Plenary Speaker 1: Professor Henrik Hautop Lund (Center for Playware, Technical University of Denmark, Denmark)

Title: Robotics for Growing Life

Henrik Hautop Lund, Ph.D., Professor, Center for Playware, Technical University of Denmark.

Education: 1995: MSc Computer Science. 2000: Ph.D. Computer System Engineering.

Employment:

1992-93 & 1994-95: The National Research Council, Rome, Italy.

1996-1997: Research associate (Post Doc). Department of AI, University of Edinburgh, UK.

1998-2000: Head of LEGO Lab. Department of Computer Science, University of Aarhus, Denmark.

2000-2008: Full Professor. The Maersk Mc-Kinney Moeller Institute for Production Technology, SDU.

2009-present: Full Professor. Technical University of Denmark (DTU Elektro). Head of Center for Playware.

Distinctions and awards (selected):

RoboCup Humanoids Free Style *World Champion* 2002.

FIRA KheperaSot *World Champion* 2002.

Winner: Product Innovation of the Year, Asia-Pacific Eldercare Industry Awards 2018.

Winner: Innovation of the Year - Dementia Solution, Asia-Pacific Eldercare Awards, 2019.

Winner: SilverEco Ageing Well International Award, 2019.

Winner: Most Outstanding Healthcare Innovator in the World, The Globals Awards, 2019.

Title: Robotics for Growing Life

Abstract:

We present a novel direction of artificial life robotics in which we use robotics to control the growth of real, natural life. The concept of using robotics to grow life present itself as a potential sustainable solution for food production, allowing an optimization of food quality and outcome. The design of these artificial life robotic system allow for urban farming where food production happens in the close vicinity to the consumer, avoiding the long transportation of food to the consumer. We illustrate this concept with our development of the Growbot, which is a tabletop size robotic green house for growing edible food plant. The GrowBots use sensors such as humidity, CO2, temperature, water level and camera sensors, and actuators such as full spectrum LEDs, IR LEDs, UV LEDs, fertilizer and water pumps, air change and air circulation fan. The software acts as recipes for the plant growth in the robotic greenhouse adjusting the environmental condition for the growth of the living plants such as salad, parsley and basil. Changing the recipes, one may experiment and investigate easily to search for optimization for volume production, taste, etc. We illustrate this novel concept and implementation of artificial life robotics with the growth of Italian basil, *Ocimum basilicum*.

Plenary Speaker 2: Professor Hidehiko Yamamoto (Gifu University, Japan)
Title: Road to Cyber Physical Factory (Application Examples of Intelligent Factory and its Technology)

Hidehiko Yamamoto,
Specially Appointed Professor, Gifu University
Education: 1980 year Master's Degree of Mechanical Engineering (Nagoya Institue of Technology)
1991 year Docter's Degree of Engineering (Nagoya Institue of Technology).
Employment:
1980-1992: Toyota Industrial Coorporation Ltd.
1992-2000: Associate Professor, Wakayama University, Japan.
2000-2021: Professor, Gifu University, Japan.
2021-present:Specially Appointed Professor, Gifu University, Japan.
2021: Honarary Professor of Gifu University.

Awards (selected):

・Manufacturing Systems Academic Achievement Award, The Japan Society of Mechanical Engineers, 2012.

・The Fellow of The Japan Society of Mechanical Engineers, 2014.

・Best Paper Award, Autonomous decentralized FMS that adopts priority order structure based on AGV's lie, The 2019 International Conference on Artificial Life and Robotics (ICAROB2019),

Title: Road to Cyber Physical Factory (Application Examples of Intelligent Factory and its Technology)

Abstract:

Since 1980, Computerized machine tools and robots have been developed. I talk about the history of the Intelligent manufacturing systems and their technology including Artificial Intelligence and GA. For example, Future Factory by using Autonomous System, we call Autonomous Decentralized Flexible Manufacturing Systems, is presented. Virtual Factory and several kinds of simulations for production systems and scheduling problems is presented. IoT production and Cyber Physical Factory which is the near future manufacturing model are presented.

Plenary Speaker 3: Professor Takao Ito (Hiroshima University, Japan)
Title: Robot Technology, and it's Development Trend –Developing a New Networking Robot System-

HIROSHIMA UNIVERSITY

Takao Ito, Professor, Hiroshima University

Education: 1990 year Master's Degree of Economics (Kyushyu University)

2005 year Docter's Degree of Economics (Kyoto Universty).

2008 year Docter's Degree of Engineering (University of Miyazaki)

Employment:

1995-1996: Lecturer, Department of Business Administration, Aso Fukuoka Junior College (1998-, Kyushu Institute of Information Sciences), Japan.

1996-2004: Associate Profesoor, Department of Business Administration, Ube National College of Technology Japan.

2004-2008 & 2009-2014: Full Professor, Department of Business Administration, Ube National College of Technology Japan.

2008-2009: Visiting Research Professor, School of Managment, New Jersey Institute of Technology, USA.

2014-2020: Full Professor, Graduate School of Engineering, Hiroshima Univeristy, Japan.

2020-Present: Full Professor, Graduate School of Advanced Science and Engineering, Hiroshima Univeristy, Japan.

Distinctions and awards (selected):

Winner: Best Paper Award, The Eleventh International Symposium on Artificial Life and Robotics, Oita, Japan, 2006.

Winner: Best Paper Award, The twentieth International Conference on Artificial Life and Robotics, Oita, Japan, 2015.

Title: Robot Technology, and it's Development Trend

Abstract:

Robot technology has been changed dramatically with massive development of internet environment. The author reviewed a plethora of literature and investigated advanced robot technologies. Today, most of typical robot technologies are used in single-cause-oriented products, such as robot vacuum cleaner and Asimo, a humanoid robot invented by Honda. These advanced products played important role in our modern society. For further development, a networking robot system with advanced technologies of internet and artificial intelligence is required in order to copy with the uncertainty in the future. Different technology should be combined and linked together for multiple-goal-oriented approach in the networking robot system. For evaluating the validity of our new system, a centrality index is introduced in this research.