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DEVELOPMENT OF A MATHEMATICAL MODEL OF A THRUSTER FOR THE DYNAMIC POSITIONING MODE OF AN UNDERWATER VEHICLE

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The ability to perform contact operations by uninhabited underwater vehicles (UUVs) equipped with a multi-link manipulator (MM) is determined by the accuracy of dynamic positioning of the UUV over the object of work in the conditions of disturbing influences from the currents, communication cable and manipulator. A new approach to the development and verification of the steering thruster (ST) mathematical model in the dynamic positioning mode of the UUV based on the results of experimental studies of the thruster characteristics and its electric drive is proposed. The static characteristic of the thruster, as well as the dependence of the propeller thrust and drag torque on the rotational speed were determined based on the results of basin tests of the ST in the mooring mode and load tests of its electric drive. A mathematical model of a brushless rowing electric drive based on the model of a brushed DC motor with independent excitation is proposed, and parametric identification of this model based on the results of load tests is performed. An evaluation of experimental and simulated ST responses to typical variants of target stops is presented. The developed mathematical model of ST provides an opportunity for increasing the accuracy of UUV positioning, as well as the accuracy of modeling the real behavior of the underwater vehicle.

Keyword: uninhabited underwater vehicle, dynamic positioning, steering thruster, mooring tests, electric drive, load tests, mathematical model, verification.

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