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NEO DEFLECTION PERFORMANCE ANALYSIS OF A SMART CLOUD APPROACH

Abstract

Smart Cloud is an asteroid deflection strategy proposed to fractionate a single monolithic Kinetic Impactor into a swarm composed of small satellites that hit the NEO nearly at the same time. This technique reduces the risk of failure and of unwanted outcomes of the deflection action in the case of loosely cohesive bodies, which indicates an improvement on the redundancy of a Kinetic Impactor mission. Previous study already demonstrated that Smart Cloud has the advantages of reducing the system mass and complexity of the spacecraft design compared with the Ion Beaming.

Compared with a classic Kinetic Impactor, a distributed transfer of momentum will be applied by a Smart Cloud. This paper will first investigate the effects of a distributed transfer of momentum on the deflection performance. With the consideration of aleatory uncertainties on orbital elements, and the epistemic uncertainties on physical properties, this paper introduces a model of mixing the uncertainties consisting of probability distributions and intervals, therefore, to estimate the lower bound and upper bound of post-deflection impact probability. Then, the deflection performance of a Smart Cloud under uncertainties is discussed.