

INDUSTRIAL MANIPULATOR BASED INTELLIGENT ASSIST SYSTEM FOR HUMAN-ROBOT COOPERATIVE ASSEMBLY TASKS

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Introduction. Industrial robot manipulators are widely being used for various automated tasks such as pick and place, welding, painting, palletizing, drilling, etc. in standardized industrial processes that require monotonic execution of preprogrammed repetitive tasks with high precision and/or productivity. However, in many operations, it is desirable to exploit the force capabilities of robots by directly combining them with the skills and incomparable sensomotoric abilities of a human being for complex tasks.

Materials and methods. The project aims to create an intelligent robot assistive system for human-robot collaborative assembly tasks in industrial settings. In this system, a human operator and the robot undertake complementary parts of an assembly task which they are good at. The human operator performs tasks more suitable for humans such as delicate assembly. The robot undertakes tasks like carrying or holding heavy mechanical parts or those requiring repetitive execution. The robot assistive system will include novel design of a prototype of an industrial robotic end effector with integrated sensors as well as machine learning algorithms for interactive programming of grasping tasks for various objects.



Figure 1. Two designs of three fingered adaptive underactuated end effectors.

Results and discussion. As the preliminary work for this project several initial mechanical designs of the 3D printed three-fingered robotic end effector with one actuator were developed as shown in Fig. 1. More information and accompanying video can be viewed at www.alaris.kz.

Conclusions. It is anticipated that the proposed system will increase the capabilities of the robot manipulators to perform assistive operations during various assembly tasks performed by a human operator and also decrease the time spent by the operators to program the robot. The know-how gained as a result of this project can be utilized to build next generation manufacturing systems for cooperative work of human operators with robots using currently commercially available robot systems and sensors.

References.

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