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Region based Control of Robots

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Abstract:

In most human reaching movements, the desired targets are regions with arbitrary shapes rather than points. For example, placing chess pieces onto a chess board, putting a spoon into a cup, typing on a keyboard, inserting a thermometer into a patient's mouth, placing an object on a table. Other examples include keeping a vehicle within lanes, playing a game of darts, throwing a basketball into a net. This talk introduces a control concept called region control. In region control, the desired objective is specified as a region instead of a point or a trajectory. Since the desired region can be specified arbitrarily small, the region control method is also a generalization of setpoint control problem and trajectory tracking control problem. The desired region can also be used as a performance bound to ensure transient and steady-state response of the system. Since a region is defined instead of a point or a trajectory, less control effort or attention is required and thus results in energy saving of the reaching tasks. The extension to region based shape control of multi-robot systems will also be discussed in this talk.

Biography:

CHEAH Chien Chern was born in Singapore. He received B. Eng. degree in Electrical Engineering from National University of Singapore in 1990, M. Eng. and Ph.D. degrees in Electrical Engineering, both from Nanyang Technological University, Singapore, in 1993 and 1996, respectively. From 1990 to 1991, he worked as a design engineer in Chartered Electronics Industries, Singapore. He was a research fellow in the Department of Robotics, Ritsumeikan University, Japan from 1996 to 1998. He joined the School of Electrical and Electronic Engineering, Nanyang Technological University as an assistant professor in 1998. Since 2003, he has been an associate professor in Nanyang Technological University. In November 2002, he received the overseas attachment fellowship from the Agency for Science, Technology and Research (A*STAR), Singapore to visit the Nonlinear Systems laboratory, Massachusetts Institute of Technology. He serves as an associate editor for *Automatica* and has served as an associate editor for *IEEE Transactions on Robotics* from 2010 to 2013. He was a guest editor of the special issue on vision based control of the *Asian Journal of Control*. He was the program chair of the International Conference on Control, Automation, Robotics and Vision (ICARCV) in 2012 and 2006.