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A Semianalytical Framework for 1D Shock Hydrodynamics with Application to HED Systems[1] MICHAEL WADAS, ERIC JOHNSEN, University of Michigan — Interfaces separating media of different densities undergoing strong accelerations play important roles in high energy density (HED) systems, including dynamic compression and hydrodynamic instability studies. Our objective is to develop a framework for semianalytically solving the one-dimensional Euler equations in planar geometries in the context of designing and analyzing HED experiments. By combining the method of characteristics with boundary conditions prescribed by the exact solution to the Riemann problem, it is found that semianalytical solutions can be obtained for one-dimensional planar flows involving any combination of interactions of shock and rarefaction waves with fluid interfaces. The solutions obtained using this method are computationally less expensive and more physically insightful than their numerical counterparts, evidenced by their comparison to solutions obtained using an in-house, high-order accurate discontinuous Galerkin code.

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