

DEVELOPMENT AND INVESTIGATION OF THE FUNCTIONING PROCESS MODEL OF AN ELECTROMAGNETIC DETECTOR FOR EXTENDED BOTTOM OBJECTS

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When inspecting extended bottom objects, a promising solution is the use of an electromagnetic detector (EMD) installed on an underwater carrier, in particular, an autonomous uninhabited underwater vehicle (AUV). In general, the aim of the EMD is to detect a bottom object and generate signals to control the carrier in order to track the object. The article proposes a new model of the EMD interaction process with an extended bottom object, both with and without an insulating surface coating. The concept of a volumetric field of currents in a conducting medium in the zone of signal emission by transmitting dipoles is introduced. The relationship between the potentials on the receiving dipoles and the physical characteristics of an extended bottom object introduced into the volumetric field of currents is determined. The EMD algorithm, developed earlier at the IMTP FEB RAS, was refined, which made it possible to increase the accuracy of determining the angle of intersection of the AUV course with the bottom object. A mathematical model of the interaction between the EMD and the bottom object is proposed. The adequacy of the model was checked by comparing the simulation results with the physical model of the interaction process at the stand. The results obtained convincingly confirm the validity of the proposed hypothesis about the EMD interaction physical nature with the bottom object and the adequacy of the developed mathematical model. This provides the basis for creating a complete mathematical model of the EMD–AUV complex in order to build and study AUV control algorithms in various object tracking modes.

Keywords: extended bottom object, electromagnetic detector, autonomous uninhabited underwater vehicle, volumetric field of currents, interaction process model, computer and field experiment.

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