Compressive Feedback Control for Robots

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ABSTRACT: In the AI era, data play essential role for making decisions. The fundamental issues are how to use the data efficiently and conveniently to achieve the maximum benefits. In a robot control system, data has been used to obtain models for designing the controller and real-time feedbacks. The compressive feedback means the data that represents sensory information in the feedback of a control system is compressed or obtained from compressive sensing. Compressive sensing is a newly developed sensing method in which the key information can be obtained based on limited sampling or sensing. The compressive feedback method can significantly reduce sensing time and amount of data for the feedback purpose. Therefore, high-performance real-time control can be achieved even for the systems with slow sensory feedbacks or limited amount of data such as visual feedbacks. The key question is how to use such compressive information to control a robotic system. In this talk, following a brief introduction of compressive sensing and data compression, the theoretical foundation as well as implementation methods for modeling, analysis and design of compressive feedback control systems will be presented. Applications, including robot control, visual servoing and high precision nano motion control, will be discussed. The experimental testing results will also be presented.

BIOGRAPHY: Ning Xi received his D.Sc. degree in Systems Science and Mathematics from Washington University in St. Louis, Missouri, USA in December 1993. He is the Chair Professor of Robotics and Automation in the Faculty of Engineering and the Director of the Emerging Technologies Institute at the University of Hong Kong. Before he joined the University of Hong Kong in 2016, he was University Distinguished Professor, the John D. Ryder Professor of Electrical and Computer Engineering and the Director of Robotics and Automation Laboratory at Michigan State University. Dr. Xi received the Best Paper Award in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) in August, 1995, and the Best Paper Award in the 1998 Japan-USA Symposium on Flexible Automation. Dr. Xi was awarded the first Early Academic Career Award by the IEEE Robotics and Automation Society in May, 1999. He also received The Best Paper Award of IEEE Transactions on Automation Science and Engineering in 2007. Dr. Xi was awarded SPIE Nano Engineering Award in 2007. In addition, he is a recipient of US National Science Foundation CAREER Award. Dr. Xi is a fellow of IEEE.