14TH IAA SYMPOSIUM ON SPACE DEBRIS (A6)
Measurements (1)

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AUTONOMOUS DETECTION AND FOLLOW-UP TRACKING OF NEW OBJECTS AT HIGH NEAR-EARTH ORBITS

Abstract

Trial operation of dedicated optical observation facilities has been carried out during period of 2013-2015 to provide functional support to the Automated System of Warning about Hazards in the Near-Earth Space serving as a source of situational information required for the spaceflight safety provision at GEO, MEO and HEO orbits. One of key modes of operation is autonomous detection and immediate follow-up observation of space objects that do not correlate with any object currently known for the system. Absolute majority of such objects is represented by previously unknown faint space debris and by previously discovered but then lost objects. As a rule, such objects represent quite challenging targets for observations due to variability of brightness and rapidly growing errors of predicted position caused by unknown area-to-mass ratio. The autonomous detection and immediate follow-up observation mode includes several operational procedures: quick on-site CCD-images processing, tracklets generation, selection of tracklets not associated with any of known objects, orbit determination based on selected tracklets, prediction of the position and brightness for the investigated object and generation the new task for one of instruments at the same facility, improvement of orbit using additional measurements, dissemination of information on the investigated object among other cooperating optical observation sites. Detected objects, which are supposed to be candidates for the new or previously discovered but then lost ones, are placed into the list of high priority observation tasks for one of instruments having larger aperture and working in the tasking mode. The new task supersedes other scheduled tasks that have lower priority at the moment. If no positive association results have been obtained, then observation task for the investigated object has been included repeatedly into the observation schedule until the end of observation period for the object during the current night. Instruments at other observation facilities have involved in order to collect additional follow-up observations. In favorable circumstances such approach permits to collect several tracklets distributed over an observation arc of a few hours length at the same night when the investigated object has been detected. As a result, orbit of the object has significantly improved accuracy. We will present results of real operation of dedicated optical observation facilities in the autonomous detection and immediate follow-up observation mode and will demonstrate current performance of operations (the increased rate of detection of previously unknown GEO and HEO objects, improved accuracy of determined orbits, dense set of measurements).