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Advanced trajectory design: Application to near-earth Asteroid Rendezvous for mitigation and mining

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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 Superhighway, 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, and high specific impulse propulsion methods.

Biography

Hyerim Kim is a Ph.D. student in Aerospace engineering at Texas A&M University and received her B.S. in Astronomy and Space science and B.E. in Mechanical Informatics Engineering from Kyung Hee University, South Korea in 2009. Her research interests include space mission design, optimal control, and optical imaging. Currently, her research focuses on low energy trajectory design for exploration, mitigation and mining of Near-Earth Asteroids.

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