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Safe and Efficient Robot Collaboration System

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ABSTRACT:

In factory automation, humans and robots comprise the two major work forces. Traditionally, humans and robots have not physically collaborated with each other during operation, in significant part because full automation with robots was the goal. In recent years, however, it has been recognized that there are tremendous advantages if robots are brought out of their cages and to allow them to share work space with and to collaborate with humans to take advantage of the best of two worlds – on one hand, the reliable execution of tasks by robots without wear handling objects of a wide range of sizes and weights, and on the other hand, the intelligence of humans and their five senses-based adaptability and flexibility. For collaboration between humans and robots to be successful, it is a prerequisite to ensure the safety of the humans in such collaboration. At the same time, it is important to ensure that robots collaborate with humans to ensure the best performance possible. The safe and efficient robot collaboration system (SERoCS) is for the next generation co-robots, which consists of robust cognition algorithms for environment monitoring, optimal task planning algorithms for safe human-robot collaboration, and safe motion planning and control algorithms for safe human-robot interactions (HRI). The proposed SERoCS will significantly expand the skill sets of the co-robots and prevent or minimize occurrences of human-robot collision and robot-robot collision during operation.

BIOGRAPHY:

Masayoshi Tomizuka received his Ph. D. degree in Mechanical Engineering from the Massachusetts Institute of Technology in February 1974. In 1974, he joined the faculty of the Department of Mechanical Engineering at the University of California at Berkeley, where he currently holds the Cheryl and John Neerhout, Jr., Distinguished Professorship Chair. His current research interests are optimal and adaptive control, digital control, signal processing, motion control, and control problems related to robotics, precision motion control and vehicles. He served as Program Director of the Dynamic Systems and Control Program of the Civil and Mechanical Systems Division of NSF (2002- 2004). He served as Technical Editor of the ASME Journal of Dynamic Systems, Measurement and Control, J-DSMC (1988-93), and Editor-in-Chief of the IEEE/ASME Transactions on Mechatronics (1997-99). Prof. Tomizuka is a Fellow of the ASME, IEEE and IFAC (International Federation of Automatic Control). He is the recipient of the Charles Russ Richards Memorial Award (ASME, 1997), the Rufus Oldenburger Medal (ASME, 2002), the John R. Ragazzini Award (AACC, 2006) and the Richard E. Bellman Control Heritage Award (AACC, 2018).