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Author: Mr. Giacomo Porcarelli
University of Padua, Italy

Mr. Federico Toson
CISAS "G. Colombo" - University of Padova, Italy
Mr. Giacomo Colombatti
Università degli Studi di Padova, Italy

GENETIC ALGORITHM FOR LUNAR FLOWER CONSTELLATION

Abstract

As the number of lunar missions continues to grow, so does the need for accurate lunar observation and full signal coverage. However, the nature of lunar orbital perturbations makes it difficult to study frozen ground orbits, and the cost of deploying large numbers of satellites around the Moon, although decreasing, is prohibitive. The aim of this work is to present a genetic optimization algorithm that searches for a flower constellation in Low Lunar Orbits (LLOs) of nanosatellites, providing complete coverage of a selected area. Due to the complexity of the gravitational field near the lunar surface, full Keplerian and J2 perturbation solutions and optimizations are not accurate enough. Thus, propagation taking into account the LP-165 gravity field, Earth and Sun perturbations are performed in the algorithm. To account for orbital shift, small corrections are made to maintain the constellation formation. Considering the importance of orbital stability and fuel efficiency in this specific application, the presented genetic algorithm is being developed using a cost function that takes these parameters into account. The aim of this research is to develop a tool that can determine the most efficient flower constellation for complete coverage of a specific lunar site, given enough calculation power and time.