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A NEW ANGLE-ONLY INITIAL ORBIT DETERMINATION PROCEDURE OF SPACE-BASED SPACE DEBRIS SURVEILLANCE

Abstract

Space surveillance is advanced to space-based era when the low Earth orbital space-based space surveillance system SBSS-1 and the Geosynchronous Space Situational Awareness Program (GSSAP) constellation worked. This paper presents key problems of initial orbit determination (IOD) while space-based optical sensor observed space debris. The iteration always convergences to the space-based payload orbit elements using either Laplace, Gauss, double_R or Gooding IOD method. Moreover, it is very sensitive to the rang initial value guess when using the Gooding IOD method. From eliminating the common trivial solution in the Gauss eight-order polynomial which only occurring in space-based situation but not in the case of ground-based, meanwhile algebraic estimating the rang initial guess value, we propose a new reasonable procedure to reach the unique right initial orbit using very shot-arc and sparse space-based optical measurements. The real space-based observed data is used to verify that the new IOD procedure can effectively solve the problems of trivial solution and initial value sensitivity. The results show that it has good convergence and credible accuracy.