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

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INTRODUCTION.

In many operations, it is desirable to exploit the force capabilities of industrial robot-manipulators by directly combining them with the skills and incomparable sensomotoric abilities of a human operator for complex assembly tasks. However, traditional robot reprogramming or switching between robot programs many times during a hybrid human-robot cooperative assembly scenario is not applicable. Effort should be allocated to introduce more degrees of autonomy and intelligence in such industrial settings such as automatic object recognition and corresponding grasping algorithm engagement.

AIM AND OBJECTIVES.

The project aims to create an intelligent robot assistive system for human-robot collaborative assembly tasks in industrial settings by integrating a state of the art industrial manipulator, an advanced multi-fingered robot hand equipped with a torque/force sensor, a range camera and machine learning algorithms. In this system, the 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 executes tasks such as carrying or holding heavy mechanical parts or those requiring repetitive execution. An image of such a system is shown on the picture to the right.

CURRENT RESULTS.

The first phase is the design and implementation of a sensor rich robotic end effector (Figure below). The project investigators are focusing on the design and implementation of an underactuated adaptive robotic end effector with embedded range camera and tactile sensors. This is largely attributed to the relatively simple design of such mechanisms comparing with fully actuated dexterous artificial fingers.

CONCLUSIONS.

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.