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SPACECRAFT NAVIGATION BY THE SPACE OBJECTS' RADIO EMISSION

Abstract

Often spacecraft should define position of its mass center and angle orientation in some base coordinates performing its target problem.

To solve the tasks of spacecraft's navigation different methods could be used. There are such methods:

- the methods of inertial navigation;
- the radiolocation methods;
- the methods of satellite navigation: they are similar to radiolocation methods.

Each of those methods has both advantages and disadvantages.

According to requirements to spacecraft's orientation and navigation it is necessary to combine those tasks in one method. It allows reducing the instrumental implementation of those systems.

The principle of spacecraft navigation and angle orientation by radio emission from other objects is proposed in this work. As such objects both spacecrafts and objects allocated on the Earth could be used.

Imagine that the radiolocation system with rotatable directional diagram is located on the board of spacecraft. Using this system bears the spacecrafts with the help of equisignal-zone method.

Bearing at least three emission sources with the known coordinates in the basic system of coordinates the possibility to navigate basic spacecraft in the basic system of coordinates appears.

The determined coordinates of spacecraft's emission sources and basic craft as well as bearing according to method of equal-signal zone to emission crafts allow to determine the craft's orientation solving the triangulation task.

The tasks of orientation and navigation of spacecraft according to the results of bearing at least three emission sources are considered in this work. Functional dependence of accuracy orientation spacecraft from accuracy navigation radio beacons and base spacecraft, errors pointing on radio beacons, errors are taken by the result of rotation concerned basis on first and second moment measure is taken by the research results. The functional dependence, which allow to held the basic craft navigation according to bearing results are received in this work.

The accuracy of angle orientation depends on the time of bearing by the spacecrafts' emission sources, for the forecast of crafts' movement it is necessary to have information about the angle speed of basis spacecraft, which could be received from the angular speed sensors. Using the polarised emission from spacecrafts sources of emission there is a possibility to determine the angular speed by the results of a signal past through the polarimeter.

The proposed method can be used both as an autonomous for the navigation and orientation of spacecrafts and as reserve.