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A GUI for optimization of low-thrust trajectories for nuclear and solar electric propulsion

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The optimization of low-thrust trajectories is a well known subject and now-a-days it is important to have a simple graphical interface in order to obtain in a very fast way the optimized results to compare different solutions. The optimization, in this case, is made with indirect method and it is possible to optimize travels in the entire solar system. The optimization of the trajectory and the optimization of the spacecraft are two separated steps, linked together by a single parameter: The specific mass of the power generator. The entire problem is solved under the assumption that the specific mass of the power generator is constant for the nuclear propulsion. In the case of solar propulsion, this key parameter depends on the distance of the spacecraft from the sun. In this work, the optimization is solved for circular orbit and taking into account all phases of the journey, spiraling around the departure planet, interplanetary cruise and spiraling around the destination. It is also possible to evaluate the opportunity of journey in presence of space elevator, very effective gateway to solar system, able to make robotic and human explorations faster and cheaper. All results are strongly documented with a large variety of plots.

Biography

Porzia Federica Maffione completed her Master's degree in Mechatronic Engineering from Polytechnic of Turin. Her project thesis was on space propulsion for human spaceflight with VASIMR and the aim of this project was to study the optimization problem with indirect method. Currently, she is doing PhD at Polytechnic of Turin on astrodynamics and space robotics. Her first publication was on optimal low-thrust trajectories.

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