Workshop on the Power, Beauty and Excitement of the Cross-Boundaries Nature of Control, Seoul, 6 July 2008

Date: 6 July 2008 (Sunday)

Time: 10:00 - 15:00

Place: The Convention and Exhibition Center (COEX), Room 304 (A), Samsung-dong, Gangnam-gu, Seoul 135-731, Korea, http://www.coex.co.kr

Workshop Organisers:
* Technical Committee on Education of the International Federation of Automatic Control (IFAC)
* Technical Committee on Education of the Control Systems Society, the Institute of Electrical and Electronics Engineers (IEEE)
* The Korean Institute of Control , Robotics and Systems (ICROS)
* The Robot HRD Center supported by the Korean "Ministry Knowledge Economy"

Program and Speakers:
The Workshop aims to inspire interest from youth towards studies in Automatic Control and to assist high school teachers in promoting the discipline of Automatic Control among their students. It is composed of several short but effective presentations on various problems from the real world that have been solved by using control engineering methods, techniques and technologies. The attractiveness and excitement of choosing a career in control engineering will also be addressed. Live interaction between the presenters and the audience is to be an important feature of the Workshop.

10:00 - 10:30 EMBEDDED CONTROL SYSTEMS
Professor S.B. Moon
Sejong University

Many recent control applications require implementation in an embedded systems area due to the demand in small scale products such as hand-held devices. In typical embedded systems, computing power is rather limited and real-time operating systems are often required. In this talk, we will review embedded hardware and operating systems so that one is equipped with the knowledge to make appropriate decisions on hardware and software in the initial stages. Control algorithms for robotic control, strategies for service robot planning, and human-robot interactions will also be reviewed.

Basic concepts such as forward and inverse kinematics, and path planning will be covered for industrial manipulators. Mobile navigation concepts including localization, mapping, and the required sensor technologies are summarized. As service robotic applications are emerging, we will also review HRI (Human Robot Interaction) technologies, such as face and gesture recognition, and speech processing in an embedded module.

10:30 - 11:00 JOYS AND PERILS OF AUTOMATION:
CONTROLLING ELEVATORS TO SERVE YOU SMART AND FAST
Professor Christos G. Cassandras
Dept. of Manufacturing Engineering
and Center for Information and Systems Engineering (CISE)
Boston University, Brookline, MA 02446, USA

One of the definitions of the word "control" is "to govern or direct according to rule" (Merriam-Webster dictionary). In science and engineering, these "rules" have traditionally been dictated by the laws of nature - such as gravity or conservation of mass. Computer technology, however, has enabled us to build complex systems that have become essential to our daily life, from automated factories to computer networks. The "rules" that these systems must obey are as arbitrary as human imagination can make them. While this is exciting, it is also dangerous.

This presentation will contrast these two kinds of systems and then discuss, as an example of the latter "human made" systems the case of controlling elevators. We will describe the basic elevator dispatching control problem, where elevators are assigned to floors so as to minimize the amount of time people wait. We will also show how simple ideas from control engineering can make elevators serve you smart and fast.

11:00 - 11:30 NETWORK-BASED SENSING AND CONTROL FOR
INDUSTRIAL SYSTEMS
Professor. J.I. Moon
Hoseo University
The integration of intelligent devices, communication networks, and software into industrial systems can deliver fast diagnostics and warnings for system reliability, real-time control, system flexibility, and simplified wiring.

This talk will address industrial network solutions based on either wireless or wired network for sensing and control of industrial devices such as robot and vehicle systems. Among industrial wireless and wired network, wireless LAN and Zigbee based application examples are given. In addition, CAN (Controller Area Network) based examples are introduced.

11:30 - 13:00 JOINT LUNCH AND INFORMAL CHATS

Break for refreshments with presenters, control scientists and engineers mingling with the attendees in informal chats;

Also, Professor Jong Hyeong Kim of Seoul National University will demonstrate a mobile robot system developed by his research group.

13:00 – 13:30 FROM THE BRAIN TO THE STOCK MARKET
Dominique Duncan, PhD Student, Yale University, USA
Professor Bozenna Pasik-Duncan, University of Kansas, USA

The modern world is full of randomness. Many systems in fields such as biomedicine, engineering, natural sciences, and social sciences exhibit randomness in

how they behave. They are often subject to some random environmental effects, and due to inaccuracies in our observations (measurements) they are not deterministic but disturbed by noise. Two of the most complex systems disturbed by noise are the brain and the stock market. This presentation will focus on showing how researchers model a noise in the brain as well as in the stock market. We will show similarities in the analysis of brain waves and of stock market behavior. We will report the success of using mathematics and control engineering in predicting neurological disorders, such as epileptic seizures, and then, in theory, one dollar into billions. We will move with powerful stochastic theory and control from the brain to the stock market showing that the partnership in mathematics and control engineering, as well as a collaborative effort in research are necessary for success in solving complex problems of the modern world.

13:30 – 14:00 Cooperative Driverless Vehicles
Professor Ljubo Vlacic
Griffith University, Brisbane, Australia

The idea of intelligent vehicles has brought with it promises of heightened safety, reliability and efficiency. No longer would the onus of responsible driving be placed on fallible humans, in fact, the very idea of a car crashing, or causing damage to someone would be completely alien and unthinkable. Congestion would entirely evaporate as computers took control of vehicles and decided the optimal route for greatest efficiency. While this seems extremely idealistic, there is an element of truth to these benefits that intelligent vehicle technologies can provide. Thanks to the most recent development of decision and control algorithms intelligent vehicles are now even capable of undertaking driving manoeuvres in cooperation with each other. This talk will address intelligent vehicle technologies and give examples of cooperative driverless vehicles for cities.

14:00 – 14:45 Panel Discussion
Panel discussion through interaction with the audience (Moderators: Professor Jong Hyeong Kim, Seoul National University)

14:45 – 15:00 Wrap-up
Professor Bozenna Pasik-Duncan and Professor Ljubo Vlacic