

Intelligent and Human-Aware Decision Making for Semi-autonomous Human Rehabilitation Assistance using Modular Robots

Anoop Mishra, Graduate Student, Computer Science
Faculty Mentor: Prithviraj Dasgupta, Computer Science

Autonomous robots are frequently used to assist humans in complex or tedious tasks ranging from space applications to medical and household tasks. In this research, we are developing artificial intelligence-based semi-autonomous control techniques for a modular self-reconfigurable robot called Modular Robot for Assistance in Robust and Intelligent Operations (MARIO), to assist patients with spinal cord injury in performing daily living tasks. In this research, we describe a machine learning based framework called Deep Q-networks with actor-critic learning that enables MARIO to determine the actions and configuration that can perform a certain assistive task while reducing the time and energy expended by MARIO to perform the task. Our technique also involves real-time adaptation of the robot's actions in response to the human's interactions with the robot while performing the task, so that the trust and satisfaction of the human towards the robot is improved. The evaluation of our proposed techniques will be presented for MARIO performing different assistive tasks like opening closet doors, picking small objects like TV remotes, and fetching objects like laundry baskets and pillows within simulated household environments including bedroom, laundry, and kitchen.