

Intelligent Robots and Hidden Champions

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Abstract

Industrial robot manipulators in the factories with similar morphology are treated as automation equipment for mass production purpose, for example, those in the automobile factories. However, when more and more robots are getting out of the factories and entering different types of environments, such as hospitals, homes, warehouses, construction sites, etc., their morphology can be drastically different in order to perform different tasks and interact with human beings. The roles of these robots are similar to those of human professionals rather than automation equipment with uniformity. An intelligent robot normally possesses three basic functions: perception, cognition and action. The demands for these functions are scenario-dependent, which is analogous to the profession-dependent job requirements in the human society. This lecture explores the economy and technical challenges in design and deployment of intelligent robots in the future society in a broad perspective. We draw the term "Hidden Champions" coined by German economist, Hermann Simon in 1986 to describe the role and development of intelligent robots. Simon first used the term to describe the small, highly specialized world-market leaders in Germany. These smaller companies are normally known only in their own area, by customers and suppliers, but not to the wider public or business community. When these companies are very successful on the international markets, they are hidden champions. Intelligent robots, like a hidden champion, need to have very specific capability to tackle an application scenario. The robot developer, likewise, needs to be focus on domain-specific industry in order to create technology barrier and stay competitive to become the market leader. This lecture will discuss the importance of system morphology, perception, learning/cognition, and actions to an intelligent robot used in three emerging application domains: logistics, construction and social education. We will share the experience and challenges of a number of robotics projects that have been or are being rolled out to the real world, such as logistics picking robots, smart painting robots, and social robots, to exemplify the "Hidden Champion" nature of intelligent robots outside of factory floors.

Biography

Professor I-Ming Chen is an internationally renowned robotics researcher. He received the B.S. degree from National Taiwan University, M.S. and Ph.D. degrees from California Institute of Technology, Pasadena, CA respectively. He has been with the School of Mechanical and Aerospace Engineering of Nanyang Technological University (NTU) in Singapore since 1995. He is Director of Robotics Research Centre in NTU from 2013 to 2017. He is a member of the Robotics Task Force 2014 under the National Research Foundation which is responsible for Singapore's strategic R&D plan in future robotics. He is now the Program Leader for National Robotics Program in Construction 4.0 in Singapore. His research interests are in logistics and construction robots, wearable devices, human-robot interaction and industrial automation. Professor Chen is Fellow of Singapore Academy of Engineering, Fellow of IEEE and ASME, General Chairman of 2017 IEEE

International Conference on Robotics and Automation (ICRA 2017) in Singapore. He is Editor-in-chief Elect for IEEE/ASME Transactions on Mechatronics and will assume Editor-in-Chief from Jan 2020. Furthermore, Prof Chen is an avid entrepreneur in robotics. He is the founder and CEO of Transforma Robotics Pte Ltd developing robots for construction industry and founder and CTO of Hand Plus Robotics Pte Ltd developing robotics and AI solutions for logistics and manufacturing industry.