REMOTE CONTROL OF THE ROBOT MANIPULATOR

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The aim of this work is to expand the functional capabilities of the intelligent control subsystem of the robot manipulator (RM) to safely grasp an object of arbitrary shape. To achieve this goal, a hardware–software subsystem for the remote control of a robotic manipulator, designed for the safe grasping of an object of arbitrary shape, has been developed.

As a prototype for the subsystem, an intelligent hardware–software subsystem described in our work [1] was used. The development of the subsystem's software included creating the manipulator's software with machine vision cameras, the microcomputer, and a web application, taking into account established RM control systems. The Python language is used throughout the developed subsystem. For the web application, the WebStorm development environment from JetBrains and the Flask framework were chosen.

The functional part of the developed subsystem performs tasks such as moderation, collective administration, user feedback, real-time programming of the microcomputer, and connecting to a local network or the Internet. It allows for the involvement of a team of competent users – including both unauthorized and authorized users, experts, and administrators.

Research has shown that the proposed remote control subsystem extends the functional capabilities of the hardware–software object-grasping subsystem of the robotic manipulator. In addition to the functions of automatic object grasping, the remote adjustment of precision and the technological aspects of grasping, by remotely controlling and correcting the inclination angles of the servomotors, enables high-precision positioning of objects relative to each other, as well as precise force application by the working manipulator for performing exact operations with explosive objects and in precision machine building. Individual errors in the operation of the subsystem were of an instrumental nature and were corrected by selecting the appropriate hardware part, while the process of automatic capture and movement of the object was remotely controlled by one or several users, depending on the production task. The reliability of object grasping is further enhanced by the subsystem's ability to involve an additional team of competent users. The proposed system thus increases the degree of automation while providing the possibility for moderation, collective administration, and user feedback.

References

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