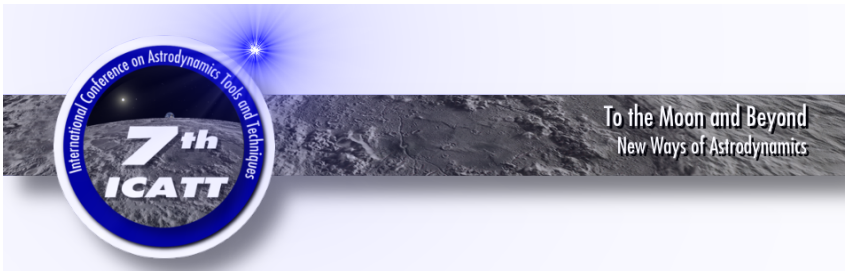

Contribution ID: **9** Type: **Oral presentation at the conference**

MOLTO-IT: A Multi-Objective Low-Thrust Optimization Tool for Interplanetary Trajectories

Friday, 9 November 2018 14:00 (30 minutes)

Low-thrust propulsion and gravity assists maneuvers are both well known to provide sig- nificant benefits in terms of required propellant mass for interplanetary trajectories. However, the propellant reduction achieved with low-thrust engines, when compared to their chemical counterparts, comes at the cost of a higher transfer time.
Therefore, the design and optimization of interplanetary missions has to be treated as a multi-objective optimization problem. The goal is to determine the set of optimal trajec- tories along with the optimal sequence of planetary flybys. For such purpose we present the optimization tool MOLTO-IT (Multi-Objective Low-Thrust Optimizer for Interplanetary Tra- jectories). It is based on a two-step sequential algorithm. In the first step, the trajectory is assumed to be a Generalized Logarithmic Spiral. A heuristic global search algorithm combined with nonlinear programming are in charge of optimizing the set of parameters defining the spirals, as well as the number, sequence and configuration of the gravity assists. As a result the set of Quasi-Pareto-Optimal solutions trading off propellant mass consumed and time of flight are obatined. In the second step, candidate solutions are regarded as initial guesses for a direct collocation method, where the problem is transcribed into a Nonlinear Programming Problem by discretization, considering the full dynamics and the complete set of constraints.
A full overview of the capabilities and features of MOLTO-IT will be given. In particular, the ability to obtain optimal flyby sequences without a-priory knowledge by the user. Addi- tionally, the effectiveness of our methodology to generate not only rapid performance estimates for preliminary trade studies, but also accurate calculations for the detailed design, will be highlighted.

Summary

Primary authors: MORANTE, DAVID (Universidad Carlos III (Madrid)); Mr GARCÍA MATEAS, José Carlos (Universidad Carlos III de Madrid (Spain)); SANJURJO-RIVO, Manuel (Universidad Carlos III de Madrid); Dr SOLER-ARNEDO, MANUEL (Universidad Carlos III)

Presenter: MORANTE, DAVID (Universidad Carlos III (Madrid))

Session Classification: Low Thrust #3

Track Classification: 03: Low Thrust