Guest Lectures

Industrial Robots Course (PRODES), Technical University of Crete

TU Bergakademie Freiberg · TUBAF The University of Resources. Since 1765. · Chair of Automated and Autonomous Systems



From Collaborative Robots to Shared Autonomy: Towards Intelligent Robot Cooperation

Abstract

Flexible manufacturing increasingly requires multiple robots to share workspaces, resources, and tasks. Without awareness of partners' trajectories or intentions, independently planned motions may conflict, causing collision risks, interruptions, and inefficient resource use. This lecture examines the transition from collaborative robotics towards shared autonomy through three ongoing experiments: supervised stopping and replanning on a real UR5, localized repair of predicted UR5–UR7e trajectory conflicts in simulation, and global RGB-D perception for workspace awareness. It concludes by discussing how shared environmental representations and cooperative decision-making could enable more adaptive and efficient robot cooperation in dynamic industrial environments.

Biography

Hafsa Siddiqui is a Research Associate at the Chair of Automated and Autonomous Systems at TU Bergakademie Freiberg, Germany, and holds an M.Sc. in Mechatronics from the University of Siegen. She previously conducted her master's thesis research at KUKA Deutschland GmbH, focusing on trajectory optimization, model predictive control, and reactive obstacle avoidance. Her current research focuses on autonomous robotic systems, particularly motion planning, multi-robot coordination, perception-based adaptation, and intelligent robotic cooperation.



Humanoid Robots for Human–Robot Collaboration in Industrial Environments

Abstract

This talk introduces our research on humanoid robots for human–robot collaboration in industrial environments. Using the Unitree G1 as a case study, it presents how visual perception and speech interfaces connect to robot actions through ROS 2. Examples from our laboratory illustrate progress in object detection and supervised grasping, alongside the practical challenges of integrating these components. The discussion then considers shared autonomy as a research direction, emphasizing when robots should act independently and when operators should remain involved.

Biography

Ahmed Mahmoud is a Research Associate and Doctoral Researcher at the Chair of Automated and Autonomous Systems at TU Bergakademie Freiberg, Germany. His doctoral research focuses on shared autonomy for human–humanoid collaboration in industrial environments, using the Unitree G1 platform to develop and integrate visual perception, speech interfaces, and robot control through ROS 2. His current research also investigates edge AI for onboard perception and decision-making, with an emphasis on reliability and human oversight.