

SPACE DEBRIS SYMPOSIUM (A6)
Modelling and Risk Analysis (2)Author: Prof. M. Navabi
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Shahid Beheshti University, Iran, reza.hamrah@gmail.comEVALUATION OF THE MAXIMUM COLLISION PROBABILITY USING A PRECISE
PROPAGATION MODEL, THE COSMOS2251 AND IRIDIUM33 SATELLITES COLLISION CASE
STUDY**Abstract**

In this paper, a comparative study of three propagation models are considered and Cosmos2251 and Iridium33 satellites closest approaches are predicted as a case study and the maximum probability of collision between these mentioned satellites is computed according the given satellite sizes, the aspect ratio (i.e., the ratio of major-to-minor axes of the projected combined covariance ellipse) and the relative distance at the point of closest approach, then the results are discussed. Our purpose is to find out that which one of the considered models will achieve a more accurate prediction and then calculating the maximum probability of collision using of the predicted closest approach for our case. So first using of a TLE released in various days before the collision as an input of the three models, the results of the orbit propagation were obtained. Then, the distances between the two satellites were predicted by SGP4 using of old and new TLEs and the maximum probabilities of collision were computed for all of the predicted relative distances and different aspect ratios. According to obtained results from the propagation model using different TLEs, it is clear the older TLEs couldn't help to predict the occurrence of this event well while using the newer TLEs shows a significant adjacency at a desired time. Since in reality the motion of the satellites and space orbits are affected by many perturbations, for accurate and even more real modeling and risk assessment the effects of all perturbations on space objects should be considered in modeling. With precise and more complete modeling it can be able to realize the exact position of each space object at any time and also the maximum collision possibility can be calculated even in the absence of known covariance and so the threat of collision will be prevented. In this paper, the accuracy of each used models in prediction of collision and estimation of maximum collision probability for different miss distances resulted from various TLEs was presented. This makes that if a critical distance is going to be happened at the desired time and the maximum probability of its occurrence is exceeding a safe threshold, the time available to collision avoidance maneuver will be obtained.