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THE RECENT DEVELOPMENTS OF THE KIAM SPACE DEBRIS DATABASE FOR SPACE SITUATION AWARENESS AND CONJUNCTION ANALYSIS

Abstract

Keldysh Institute of Applied Mathematics, Russian Academy of Science (KIAM RAS) Space Debris Database has been developed since 2005 by the order of RAS for data collection of the ISON network including space object identification and accuracy analysis of received observations, orbit determination (OD) based on a numerical propagation, maintaining and daily updating list of orbits and scheduling of the ISON observations. The database keeps the archive of observations, orbits and related events.

Since 2012 centre on conjunction analysis (CA) has started its operations by joint RAS/Roscosmos resolution under annual contracts. It provides the automatic screening and daily data transfer to TSNI-Imash Mission Control Center (including on-demand requests) and the analysis of related events (launches, fragmentations, disposals to graveyard orbits).

Since 2016 the part of ingenious scheduling and data analysis software has been adopted by "SIE "KIAM Ballistics-Service" in order to operate with other customers including foreign ones and provide supply of raw measurements, orbital data and conjunction analysis (CA).

CA procedure is conducted for GEO objects, MEO orbits (which OD incorporates both ISON data and freely available laser ranges and GNSS products) and HEO objects which passes through these regions. Moreover, at the moment automatic CA screening is performed for all objects in KIAM list of orbits (earlier it was narrowed for only agreed list of Russian satellites).

By the end of 2017 the KIAM database has collected 22.689 million optical observations in 2.647 million tracklets for more than six thoursand space objects at high orbits. This allowed to prognosticate 62 conjunctions closer 1 km at GEO and 5 at MEO. For example, the hazard conjunction between two Russian active and passive MEO objects was predicted on 2018 Jan 06, with distance less then 400 meters.

The observational and orbital data from the KIAM Space Debris Database is used for elaboration and verification of the statistical space debris population model.

Results of special research of conjunction statistics for different class objects including the GEO fragments including HAMR will be presented.