

Plenary talker:



**Professor
Jun Ho Oh**

PT1 : Development Outline of Humanoid Robot: HUBO II

Jun Ho Oh

Professor of Mechanical Engineering, KAIST
Director of Humanoid Robot Research Center (Hubo Lab)

The full size humanoid robot with height of around 1.5m is quite different from the toy size small ones in many aspects. It should have very stable and well designed structure with little uncertainties. It must be strong enough to move its body weight but not so heavy to minimize the torques to drive the body parts. All the electrical parts and sensors must be compact to be fit in the enclosure of the body. We designed such kind of parts including force/torque sensors, inertia sensors and all the driver circuits, internal decentralized control architecture and hardware. Another important task is design walk algorithm. Walking algorithm is composed with two parts: off-line gait pattern design and real time stabilization control. Gait pattern design is to find a periodic function for each joint of leg such that humanoid robot is to walk with desired velocity keeping certain level of stability. We suggested a simple function connected with cubic spline and sine functions with minimal number of parameters. This approach simplifies the parameter adjustment procedure. Play back of gait pattern found from the former process, however, does not guarantee the robot walks in real practice since there are number of uncertainties involved in real situation. The uncertainties include ground inclination, friction, un-modeled vibration of the body. The stabilization algorithm should deal with such kind of problems. Hubo's walk algorithm has 8 levels of hierarchical control architecture to cope with the general circumstances in walking environment. The general issues including mentioned above will be presented.

Education:

- In 1977, B.S. degree in Mechanical Engineering from Yonsie University, Korea
- In 1979, M.S. degree in Mechanical Engineering from Yonsie University, Korea
- In 1985, Ph.D. in Mechanical Engineering, University of California, Berkeley, USA

Professional Training and Employment:

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| - 1985 – present | Professor of Mechanical Engineering, KAIST |
| - 2010 – present | Distinguished Professor at KAIST |
| - 1997 – 1998 | Visiting Professor, University of Texas, Austin, USA |
| - 2010 | Member of National Academy of Engineering of Korea |

PT2 : Robotics:From Manufacturing to Intelligent Machine

Tzyh Jong Tarn



**Professor
Tzyh Jong Tarn**

This presentation describes the evolution from tele-robotics to interactive robotics and to intelligent machines due to the silicon revolution. The impacts of this transformation to the manufacturing culture as well as the automated manufacturing research facility are outlined. Finally the current trends in robotics research and new applications to intelligent life are described.

Education:

- 1959, B.S. degree in Chemical Engineering, National Cheng Kung University, Tainan, Taiwan, China
- 1965, M.E. degree in Chemical Engineering, Stevens Institute of Technology, Hoboken, USA
- 1968, D. Sc. Degree in Control Engineering, Washington University, St. Louis, USA

Professional Training and Employment:

- 1968-1969 Postdoctoral Fellow, Washington University, St. Louis, USA
- 1969-1972 Assistant Professor, Washington University, St. Louis, USA
- 1972-1977 Associate Professor, Washington University, St. Louis, USA
- 1977- Professor, Washington University, St. Louis, USA
- 2003-2006 Chair Professor in Quantum Control, Tsinghua University, Beijing, China
- 2006- Director, Center for Quantum Information Science and Technology, Tsinghua University, Beijing, China
- 2009-2010 Distinguished Visiting Chair Professor, National Cheng Kung University, Tainan, Taiwan, China



**Professor
Fumitoshi Matsuno**

**PT3 : Rescue Robot Systems
- From Snake-like Robots to Human Interface -**

Fumitoshi Matsuno

(Kyoto University, Japan)

Intelligent rescue systems with information and communications technologies (ICT) and robotics technology (RT) have been proposed to mitigate disaster damages, especially in Japan after the 1995 Hanshin-Awaji Earthquake. In particular, it has been stressed the importance of developing robots for search and rescue tasks, which can actually work in a real disaster site. In USA the September 11, 2001 terrorist attack on New York City and Washington, DC, the hijacked plane crash in Pennsylvania, and the Anthrax attack that immediately followed instantly changed people attitude about safety and security in their personal lives. Public safety and security problems are not limited to Japan and the United States, since every country has experienced man-made and natural disasters in the past. Solutions will depend upon new, unconventional approaches to search and rescue. Robotics, information and communications technologies, devices and system integration can play an important role in providing technology that can contribute to Safety, Security and Rescue activities. In this talk, I would like to explain my motivation to start the development of rescue robot systems for the disaster response and discuss necessary technologies that can accomplish search and rescue missions. I also introduce developed rescue robots for the information correction and teleoperation human interface.

Education:

- In 1981, B.E. degree in Instrumentation Engineering from Nagoya Institute of Technology, Japan
- In 1983, Master Degree from Dept of Control Engineering at Osaka University Japan
- In 1986, Doctor Degree from Dept of Control Engineering at Osaka University, Japan

Professional Training and Employment:

- 1986 – 1991 Research Associate, Osaka University
- 1991 – 1996 Associate Professor, Kobe University
- 1996 – 2003 Associate Professor, Tokyo Institute of Technology
- 2003 – 2009 Professor, University of Electro-Communications, Tokyo
- 2009 – Professor, Dept of Mechanical Engineering and Science, Kyoto University