

Research Project 1: Optimal Trajectories for Hypersonic Boost-Glide Vehicles

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This project's objective is to find optimal trajectories for hypersonic Boost-Glide Vehicles for various objective functions, such as maximal range, minimum effort, and maximum lateral maneuver at different points along the trajectory. The optimization is applied to the gliding phase, including constraints on the heat flux, dynamic pressure, overload, and terminal states. The trajectory Optimization Problem (OP) is solved using a hp-adaptive pseudospectral method version of the Legendre-Gauss-Radau (LGR). The optimization is carried out in 3D, assuming a non-rotating spherical Earth. It was shown numerically that the results satisfy the necessary conditions for optimality. Good matching was found to a previous work from the literature, demonstrating the reliability of the solutions. This project is the first step towards a two-sided pursuit-evasion solution in real-time involving a Hypersonic Boost-Glide Vehicle.