
Feedback Optimal Control of Low-thrust Orbit Transfer in Central Gravity Field

Ashraf Owis*¹

¹Astronomy, Space and Meteorology Department-Cairo University – Cairo University St, 12613 Giza, Egypt

Abstract

Low-thrust trajectories with variable radial thrust is studied in this paper. The problem is tackled by solving the Hamilton Jacobi-Bellman equation via State Dependent Riccati Equation(STDE) technique devised for nonlinear systems. Instead of solving the two-point boundary value problem in which the classical optimal control is stated, this technique allows us to derive closed-loop solutions. The idea of the work consists in factorizing the original nonlinear dynamical system into a quasi-linear state dependent system of ordinary differential equations. The generating function technique is then applied to this new dynamical system, the feedback optimal control is solved. We circumvent in this way the problem of expanding the vector field and truncating higher-order terms because no remainders are lost in the undertaken approach. This technique can be applied to any planet-to-planet transfer; it has been applied here to the Earth-Mars low-thrust transfer.

*Speaker