Paper ID: 84534
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IAF SYMPOSIUM ON PLANETARY DEFENSE AND NEAR-EARTH OBJECTS (E10)
Interactive Presentations - IAF SYMPOSIUM ON PLANETARY DEFENSE AND NEAR-EARTH OBJECTS (IP)

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DEEP NEURAL NETWORK-BASED ASTEROID DEFENSE STRATEGY: REDIRECTING INTERMEDIATE ASTEROID ORBITS VIA KINETIC ENERGY IMPACT

Abstract

In this study, a threatening asteroid defense strategy by kinetic energy impact is proposed. The defense strategy includes the selection of intermediate asteroids and the orbit design. For solving the performance optimization problem in multi-impactor mission planning, the optimal transfer location and time is difficult to select and a two-point boundary value problem need be solved. Therefore, a model capable of estimating transfer parameters and generating preliminary trajectories is important. Inspired by the successful applications of neural networks for deep space exploration, this study explores the potential and effectiveness of mapping the transfer parameters from the orbital characteristics of asteroid using the deep neural networks. Furthermore, the selection of suitable intermediate asteroid is facilitated by employing the Monte Carlo tree method, and the Lambert problem is solved based on search results. Simulations verify the efficacy of this methodology.