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UNDERWATER PIPELINE RECOGNITION USING AUTONOMOUS UNDERWATER VEHICLE BY STEREO IMAGES IN THE TASKS OF INSPECTION OF UNDERWATER OBJECTS

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Today, an inspection of underwater communications (gas and oil pipelines, etc.) using autonomous uninhabited underwater robots (vehicles) is an urgent practical task. Inspection of underwater objects requires high accuracy of the underwater vehicle's localization relative to the target object when performing an operational mission. Standard acoustic navigation means cannot always ensure sufficient accuracy. One way to improve navigation accuracy is the use of optical images processed using computer vision methods. The article is devoted to solving the problem of recognizing underwater pipelines using stereo images. The proposed method is based on identifying the visible boundaries of the pipeline on 2D images with the subsequent restoration of the scene's spatial parameters, including the pipeline's position and orientation in the AUV coordinate system. This process relies on the following methods and algorithms of computer vision: comparison of characteristic features in images, epipolar constraints, ray triangulation, threshold filtration methods, calculation of matrix transformations of coordinates, as well as standard tools for processing statistical data. Computational experiments to assess the method's effectiveness were carried out on actual data in laboratory conditions using a Karmin2 stereo camera (Nerian's 3D Stereo Camera, baseline 25 cm). Obtained results of assessing the accuracy of the calculated localization of the pipeline showed that the proposed method for processing stereo images can provide the AUV navigation accuracy required during an inspection.

Keywords: autonomous unmanned underwater vehicle, pipeline, inspection, stereo images, recognition.

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