References

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