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A DIGITAL METHOD FOR DETERMINING THE COORDINATE REFERENCE OF A PROTRACTED OBJECT BASED ON ITS RADAR IMAGE

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A new method is suggested for determining coordinates of protracted seaborne objects based on information extracted from the binary digital radar image. The data obtained from the results of processing of an actual radar image show that the method ensures the required accuracy of coordinate reference. Practical implementation of the method is simpler compared to the methods in existence.

The growth of intensity of sea shipping, of sea vessel overall dimensions and tonnage imposes more strict requirements to safety and accuracy of movement along sea channels and in ports. One of the major technical means responsible for the safety and accuracy of ship movement is the coastal radar stations (CRS). The requirements imposed on CRS and other radar systems include such characteristics as unambiguity, reliability, and maximum attainable accuracy of coordinate referencing of the moving vessel based on data extracted from the radar signal received against the background of passive interference, which may distort substantially the radar image observed.

As shown by numerous experiments, a radar signal scattered by the object and by rough sea surface is strongly fluctuating in amplitude. In other words, the dispersion index in the azimuth plane represents a multi-lobe structure with the difference between lobes' levels up to several tens of decibels.

With this structure of the radar signal observed, processing of the envelope seems to be of little use from the viewpoint of coordinate reference estimation. In practice the processing is applied to the binary radar image of the observed object synthesized in azimuth and range.

There is a whole number of widely used algorithms for determining the conventional "center of gravity" of binary radar images. Here the main accent is made on treatment of the problem of suppressing the remainder of passive interference taking the form of the range and azimuth "tails". However, most of such algorithms are rather complicated in their implementation. Their main drawback consists in somewhat arbitrary assignment of the weighting function — as, for example, in [1].

The purpose of the work. The proposed and investigated method for determining the coordinate reference of protracted objects based on the characteristics of their binary radar image, called here the method of "board line", assumes a simpler variant of its practical implementation against the already existing methods. At the same time, we do not deteriorate the effectiveness of coordinate reference, i.e., belonging of the azimuth-range coordinates to the actual physical object (in our case — to a large-tonnage sea vessel with known physical dimensions).

The present radiophysical concepts in concern with formation of scattered field in the range of centimeter and decimeter waves from protracted objects having complex geometric shape [2] are based on the assertion that the radar scattering is mostly local.

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