Force Control as a Bridge between the Information World and the Physical World

Project manager

(selected in 2026)

SAKAINO Sho

Associate Professor, Institute of Systems and Information Engineering, University of Tsukuba



Leader's institution

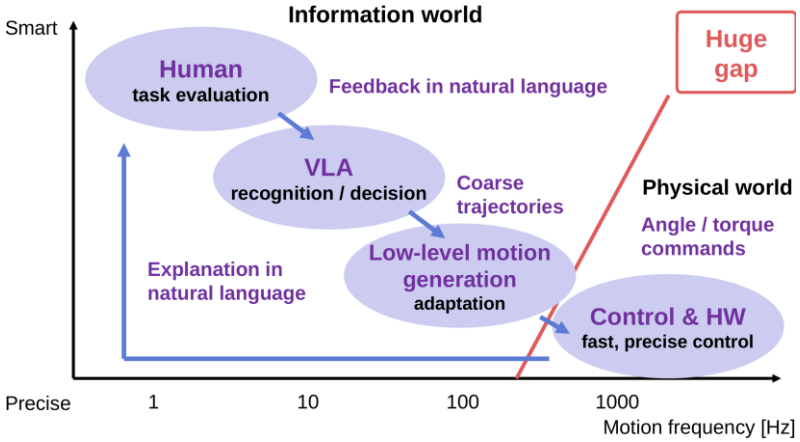
University of Tsukuba

R&D institutions

University of Tsukuba, Kyushu Institute of Technology, The University of Osaka, Doshisha University, Keio University, Nagaoka University of Technology, The University of Tokyo, Yokohama National University

Summary of the project

This project aims to realize general-purpose robots that perform diverse non-routine tasks at human-level speed, addressing severe labor shortages. We fuse the recognition and decision-making capabilities of Vision-Language-Action (VLA) models with advanced force-control technologies based on bilateral control, so that robots adapt flexibly to on-site tasks through interactive feedback. We also develop bilateral control systems with a 15 Hz control bandwidth from the motor driver and gear levels, building a robot platform that is taught and adapts on site.



Milestone by 2030

Using VLA models capable of interactive feedback and force control, we aim to perform more than ten types of non-routine tasks – such as manipulating objects on conveyors, transporting linens, harvesting fruit, and wiping and cleaning–in logistics, food manufacturing, nursing-care facilities, agriculture, retail, and other fields, with takt time, success rates, and safety comparable to junior-level workers.

Project structure

PM: SAKAINO Sho (University of Tsukuba)

■ VLA Team

1. **Development and Real-World Demonstration of Integrated Intelligence for Home Service Robots** TAMUKOH Hakaru (Kyushu Institute of Technology)
2. **Adaptive Vision-Language and Vision-Language-Action Models Grounded in Observation and Action** YOSHINO Koichiro (The University of Osaka)
3. **Development of Interaction Design for Modifying and Utilizing Foundation Models** IIO Takamasa (Doshisha University)

■ Low-Level Motion Generation Team

4. **Large-Scale Motion Model Adaptation** SAKAINO Sho (University of Tsukuba)
5. **Research and Development of Brain-Inspired Residual Learning Frameworks** MURATA Shingo (Keio University)

■ Control & HW Team

6. **Development of Wideband Bilateral Control System** YOKOKURA Yuki (Nagaoka University of Technology)
7. **Research and Development of Motor Drivers for High-Bandwidth Bilateral Control Systems** OHNISHI Wataru (The University of Tokyo)
8. **Research and Development of Highly Backdrivable Gearboxes for Force Control** FUJIMOTO Yasutaka (Yokohama National University)

