Bridging Minds and Machines: A Common Reality Based Human-Robot Collaboration Platform

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Human-robot collaboration attracts increasing interest, but it is challenging for robots to understand complex environments and unstructured commands from humans. This paper proposes an HRC platform that bridges human workers and robot teammates via an interface surface that can be used to control robots, display robots' intentions, and comprehend humans' commands. Our platform contains an interactive surface, and it is constructed by a projector and RGB-D camera that can convert any surface into tablet-liked surfaces, where you can control and communicate with the robot, thus creating a shared workspace that makes interaction intuitive. To help humans better understand robots' intentions, we display the robot's simulation on the interactive surface. In order to help humans know about the robot's comprehension, the interactive surface can display the robot's semantics understanding of the environments and logical representation of human commands. We evaluate the proposed platform in both simulated environments and real-world environments. We also evaluate the platform based on a survey that is collected from different groups of people.