Auxiliary variational inequality principle and projection methods for MHD propulsion system

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In this paper we show how one could extend Jones-Soward-Mussa (JSM) theory (2000): analytic and computational solution for \( E \to 0 \) and \( Pr/E \to \infty \) and another MHD related problems e.g., Zhang (2001) ansatz for: \( E \ll 1 \) arbitrary but fixed and \( 0 \leq Pr < \infty \) the so-called enhanced Nearly Geostrophic Inertial Wave (NGIW) approach. Such extension represents a construction of a new MHD plasma convection and magnetoconvection force theory. Different theoretical and computational aspects are presented. We proposed the auxiliary variational inequality as well as the projection method as a replacement of asymptotic analysis for the solution of some complicated MHD as well as MHD turbulence and thruster problems. We also suggest some variational formulation extension for a similar class of mathematical and engineering problems.