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Verification of sliding mesh algorithms for complex applications using MMS

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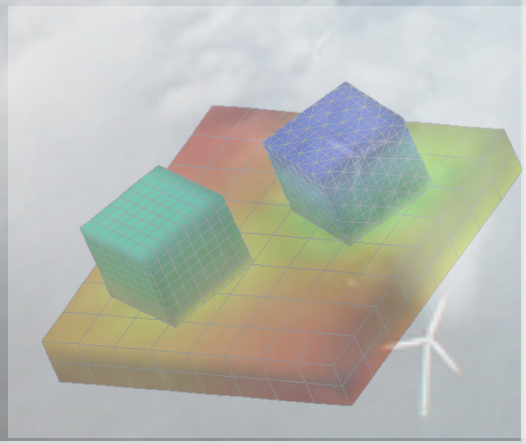
2010 CTR Summer Program Presentation of Research Plans

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Application of Interest

- RANS/LES on generalized unstructured meshes with disparate (non-conformal) mesh blocks
  - Assists in the ability to mesh complex geometries
- Generalized sliding mesh
  - Wind turbine applications, moving bluff body interaction, etc.
- Complex thermal heat conduction applications where independently meshed blocks are joined



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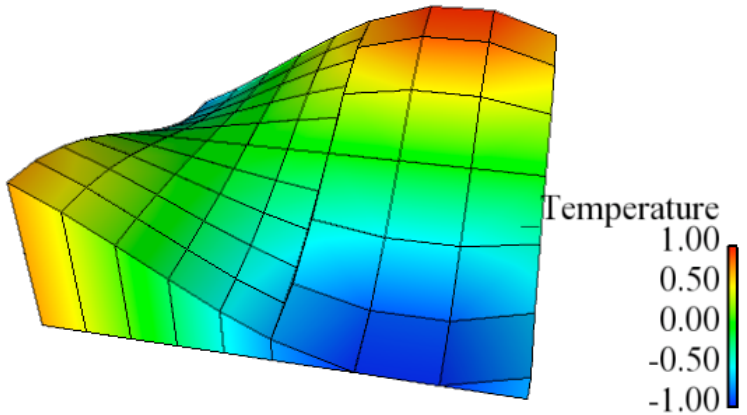
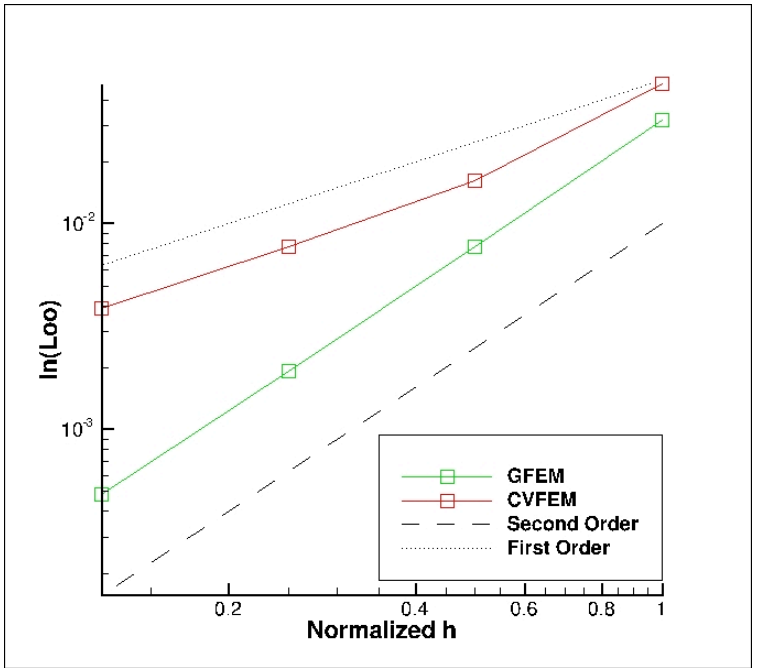
Current Thermal Contact Algorithm

- SNL generalized unstructured thermal contact algorithm on disparate mesh uses principles based on a discontinuous Galerkin method
- MMS has been used to formally demonstrate 2nd order spatial accuracy for GFEM while only 1st order for CVFEM





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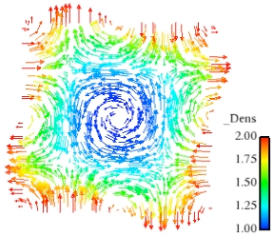
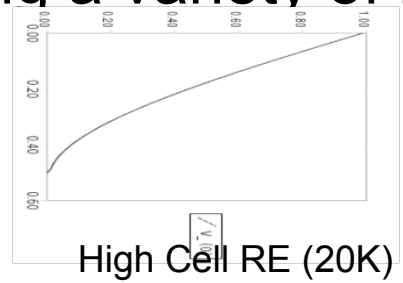
Research Plan

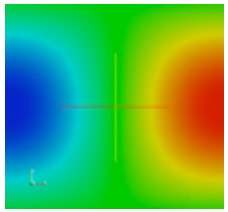
- Extend thermal contact algorithm for fluids applications
  - Evaluate using a variety of manufactured solutions

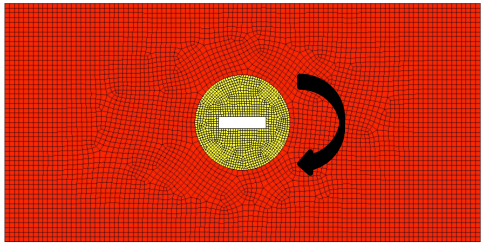


Variable density TV

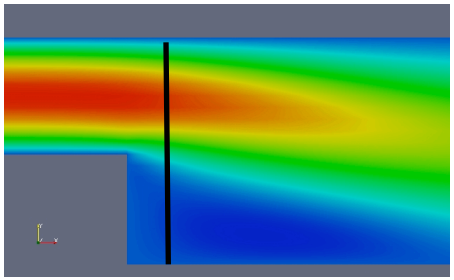


High Cell RE (20K) Convecting TV

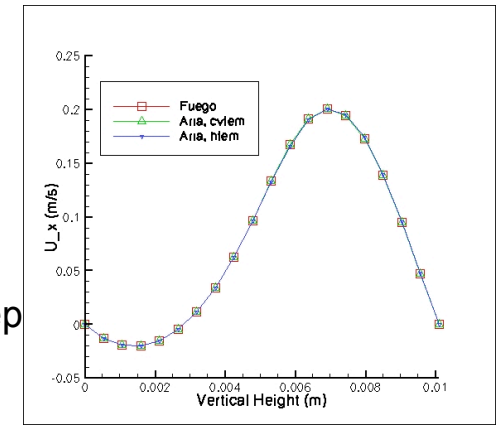


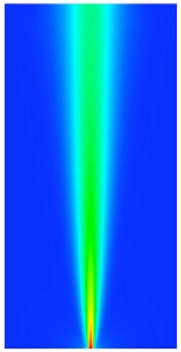


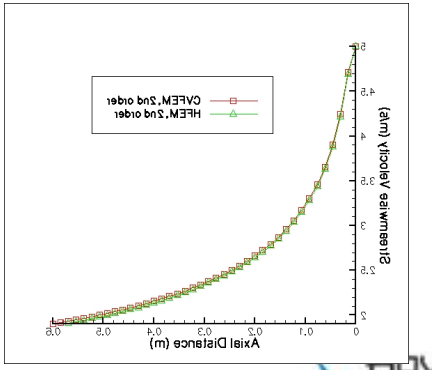
- Evaluate the formal first order CVFEM algorithm
- Advance new algorithmic consolidation methodology which demonstrates FVM and FEM to be nearly identical for a wide variety of canonical flows



Laminar backward facing step







Laminar open jet

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