# SUPPORT SYSTEM FOR OPERATOR OF MANIPULATOR MOUNTED ON UNDERWATER VEHICLE

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The article considers a support system for underwater manipulators (UM) operators, which is designed for improving the execution efficiency of complex manipulative operations performed by underwater vehicles (UV). The designed system provides a high-precision superimposition of pre-constructed trajectories of multi-joint UM's working tool (WT) onto a surface of a known underwater object, identified by technical vision systems. In this case, the operator directs the optical axis of the camera, mounted on the UV's rotary platform, and sets the required object's area. Then the desired trajectory of the UM's WT is projected on the specified area, taking into account the shape and spatial location of the object. The operator checks whether the trajectory is correctly applied to the object surface using a graphical interface developed using "OpenGL Core" libraries. Then, the formed trajectory is being passed by WT with the required orientation in the automatic mode. The system provides visual control of manipulative operations by automatically pointing the camera's optical axis at the UM's WT. The software implementation of the system is performed in the C++ programming language. A numerical simulation of the proposed system operation in the process of control of the multi-joint UM installed on the UV was performed in the V-REP virtual environment, using the Matlab/Simulink software.

**Keywords**: supervisory control, underwater vehicle, multi-joint manipulator, point cloud, mathematical model, deep-sea exploration, spatial trajectory, underwater operations, control system.

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**Recommended citation:**