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A NEW ORBIT MANEUVER DETECTION METHOD OF SPACE OBJECT BASED ON ORBITAL DYNAMICS

Abstract

More and more space activities have made the space very crowded. Meanwhile, the space events including collisions, explosions, ASAT tests will produce plenty of space debris. Under these circumstances, in order to avoid the sharp increase of space debris and make the satellites in orbit safe, space situational awareness (SSA) becomes very important. Satellite maneuver detection is a crucial part of SSA. In the paper, a new detection method based on orbital dynamics is proposed to determine the maneuver time and the variations of orbital parameters. In this method, only two sets of orbital osculating elements are needed. According to the Lagrange's equation of motion, five equations are derived which are the functions of the increment (or decrement) of the orbital elements and maneuver times. Then the maneuver times can be derived quickly and the increment of velocities and other related parameters at each maneuver time can be obtained. At last, the maneuver detection method is applied in several actual satellite maneuver cases and the results are verified by the observation data. The conclusion is drawn that the method is feasible in detecting the maneuvers of space objects. It is very efficient in find out the maneuver information among a large number of catalogued orbits.