Prof. Milutin Nikolic, University of Novi Sad, Serbia

Motion feasibility in multi-contact and multi-legged locomotion

Bipedal locomotion is a natural capability of humans but remains a significant challenge for robotic systems. A primary difficulty arises from the fact that a standing humanoid robot is underactuated and inherently unstable. Stable walking requires careful control of foot–ground contact forces, traditionally assessed using the Zero Moment Point (ZMP), introduced over five decades ago. With the increasing capabilities of humanoid and proliferation of quadruped robots it becomes necessary to address locomotion scenarios that are not adequately captured by the ZMP framework, particularly those involving multiple, non-coplanar contacts with the environment. This presentation demonstrates how contact configurations and actuation constraints determine the set of feasible contact forces, which in turn define the range of feasible center-of-mass motions. The proposed approaches are illustrated using simulations of a humanoid robot, as well as both simulated and real quadruped robot, where the same underlying principles apply.

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11:30-12:30
Hybrid: UT Hongo Campus
Eng. Bld 2 room 31A

zoom

Milutin Nikolić received his M.Sc in Mechatronics and a Ph.D. degree in Robotics from the University of Novi Sad, Serbia in 2008 and 2015 respectively. He currently works as an Associate professor of Robotics at the University of Novi Sad, Faculty of Technical Sciences, Chair of Mechatronics, Robotics, and Automation. His field of research includes whole-body motion synthesis, walking pattern generation, contact stability criteria, multi-body system dynamics and robot manipulation and grasping. He spent 18 months at Nakamura-Yamamoto lab, the University of Tokyo in Japan, as a Project assistant professor working on human motion capturing and analysis. Nikolić was also working as a research associate at NTU Singapore, TU Technikum Wien, and UMIT, Hall in Tyrol. Nikolić has industry experience, working as a principal robotic arm manipulation engineer at the Aeolus robotics, where he developed novel approaches in arm calibration and whole-body motion planning. He also gave several guest lectures at well-established robotics laboratories, some of which are Nakamura & Yamamoto Lab University of Tokyo Japan, Biorobotics Laboratory, EPFL, Switzerland, Vislab at Instituto Superior Técnico in Lisbon Portugal, Automation, Biocybernetics and Robotics Department at Jožef Stefan Institute....

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