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JOURNEY TO MARS' MOONS: ORBIT TRAJECTORY PLANNING FOR INTERPLANETARY EXPLORATION

Abstract

The target of this study is comprehensive analysis of orbits from Earth to Mars and further from Mars to its moons, Phobos and Deimos. With recent advances towards space exploration, taking into consideration the study of asteroid bodies, Phobos and Deimos provide a brilliant substitute for research objects. The prime objective here is to design the optimal trajectories for possible future space missions using present available simulation software. The analysis takes place in two separate parts; the first phase will involve the designing of orbital trajectory from Earth to that of Mars. The procedure for this design will include factors such as fuel efficiency, time of launch, travel, arrival etc into consideration. This trajectory design aims towards minimization of energy required for the journey in comparison to energy needed in present day missions while taking all the factors into consideration. The concept of Trans-Mars Injection would be taken into study, where in a heliocentric orbit, maneuvering using propulsive techniques would be used to set up the spacecraft into trajectory. The second phase of this orbital analysis will involve the orbit transfer from Mars to its moons Phobos and Deimos. Two separate analyses would be developed for both the moons on the basis of their orbit, mass, velocity, the current location of both the moons etc. The result obtained will aid future research missions aiming towards Phobos and Deimos. This will also help expand our research domains from near-earth asteroids to the said captured asteroids of Mars, which are assumed to have similar material composition to that of the asteroids present in the Asteroid Belt. Designing of the orbits for these moons will be a major milestone for observatory studies. the results of this study will have a significant contribution towards the field of space exploration and have the potential of shaping the future space of orbital analysis and mission planning.