



ME – MTech(Res) Thesis Defence



A Monolithic Finite Element Formulation for Magnetohydrodynamics Involving a Compressible Fluid

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July 25, 2023, at 11:00AM
Venue: Conference Room, ME@IISc

ABSTRACT

This work develops a new monolithic finite-element-based strategy for magnetohydrodynamics (MHD) involving a compressible fluid based on a continuous velocity-pressure formulation. The entire formulation is within a nodal finite element framework, and is directly in terms of physical variables. The exact linearization of the variational formulation ensures a quadratic rate of convergence in the vicinity of the solution. Both steady-state and transient formulations are presented for two- and three-dimensional flows. Several benchmark problems are presented, and comparisons are carried out against analytical solutions, experimental data, or against other numerical schemes for MHD. We show a good coarse-mesh accuracy and robustness of the proposed strategy, even at high Hartmann numbers.

ABOUT THE SPEAKER

Adhip Gupta is a MTech(Res) student in the Department of Mechanical Engineering, IISc Bangalore. He is working with Prof. C. S. Jog in the Computational Mechanics Laboratory. He completed B.Tech. from NIT, Kurukshetra. His research interests are in computational and experimental fluid mechanics.

