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A DIGITAL METHOD FOR SUPPRESSING PASSIVE INTERFERENCE AT THE COORDINATE PROCESSING OF RADAR IMAGE OF PROTRACTED SEABORNE OBJECTS

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The paper presents results of computer-aided simulation, usable for development and updating of channels of digital processing of coordinate information in coastal radar systems and ship traffic management systems under restricted navigation conditions.

The present-day methods and devices for suppressing passive interference use, as a rule, the difference between radar reflections created by moving targets and those arising from slowly moving sources of clutter [1]. The latter include radar reflections created by rough sea surface and rain precipitation. The "useful" objects in this case are assumed pointwise.

The problem of suppression of passive interference during coordinate processing of radar image of a shipborne object (vessel), masked by reflections from rough sea surface, is rather complex and multi-alternative. First of all, the ships themselves are slowly moving protracted objects, having intricate outline — both in range and azimuth. Next, the presence of jib-trace in the area of ship motion and small distances between a coastal radar and a fairway (ship channel) increase the intensity of passive interference created by the sea surface.

The present paper contains results of investigations of an effective digital method (developed by the authors) for suppressing radar reflections created by sources of passive interference, particularly, by rough sea surface, with simultaneous generation of a dence totality of binary signals — the coordinate signal group, which ensures the tie of object's coordinates (azimuth–range) to trajectory of movement along the sea channel.

The main purpose of the results reported in the paper is support to required safety and accuracy of ship navigation and simultaneous formation of the coordinate signal group of the single-dimensional radar image of the ship.

To authors' opinion, this purpose can be reached with the aid of an efficient digital method (developed and investigated by the authors) for suppressing the passive interference — hereinafter referred to as the method of adaptive "noise" corridor.

In order to attain the goal thus formulated, the following tasks were to be resolved:

1. Development, in the analytical form, of the digital model of the "noise" corridor with discretely controlled "noise" threshold in the form of digital values in the points of time sampling of video signal by an analog-digital converter (ADC).

2. Investigation of efficiency of suppression of the passive interference generated in the form of a digital test model, mapping the rough sea surface, by the method of computer-aided simulation, with the use of actual tactic-and-technical characteristics of a coastal radar system and of radar characteristics of reflection from sea surface.

The essence of investigations. The whole totality of radar reflections created by the underlying sea surface and by a protracted sea object (ship) can be described analytically by a single-dimensional signal model in the form of sampled intensities arriving at ADC output:

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