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SPACE DEBRIS SYMPOSIUM (A6)
Modelling and Risk Analysis (2)

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EVALUATION OF THE TLE PREDICTIONS FOR CONJUNCTION ASSESSMENT

Abstract

Japan Aerospace Exploration Agency performs Conjunction Assessment (CA) for our operational satellites by using the publically released TLEs observed by the U.S. Space Surveillance Network (SSN). As the first screening, CA is analyzed for seven days into the future every day. When an approaching object is detected, JAXA requests for radar observation in order to improve the accuracy of orbital prediction by determining the orbit with radar data. However, the radars which can response promptly are limited and those situations can be happen that we have to make a decision of performing Debris Avoidance Maneuver (DAM) based on the results of CA using only TLEs. The decision is very difficult under such a condition. From the past close approach events, we confirmed that there would be enough distance on the event which was predicted to approach in the assessment by a TLE at a certain epoch, after we performed radar observation of the object. This means that the event which is not predicted to approach can be close enough since the covariance matrix of each TLE is not publically released. Therefore the following two points are important and also our tasks on CA using TLEs. The first one is how we screen out the possible candidates to approach as accurately as possible in the first screening. The second one is to comprehend the trend how much the TLEs of the object has possibility to enlarge the prediction errors till the Time of Closest Approach (TCA) in order to make it as an information for making a decision of DAM. Towards the first task, the orbital prediction accuracy for each orbital characteristic (altitude, eccentricity and inclination) was statistically evaluated when TLEs were propagated for 14 days. Especially, the objects which have possibility to approach to JAXA satellite, ALOS, were picked out and the accuracy was evaluated for each orbital characteristic. Also, we picked up some objects and comprehended the difference of prediction errors which caused by the level of solar activity. For the second task, we evaluated how far the past collision events had been predictable by comprehending the trend of prediction errors of past TLEs. In this paper, we discuss the effectiveness of CA referring TLEs by showing the evaluation methods and results of TLE prediction errors.