

Guest Lecture

*LTU Math and Computer Science Department and ROBDFEST present:*

# **Recent Progress and Development of Intelligence Technology for “Robots That Think”**



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Engineering Building Room **E101**

### **Abstract:**

Human beings will be living in a ubiquitous world in which all IT devices are fully networked so that they can offer us desired services at any place and anytime. This shift has hastened the ubiquitous revolution, which has further manifested itself in the new multidisciplinary research area, ubiquitous robotics. It initiates the third generation of robotics following the first generation of the industrial robot and the second generation of the service robot. A fairy tale introduced Genie, which upon springing from a lamp served Aladdin. The ubiquitous era brings us to the threshold of the realization of this dream, through ubiquitous robotics. Moreover, the robots shall have their own genome in which a specific personality is encoded. This concept leads to the research on genetic robotics. Cyber-physical robot system (CPRS) combines these new concepts of next generation robots for the convergence of computational and physical systems.

This talk first introduces the recent progress and development of ubiquitous robot, genetic robot and CPRS. Ubiquitous robot is composed of three forms of robots: software robot, embedded robot and mobile robot to represent an amalgamation of the tripartite personification of entities of perception, thinking and action. Genetic robot has its own

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genetic codes to represent a specific personality. CPRS conjoins and coordinates the software agents and physical robots including SW and HW resources. Special emphasis in this talk is placed on “Intelligence Technology (IT)” for “Robots That Think (RTT).” Considering the next generation robots, robot intelligence can be classified into six categories such as cognitive intelligence, social intelligence, behavioural intelligence, ambient intelligence, collective intelligence and genetic intelligence. The robot intelligence can be realized through intelligence Operating Architecture (iOA) in which IT is embedded. To make RTT deliberately interact with the environment, the behavior selection method based on the degree of consideration-based Mechanism of Thought (DoC-MoT) is introduced, which mimics a living creatures’ thinking mechanism. As application examples, this talk introduces a synthetic character “Rity” in the 3D virtual environment, a humanoid robot HanSaRam (HSR) based on DoC-MoT with the gaze control, a robotic fish Fibo with the multicriteria decision making in a sensor node environment, a robotic doll GomDoll, etc., developed in the RIT Lab., KAIST.

### **Biography:**

Jong-Hwan Kim received his B.S., M.S. and Ph.D. degrees in Electronics Engineering from Seoul National University, Korea, in 1981, 1983 and 1987, respectively. Since 1988, he has been with the Department of Electrical Engineering at KAIST and is currently KT Chair Professor. He was Head of Robotics Program, KAIST for 2004-2006. He is Adjunct Professor of Griffith University, Australia and Honorary Professor of De La Salle University, the Philippines. Dr. Kim is Director for both of the National Robotics Research Center for Robot Intelligence Technology and the National Research Lab for Cognitive Humanoid Robots. His research interests include computational intelligence and ubiquitous and genetic robotics. Dr. Kim has authored 5 books and 3 edited books, 2 journal special issues and around 300 refereed papers in technical journals and conference proceedings. He currently serves as an Associate Editor of the *IEEE T. on Evolutionary Computation* and the *IEEE Computational Intelligence Magazine*. Dr. Kim is one of the co-founders of the Int’l Conf. on Simulated Evolution and Learning in 1996, FIRA Robot World Congress in 2002 and Int’l Conf. on Robot Intelligence Technology and Applications (RiTA) in 2012. He was General Chair for the *IEEE Congress on Evolutionary Computation*, Korea, 2001, the *IEEE Int’l Symp. on Computational Intelligence in Robotics and Automation*, Korea, 2009, and RiTA 2012. He has been on the program committees and advisory boards of more than 100 int’l conferences. Dr. Kim has delivered over 180 invited talks, keynote speeches and tutorials on computational intelligence and robotics in 24 countries. His name was included in the *Barons 500 Leaders for the New Century* in 2,000 as *the Father of Robot Football*. He is the Founder of FIRA and IROC and is currently serving them as President. Dr. Kim was the recipient of the science and technology award from the President of Republic of Korea in 1997 and has been elevated to 2009 IEEE Fellow.