IEEE ICM2027
INTERNATIONAL CONFERENCE ON MECHATRONICS

MARCH 7 – 9, 2027, YOKOHAMA, JAPAN

Special Session on

Robots in the Physical World: Advances in Control, Learning and Physical AI

Organized by

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Call for Papers

Robots are increasingly expected to support flexible manufacturing, assist older adults and perform demanding tasks in human environments. These applications require reliable motion and force control, effective sensing and safe physical interaction under changing conditions. Advances in actuation, compliant mechanisms and control provide essential capabilities, while learning and artificial intelligence offer further opportunities for adaptation and autonomy. This special session brings together researchers to discuss robot–environment interaction, spanning established control methods and emerging approaches to Physical AI. We welcome theoretical, methodological and experimental contributions addressing robotic systems that interact effectively with people, objects and their surroundings. Topics of interest include, but are not limited to:

- High-performance motion and interaction control.
- Tactile, force and multimodal sensing for perception and action.
- Compliant actuators, variable impedance mechanisms and soft robotics.
- Dexterous manipulation and contact-rich tasks.
- Haptics, bilateral control and teleoperation.
- Safe physical human–robot interaction and collaboration.
- Humanoid and mobile robots operating in complex environments.
- Learning-based control and skill acquisition through interaction and demonstration.
- Integration of AI-based planning with physical interaction control.
- Physical AI and embodied intelligence.
- Skill transfer and generalisation across tasks, environments and robots.
- Applications in manufacturing, construction, healthcare, rehabilitation and daily assistance.