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# ORBIT DESIGN OF SPACE-BASED INTERCEPTOR FOR DEFENSE AGAINST SMALL CELESTIAL BODY IMPACTING THE EARTH

**Abstract**

In recent years, threat events about near-Earth asteroid have occurred frequently, and its defense issues have received widespread attention. Space-based interception is one of the important means against small celestial body impacting the Earth. Therefore, orbit design of space-based interceptor is a key of this defense technology. In this paper, we design a space-based defense interceptor which is normally orbiting the Earth and is launched to collide for asteroid deflection in planetary threat situation. Then we have simulated the minimum velocity increments of interceptors, which are deployed at different orbit heights, based on the Hohmann transfer theory. Intercepting orbit against near-Earth small asteroids have been simulated by using Lambert algorithm and the characteristics of coplanar intercepting window have been depicted. By solving the Lambert orbit transfer problem in rectangular coordinate system, the coplanar interception problem in theory is transformed into the non-coplanar interception problem. The simulation shows that the intercepting window is wider if the increment of interceptor's maximum velocity is larger. In the case of the interceptor being deployed on a geostationary orbit, in order to intercept the near-Earth small celestial body which latitude is greater than 20, at the location of 0.5 times distance between the Earth and the moon, the minimum speed of the interceptor is required to reach 2000m/s.

Keyword: Space-based interception; Defense against small celestial body; Orbit design; Lambert algorithm