NASA SBIR/STTR Technologies

Contract# NNX11CG69P - Implicit Higher Order Temporal Differencing for CFD Applications

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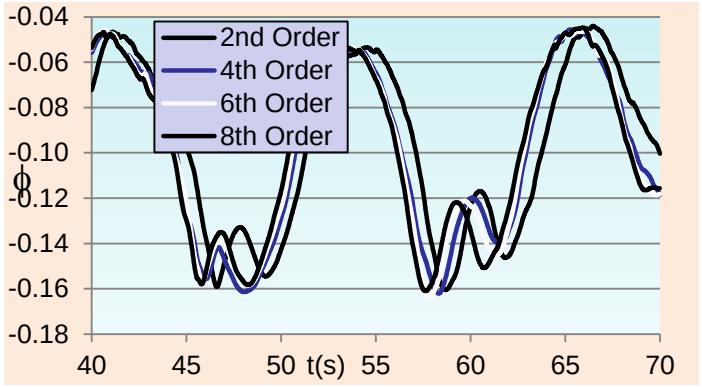
Identification and Significance of Innovation

- Development of a standalone temporal integrator that can interface with various numerical analysis solvers.
- Ability to easily solve arbitrarily high implicit temporal order of accuracy
- No need to develop new spatial solvers with higher order time integration or to make massive infrastructure changes to existing solvers.
- Low-overhead software interfacing using Trilinos libraries

Expected TRL Range at the end of Contract (1-9): 4



Technical Objectives and Work Plan

Technical Objectives:

a) extract the SDC algorithm from an existing CFD solver and create a standalone component;
b) verify the order of accuracy claims of the SDC algorithm;
c) Incorporate a high order Runge-Kutta algorithm into the temporal integrator for comparison purposes, and
d) integrate the standalone component with various spatial solvers to demonstrate proof-of-concept.

Work Plan:

a) Define interface protocols for communication between the temporal solver and various spatial solvers
b) Develop the standalone temporal integrator
c) Integrate the temporal solver with various spatial solvers;
d) Test and demonstration cases, including comparison of the SDC algorithm with a higher order implicit Runge-Kutta algorithm.

NASA and Non-NASA Applications

Applications involve any area where high order numerical accuracy is desired. Potential CFD applications include combustion (including instability), noise generation and propagation, and LES and DNS simulations. Other applications include long transient analyses using a large number of time steps in which numerical errors can grow over time and pollute the solution.

Firm Contacts

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