The TriForce Project: Progress and Plans


The TriForce Center for Multiphysics Modeling, a collaboration between the Departments of Mechanical Engineering, Physics, Computer Science, and the Laboratory for Laser Energy Research at the University of Rochester

The goal is to provide better predictive capability and access to advanced models for the benefit of the academic community.

- Student involvement: high school, undergraduate, and graduate

Smoked bundles (uses interpolation)

Magnetized plasma physics

- Plasma flow in pulsed-power transmission lines
- Magnetically driven implosions

Ray examples: "spontaneous direct simulation" (DDS) test which help us explore the idealized 3D geometry.

MHD transport coefficient sensitivity studies

- Impact of the choice on integrated modeling
- "2012 point design" analysis
- "B"rajnik
- Graham stations
- J. Held-Davies
- Lader
- Longer-term goal:
- Compare MHD and XMD to impulse EDM and PIC

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Particles examples: "spontaneous direct simulation" (DDS) test which help us explore the idealized 3D geometry.

Coulomb collision models

- Crossed beam energy transfer (CBET)
- Direct drive ICF implosions

Acknowledgments

Particle-based meshless fluid algorithms

- Smoothed-particle hydrodynamics (SPH)
- A meshfree approach to CFD

Material models (fluids)

- Equation of state:
  - Argonne (PESOS, ASTOS, SEASAN)
  - Classic
  - Physical (PPM, PPM, PPM)

Electrical resistivity:

- q2 = 0.2
- q2 = 0.3

- Viscosity:
  - 0.3 and 0.4
  - 0.5 and 0.6

- Sediment and material strength
- Stress-strain and material strength

Electromagnetic field and plasma interactions

- Charged particle beams
- Interaction and excitation
- Magnetohydrodynamics
- Circuit model
- Nuclear thermal conduction
- Fusion and q-g transport
- Neutron transport
- Photon transport

Closed field to accelerate the plasma

3D TriForce modeling

References

This material is based upon work supported by the Department of Energy (DOE)
- Office of Fusion Energy Sciences (DOE) under Award No.
- National Science Foundation under Award No.
- CNS-1848081, and DOE Advanced Research Projects Agency—Energy (ARPA-E) under Award No. All.
- The National Science Foundation under Award No.
- CNS-1848081, and DOE National Nuclear Security Administration (NNSA) under Award No.

Other models and advanced structures

- Explicit or implicit particles & fields
- Adaptive particle and mesh
- Charged particle beams
- Interaction and excitation
- Magnetohydrodynamics
- Circuit model
- Nuclear thermal conduction
- Fusion and q-g transport
- Neutron transport
- Photon transport

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