
Andrew Salinger
Space-Time Solution of Large-Scale PDE Applications

Sandia National Labs
PO Box 5800
MS-1111
Albuquerque
NM 87185
`agsalin@sandia.gov`
Daniel Dunalvy
Eric Phipps

Software and algorithms are being developed to efficiently formulate and solve transient PDE problems as "steady" problems in a space-time domain. In this way, sophisticated design and analysis tools for steady problems, such as continuation methods, can be brought to bear on transient (and eventually periodic) problems. This new capability is being developed in the Trilinos solver framework, and is designed to present a simple interface to application codes. The software allows for parallelism over both the space and time domains.

The main hurdle to make this approach viable is to be able to efficiently solve the very large Jacobian matrix for very large the space-time system, with its characteristic structure. We will present results for a number of preconditioners and solution methods that we have developed for this linear system. Numerical results for a PDE reacting flow application will be presented. These results will shed some light on the underlying question of whether it can pay to parallelize the time domain.