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EXPLORING SOLUTIONS FOR MULTI-IMPULSE AIDED LOW-ENERGY MOON-TO-MOON  
TRANSFER

**Abstract**

With the growing interest in exploration of multi moons in future Jupiter missions, low-energy tour design between periodic orbits in different dynamic systems has attracted attention. The recent moon-to-moon analytical transfer (MMAT) method offers a new efficient tool to design direct transfer between neighborhood moons in the coupled circular restricted three-body problems. However, only one patched impulse is considered and the corresponding transfer solutions are limited by the orbital parameters of departure arc and arrival arc. An extended MMAT method incorporating two or three burns does not analyze the optimality of the transfer. In this investigation, a new strategy to increase the transfer chances between moons is introduced. This strategy leverages the MMAT method and multi intermediate maneuvers to access minimum-cost transfer trajectories. The interval conditions of the transfer are first analyzed. New impulse scenarios are proposed and the optimality of the transfer is discussed. In particular, more transfer solutions are expected to be found. The method is applied to transfer designs concerning both the planar and spatial conditions in Jupiter system. Transfers are transited into higher-fidelity ephemeris models to verify the validity of this method and the velocity impulse cost.