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Advanced trajectory design: Application to near-earth asteroid rendezvous for mitigation and mining

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Abstract

Asteroids have many valuable resources such as minerals and volatiles, which can be brought back to Earth or used in space for space propulsion systems or space habitats and stations. Transportation to and from asteroids will require relatively massive vehicles capable of sustaining crew for long durations, while economizing on propellant mass. Thus, in the design of advanced space missions for exploration, mitigation, and mining of Near-Earth Asteroids (NEAs), developing new technology for low cost trajectories will play a key role. This paper is focused on NEA rendezvous mission design using fuel-minimizing trajectories that take advantage of the natural dynamics in the solar system. This energy efficient trajectory technology, called Interplanetary Super Highway, allows long duration space missions with little fuel. Invariant manifolds, can carry a spacecraft immense distances with little or no expenditure. This patched three-body method of trajectory design is fairly well developed for impulsive propulsion. Here we advance the capabilities of the method by extending it to continuous, low-thrust, high specific impulse propulsion methods.

Biography

Neha Satak was awarded the Ph.D. degree at the Department of Aerospace Engineering at Texas A&M University in June, 2013. She received her Master's of Science degree in Aerospace Engineering at the Indian Institute of Science, India. There she worked on Micro Air Vehicle design, fabrication and autonomous control. She also received the best Master Thesis Award (Gold Medal) for her Master's Thesis. Her undergraduate degree is in Electronics and Communication Engineering from the Rajasthan University. She is also an Amelia Earhart Fellow for the year 2010-2011. Her interest and future goals are to become a space entrepreneur.