

Speaker: Huayong Yang

Title: The Development of Robotic Technologies Applied to the Mobile Construction

Machinery

Abstract: Tunnel Boring Machine (TBM) is a large machine especially designed to construct tunnels. A new robotic system is undergoing a development to change the cutting tools on a working cutter head of TBM automatically. New approaches to explore robotic systems have been also taken to improve the safety and productivity of TBM.

Aiming at the complex internal structure of cutterhead chamber, and high pressure and humidity working environment, the design of multi-joint snake-like manipulator and the dry-wet separation post-drive method are developed. A novel follow-the-leader path planning method for snake-like manipulator is also developed. As the manipulator moves forward, all the sections follow the path that the tip of manipulator has passed. Operator only need to control the direction of the distal section and the advance or retreat of the manipulator, which greatly simplifies human-computer interaction. A virtual three-dimensional working environment is built to realize efficient and reliable interactive control mode, reduces the difficulty of operation and improves the detection efficiency. Some changes of these robotic systems could be also applied to other mobile construction machinery.

Biography: Huayong Yang received a PhD degree of Philosophy from the University of Bath in 1988, and joined the Department of Mechanical Engineering at the Zhejiang University as a Post-doctor researcher in 1989. He is now the dean of school of Mechanical Engineering, and also the director of the State Key Laboratory of Fluid Power and Mechatronic Systems, Zhejiang University. He was elected as a member of the Chinese Academy of Engineering in 2013.

He is a prolific researcher with more than 189 invention patents, (co)authored 3 academic books and over 160 SCI technical papers. His research interests are in motion control and energy saving of mechatronic systems, development of fluid power component and system, integration of electrohydraulic system and engineering application, robotics, bio-design and manufacturing. He was appointed as a Cheung Kong Chair Professor by MOE in 2005. He has been a fellow member of the Chinese Mechanical Engineering Society, and a member of the Academic and Advisory Committees of 7 State Key Laboratories of TsingHua University, Zhejiang University, Shanghai Jiaotong University, Huazhong University of Science and Technology, Harbin Institute of Technology, Central South University and Chongqing University.

He was recipient of the first prize of the National Scientific and Technological Progress in 2012 and the second prize in 2003.