Semiosis as the Core of Systemic Intelligence for Realizing Human-Machine Symbiotic Systems

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It has become increasingly clear that a coming ubiquitous society consisting of people's everyday life, production activities, etc. is governed through integration of human and artifacts including various automated machines and information technologies. Wherein, the ecological and evolutional prospects are to be argued, and human beings and the technology should all be understood to be part of the system as well as to be evolvable. That is, cognitive agents (i.e., human and intelligent machines) are to be characterized as creative and adaptable to and within their environments. In this talk, I focus on the design issues of the mutual and inseparable relationships between the external environment and the internal of the cognitive agent that is an actor, an observer, a cognizer, a collaborator and an interpreter. An overview of our ongoing project of "Design Theory of Dynamical Systems with Semiosis" that is fully supported by a Grant-in-Aid Creative Scientific Research 2007-2011 funded by the Ministry of Education, Culture, Sports, Science and Technology will be presented. The subject of semiosis is any form of activity, conduct, or process that involves signs, including the production of meaning. By mingling technologies with semiotics, the project jointly approaches to the common design issues varying from how organisms make predictions about, and adapt to, their semiotic niche in the world, and to an aspect of the wider systems including architects, embodied robots, product innovation and human-machine and/or human social interactions. Semiotic technology offers us an indispensable tool for the creation of a truly sustainable society and human-oriented technology, and our project enables a paradigm shift from conventional "design for manufacture" to novel "design for nurture".

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Bibliography

Tetsuo Sawaragi was born in 1957 and is now a professor at the Dept. of Mechanical Engineering and Science, Graduate School of Engineering, Kyoto University, Japan. He received his B.S., M.S. and Ph.D. degrees in Systems Engineering from Kyoto University in 1981, 1983 and 1988, respectively. From 1986 to 1994, he was a research associate at the Department of Precision Mechanics, Faculty of Engineering, Kyoto University, wherein he was an associate professor and a professor in 1994 and 2002, respectively. In 2005 he was in the current department as a professor, and is presently a director of Center for Global Leadership Engineering Education (CGLEE) of Kyoto University. From 1991 to 1992, he was a visiting scholar at Dept. of Engineering-Economic Systems, Stanford University, USA. He has been engaged in the researches on Systems Engineering, Cognitive Science and Artificial Intelligence, particularly in the development of human-machine collaborative systems, modeling the transfer of human cognitive skills into machines. He was a chair of IEEE SMC Japan Chapter and a board member of the Institute of Systems, Control and Information Engineers, Human Interface Society and Japan Society for Fuzzy Theory and Systems. He was a project leader of the 21st Century COE Program "Center of Excellence for Research and Education on Complex Functional Mechanical Systems" of Kyoto University, and is currently a principal investigator of the Grant-in-Aid Creative Scientific Research 2007-2011 (19GS0208) on "Design Theory for Dynamical Systems with Semiosis" that is funded by the Ministry of Education, Culture, Sports, Science and Technology and is ongoing mainly at Kyoto University. Presently he is a president of Human Interface Society.