

Department of Biomedical Engineering

Research Student Seminar Series

(Supervised by Prof. FENG Gang)

Model-Free Adaptive Impedance Control for Autonomous Robotic Sanding

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Ph.D. candidate

Date:	September 8, 2023 (Friday)
Time:	5:00pm-5:20pm
Zoom:	https://cityu.zoom.us/j/3884397429

Abstract

Sanding is a common yet important task in the manufacturing of many wooden objects (e.g. furniture, decoration box), where the coated layer attached on objects is removed after the interaction with sanding belts. Existing sanding operation is heavily dependent on manual works, which is highly labor-intensive and with the low consistency of quality, and the issues of safety and health also arise after continuous working in the noisy and dusty environment. To deal with the aforementioned, this paper presents the development of a new autonomous sanding robot. The autonomous capability of the developed robot is reflected in the whole procedure of sanding. In particular, the CAD model of the target

object is automatically constructed with the structured-light technology, and the sanding behavior on the target surface is self-regulated under the desired impedance model. Such feature makes the robot capable of working towards uncertain objects with minimum human involvement. The proposed impedance controller has the model-free advantage, by using the adaptive neural networks (NNs) to compensate the uncertain dynamics and the unknown disturbances online. The stability of the closed-loop system is rigorously proved with Lyapunov methods, and experimental results on different objects are presented to validate the performance of the developed robot. The implementation of the developed robot can systematically address the problems associated with manual works.

Biography

HUO, Yingxin is now pursuing a Ph.D. degree in Prof. FENG Gang's group with the Department of Biomedical Engineering, City University of Hong Kong. Her research interests include robotics and automation, human-robot interaction, magnetic actuation systems and control.

All are Welcome!