Cognitive Cooperative Mobile Multi-Robot Manipulation

Motivation
• Team of robots and humans for efficient task execution
• Complex manipulation tasks in unstructured environments
• Increase of dexterity by multiple mobile robot manipulators
• Exploitation of heterogeneous team member capabilities

Research challenges
• Joint mobile manipulation with haptic coupling
• Recognition and correction of non-desired actions
• Handling intrinsic/extrinsic disturbances and uncertainties
• Coordinated task execution by a team of agents

Plan representation
• Global and local sensorimotor primitives
• Plan given by a sequence of primitives
• Goal represented by global object-centered primitives, e.g. global visual servoing task
• Funnel based task execution

Compliant mobile manipulation
• Differential kinematics derived from tunable object impedance dynamics
• Manipulability-optimized mobile platform configuration
• Recognition and interpretation of environmental interaction

Experimental setup
• Multiple robots pick up a large, rigid object
• Transport of the object from an arbitrary initial position to a desired mounting pose
• Human-guided final positioning

Selected publications
• Lee et al., "Human-robot cooperation control for installing heavy construction materials", Autonomous Robots, 2007
• Khatib et al., "Force Strategies for Cooperative Tasks in Multiple Mobile Manipulation Systems", 1996