Bio-inspired motion learning in cluttered and uncertain environments

Pengcheng Liu

University of York, York, YO10 5DD, United Kingdom

Abstract

Robotics and AI are identified as key growth areas across the world. The robots of today are no longer confined to structured environments, nor are they completely isolated from humans. Biological systems (humans/animals) naturally exhibit energy-efficient, robust, and adaptive behaviours in complex and contact-rich environments, whilst the existing robotic systems are still suffering from insufficient capabilities of sensory-motor and learning. Humans can perform a range of tasks with planning and excellence, but these are very difficult for robots. Motion learning and learning are the analysis of and planning for objects moving through space. It is a part of research problems across disciplines and requires specialised treatments. Motion planning algorithms move robots safely through complicated environments, validate both the assembly and operation of multipart systems, and solve a variety of other tasks. Real-time robot motion planning has become an active yet challenging research area recently, particularly with the issues of modelling of environmental interactions, recognition and grasping of deformable objects and optimization in contact-rich scenarios. In this presentation, I will start with the needs and challenges of autonomous motion learning in contact-rich and uncertain scenarios, and then explore plausible solutions to approach these problems with some interesting applications in agriculture and manufacturing.

Biography

Pengcheng Liu is an Associate Professor in the Department of Computer Science at the University of York, UK. He previously held academic positions at Cardiff Metropolitan University, University of Lincoln, Bournemouth University, Zhongyuan University of Technology, the Chinese Academy of Sciences, and Shanghai Jiao Tong University. As a Member of IEEE and its various societies, he has published over 100 papers and serves as an Associate Editor for IEEE Access and PeerJ Computer Science. He received the Global Peer Review Award (2019) and the Outstanding Contribution Award from Elsevier (2017). His research, funded by organizations such as EPSRC, Innovate UK, and Horizon 2020, focuses on robotics and biology, specifically the modelling and transfer of human and animal skills for autonomous systems.

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