

SPACE DEBRIS SYMPOSIUM (A6)
Interactive Presentations (IP)

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A COMPLEX OF NON-ITERATIVE METHODS FOR PLANNING SESSIONS OF OBSERVATIONS
OF ORBITAL OBJECTS

Abstract

Monitoring of catalogued objects requires regular updating of their orbital parameters, which makes it necessary to plan the use of resource of surface observation stations. Planning on the base of optimization methods or obtaining of quasi-optimal plans with the use of iterative approach to the required value of the criterion is difficult to implement for a large number of objects, especially with limitations on the time of planning. This makes non-iterative methods of planning based on selection of orbital objects for observation on the base of rational rules of a selected priority level topical.

A complex of non-iterative methods for planning observations of orbital objects has been proposed. Modifications of methods are developed for stations with a single antenna and multiple antennas, for single surface stations and for a network of territorially distributed stations.

For implementation of the methods a system of indicators for selecting objects for observations has been developed. Also, variants of numerical description of indicators with the possibility of discretization required in certain cases, for successive ranging over a multitude of indicators are proposed. The indicators of ranging can be subdivided into static (their values do not change in planning) and dynamic (their values depend on the outcome of previous steps of planning). Dynamic indicators are subdivided into those depending on obtained results and those depending on remaining reserves. One can distinguish indicators that are taken into account on one visibility interval of an object and on all its visibility intervals. Indicators are subdivided on isolated (related to characteristics of observation of an object from a particular station) and complex (related to observations from the whole number of territorially distributed ground stations). Some of the indicators can be formed on the base of values of a number of other indicators; thus, indicators differ in their level of priority. The strategy of planning may include sorting of objects into subsets of different priority and sorting of objects within one subset by indicators of ranging.

In this work, first, we present results for solving practical problems – they can be used for organizing operation of surface facilities for observation of orbital objects. Second, we present certain results in developing theoretical foundations of non-iterative planning of observation of orbital objects. Also, an analysis of the influence of different attributes of selection of orbital objects, variants of their combination and the order of priority on the quality of planning.