

Keynote Lecture 1

Robotics and Automation in Construction

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Abstract:

The Japanese research and development of robotics in construction started in early 80's to meet the strong demand on production efficiency, safety issues, and systematization of construction procedures. The major Japanese general constructor companies have been leading the developments and supporting the academies in the fundamental researches. After the collapse of the economic bubble in middle 90's the activities rapidly went down along with the dull economy itself. Since then the research and development stayed in stagnation and the Lehman Shock in 2008 accelerated this inactivity. The Tohoku massive earthquake & tsunami and the following explosion of Fukushima Nuclear Power Plant damaged the total Japanese activities. Of course, the construction machines were capable of cleaning and rebuilding the destroyed houses, buildings, infrastructures, etc. Decommission of the damaged NPP still requires mostly tele-operated construction machines. Looking at the Japanese infrastructures a quarter of major roads and bridges will get 50 years old or more in 2020. Currently the robotics technology again obtains strong demand for the inspection and maintenance of such old infrastructures. The Japanese government is strongly supporting and pushing development projects for inspection robots in these years.

The Council for Construction Robot Research has been playing active role in R&D for construction robot since 1989. The council is operated and supported by 3 academic societies and 3 industrial associations. Its major role is organizing domestic symposium on construction robot almost every year and 15 symposia have been held so far. In the recent symposium held in last year 56 papers and posters were presented which cover inspection robotics, tele-operated support and evaluation, automated building work, earth-moving robot, automated underwater construction, mobile robot, UAV, etc.

The generic researches and developments in robotics and mechatronics are still very active. As an evidence there are quite a lot of related conferences involved; mostly organized by the IEEE, e.g., ICRA, IROS, ICAR (Advanced Robotics), CASE (Automation Science and Engineering), ROMAN (Robot and Human Interactive Communication), ICMA (Mechatronics and Automation), AIM (Advanced Intelligent Mechatronics), so many international conferences are held in every year. Japan has its own domestic relevant conferences such as RSJ, ROBOMECH, SI. The ROBOMECH in last year boasted the record of 1,325 papers, featuring robotics & mechatronics key technologies, mobile robot system, novel mechanism & control, sensing & perception, nano/micro, human-robot coordination, medical & welfare, ambient intelligence, RT middleware and open system, human centered robot, biomimetics, agriculture, service, field robotics as well as construction robotics.

In this keynote the speaker would address the Japanese state-of-the-art of robotics and automation technology and its construction applications, then introduce some of the future applications.

Keywords: robotics, automation, mechatronics, service robot, inspection, maintenance

Profile of Prof. Tatsuo Arai

Tatsuo ARAI received B.S. M.S. and PhD degrees from the University of Tokyo in 1975, 1977, and 1986, respectively. He joined the Mechanical Engineering Laboratory, AIST in 1977, and was engaged in research and development of new arm design and control, mobile robot, teleoperation, and micro robotics. He stayed at MIT as a visiting scientist in 1986-1987. He was an adjunct lecturer at Chiba University and gave a course on robotics. He moved to Osaka University in 1997 and since then he has been a full professor at the Department of Systems Innovation, Graduate School of Engineering Science. His current research topics are mechanism design including parallel mechanisms, legged working robot, micro robotics for bio application, humanoid robot, haptic interface. He has published more than 400 journals and reviewed conference papers on robotics, 5 books, and has 37 patents including foreign 8. The publication list is on <http://www-arailab.sys.es.osaka-u.ac.jp/result.html>.

He is IEEE Fellow, IAARC (International Association of Automation and Robotics in Construction) Director, RSJ (Robotic Society of Japan) Fellow, and JSME (Japan Society of Mechanical Engineers) Fellow. He is a deputy editor-in-chief of the Robomech Journal. He worked for the Cabinet Office as a chair of the Technical Advisory Committee of the Destruction of Abandoned Chemical Weapon in 2000-2007.

