

SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FAR FUTURE (D4)
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DEFLECTION OF TUMBLING ASTEROIDS BY MEANS OF SUN ORIENTED TETHERS

Abstract

An open ended Sun oriented tether system capable of imparting velocity change to a tumbling asteroid and deflect it away from an Earth impacting trajectory is considered. The tether system is composed of a balancing mass at its lower end, and a net device at its upper end. The angular motion of the deployed tether system around the Sun is synchronized with the asteroid's so that the net device gently rendezvous with it and gets caught by its tumbling motion. The asteroid and the tether system are now connected together by the long Sun oriented tether and the asteroid's rotational motion begins to pull the two objects closer together while maintaining Sun orientation by gravity gradient stabilization. This orbit modification maneuver changes the asteroid's orbital period and causes it to develop a miss distance with Earth over time that reduces the likelihood of a collision with it a number of years later. The method is feasible for small to medium asteroid sizes with lead time of two decades with available tether materials. The study identifies the required system sizing for a given range of asteroid characteristics.