THE UNIVERSITY OF HONG KONG

DEPARTMENT OF MECHANICAL ENGINEERING

SEMINAR

Online

Title: **A High-payload Proprioceptive Hybrid Robotic Gripper with Soft Origamic Actuators**

Speaker: **Mr. Yinyin SU (PhD candidate)**
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Date: **27 April, 2021 (Tuesday)**

Time: **10:30 a.m.**

Zoom Link: **1) Link to join the meeting:**

https://hku.zoom.com.cn/j/93162139626?pwd=UTNZUzRENW1saW9ZMXRrNmJ4M0MwZz09

2) Meeting ID: 931 6213 9626

3) Password: 217367

Abstract:
Proprioception is the ability to perceive environ-mental stimulations through internal sensory organs. Enabling proprioception is critical for robots to be aware of the environ-mental interactions and respond appropriately, particularly for high-payload grippers to ensure safety when handling delicate objects. State-of-the-art robotic grippers with soft actuators are typically equipped with pressure sensors for pneumatic regulation and control, but very few utilized them for proprioceptive purposes. This lack of environmental awareness was largely compensated by their inherent compliance and conformity, but also due to the generally limited force capabilities. Targeting at this gap,

this work proposes a novel Proprioceptive Origamic Soft Actuator (POSA) joint, and a corresponding hybrid robotic gripper design with high-payload soft origamic actuators and rigid supporting frames, achieving up to 564.5 N actuator output force or 302.4 N finger gripping force at 150 kPa low pneumatic pressure and 3.2 kg self-weight. Despite the substantially higher force capability over state-of-the-art soft grippers, the proposed hybrid gripper could retain the excellent inherent compliance thanks to the novel soft origamic actuators. Moreover, a novel scheme of multi-actuator proprioception is proposed by only using the embedded pneumatic pressure sensors, to enable the hybrid gripper with environmental awareness, achieving real-time position and force estimations of errors at <1% and 5.6%, respectively. The principles, design, prototyping, and experiments of the proposed hybrid high-payload gripper were presented in this letter. Combining soft robotic compliance, high payload, and proprioception, the gripper could both hold a pealed grape and crack a walnut, with position and force signals being measured without requiring dedicated sensors.

ALL INTERESTED ARE WELCOME

For further information, please contact Prof. J. Lam at 3917 2805.

Research area: Robotics and Control