

The current limits and potentials of autonomous assembly

Organizers Tetsuyou Watanabe (Kanazawa Univ.)
Kensuke Harada (Osaka Univ.)
Ryuta Ozawa (Meiji Univ.)
Tokuo Tsuji (Kanazawa Univ.)

Objective

- Imagenet large scale visual recognition challenge (ILSVRC)
 - Increase in the image recognition ability
- Amazon Picking or Robotics Challenge (APC or ARC)
 - The high image recognition methods are useful for robots to pick and place many types of objects



How about robotic assembly?

- World Robot Summit (WRS) industrial category
 - Even top teams did complete only several parts of the assembly tasks



**Large gap between robots and human at assembling ability.
The current limitations and potentials of robotic assembly technologies.**

The current limits and potentials of autonomous assembly

Objective (cont.)

- Clarify the current limits and potentials at robotic assembly by
 - The assembly challenge program results
 - The state-of-art technologies for robotic assembly



- Accelerate the generation of new methodologies, strategies, and techniques for automatizing robotic assembly.

Discussion points

Requirement and Limitation of object handling ability

- How many types of parts should the robotic hand be able to grasp?
 - It is desirable that the number of tools and jigs are minimized, but the minimization includes the limitation.
- Which kind of force and torque sensors are required for which kind of assembly tasks?
- Required accuracy level of the position and posture controls of the grasped workpieces
- Elasticity is useful? If yes, where do we need?

Discussion points

Object recognition

- Limitation of Image sensor systems. How should we use the image sensor systems?
- Which kind of force and torque sensors are required for which kind of assembly tasks?

Motion Generation

- Methods for realizing the high reliability and robustness in robot motion generation. Automatic or teaching-based?
- Methods for realizing the precise calibration
- High speed parameter tuning
- Easy and highly-reliable system integration
- Useful error recovery techniques

Discussion points (cont.)

Triggers for accelerating the generation of robotic assembly technologies

- Which tasks at competitions can accelerate the robotic assembly technologies?
 - The accuracy of teaching methodologies and agility at the parameter tuning and modification of programs was important at WRS
- Breakthrough for autonomous robotic assembly.