TIME-OPTIMAL TRANSFERS TO RENDEZVOUS WITH TEMPORARILY CAPTURED OBJECTS IN THE EARTH-MOON SYSTEM

GAUTIER PICOT

The present work, led by researchers from the Mathematics Department and the Institute for Astronomy of the University of Hawaii, deals with the design of time-optimal transfers from the geostationary orbit to near Earth temporarily captured objects. The orbits of such objects can be approximated by trajectories of the well-known restricted 3-body problem in the neighborhood of the equilibrium point L1 of the Earth-Moon system. This observation suggests the model to use for this study and we base our computations on indirect methods in optimal control. According to the Pontryagin Maximum Principle, the time-optimal transfers are necessarily projections of so-called extremal solutions, which can be computed by means of a numerical shooting method. The optimality of such projections is then checked using a second order condition related to the notion of conjugate time. As a result, we obtain a collection of locally time-optimal transfers associated with a large scale from high to low-thrusts propulsion towards several different near Earth temporarily captured objects.