MONASH University

MONASH ENGINEERING

Faculty of Engineering

ASPIRE Summer Research Program 2026-2027

Project Title: Intuitive Teleoperation and Generalized Motion Mapping for Robotic Manipulators

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Objective

Develop and experimentally evaluate a miniature robotic-arm interface for intuitive, real-time teleoperation of industrial manipulators. The project will investigate safe and responsive motion mapping between leader and follower robots with different geometries and degrees of freedom.

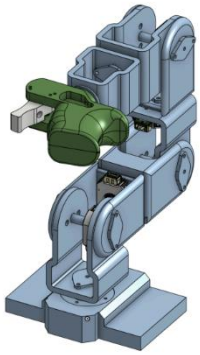
Outcome: a validated teleoperation framework and a research paper suitable for submission to a robotics, automation or digital-twin conference.

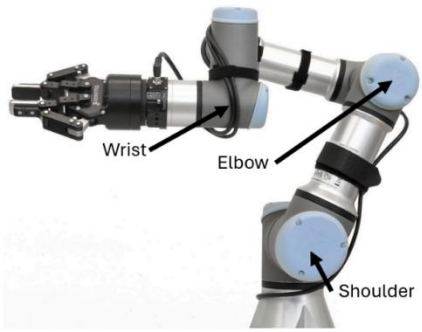
Project Details

Teleoperation enables remote robot control in hazardous, inaccessible or precision-demanding environments, but conventional joysticks, keyboards and teach pendants can be difficult to learn and unintuitive.

The project will use a passive, 3D-printed miniature arm with absolute joint encoders, a Raspberry Pi and OPC UA communication to control a KUKA LBR iiwa within the Monash Smart Manufacturing Lab. Work will refine the mechanical and sensing design, improve motion mapping and safety constraints, integrate the robot and digital twin, and evaluate the interface against conventional controls.

Evaluation may include pick-and-place, block stacking and precision path-following tasks, assessed using completion time, accuracy, errors, latency and user experience.





Project Timeline

TASK	1	2	3	4	5	6	7	8	9	10
Literature review and definition of research questions										
Review and testing of the existing mini-arm and robot system										
Mechanical, sensing and software improvements										
OPC UA, robot and digital-twin integration										
Experimental task and evaluation protocol development										
System testing and data collection										
Data analysis and comparison of control approaches										
Conference-paper preparation										
Final demonstration and documentation										