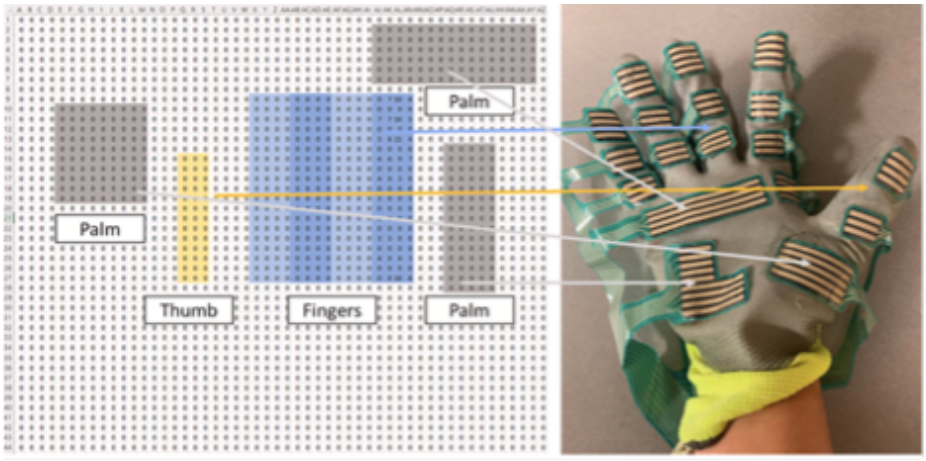
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Adaptive and Intent-Aware Controller for Object Handovers Between Humans and Robots in Close-Contact Collaborative Work

Technology number: 2024-470



Technology ID
2024-470

Category
Robotics
Engineering & Physical Sciences

Further information
Richard Greeley
rgreeley@umich.edu

Learn more

OVERVIEW

Enhancing safety in Human-Robot Collaboration for construction material handovers

- Tactile sensors and learning models for safe, natural robot-to-human handovers
- Useful for construction safety, robotics, industrial automation, material handling

BACKGROUND

Typical construction workflows involve extensive physical interactions, including material handovers, which can pose significant safety risks in Human-Robot Collaboration (HRC). Historically, ensuring safety during these interactions has been challenging due to the complexity of human grip and response behaviors. Traditional solutions often rely on pre-programmed robotic movements, which lack the adaptability and responsiveness required for safe and efficient handovers. These rigid systems cannot accommodate the dynamic and varied nature of construction sites, leading to potential hazards and inefficiencies. There is a need for improved methods that replicate human behaviors and enhance safety during robot-to-human interactions, benefiting both productivity and worker protection.

INNOVATION

Researchers have introduced two key innovations to improve safety in robot-to-human material handovers. First, a comprehensive receiver grip state indicator utilizes whole-hand tactile sensors to detect both grip strength and gestures, ensuring that the robot can accurately sense human intent. Second, a Learning from Demonstration (LfD) model is designed to replicate human grip state-reactive behaviors, enabling robots to perform natural and safe handovers based on single demonstrations. This approach surpasses existing techniques by offering a user-friendly programming interface suitable for construction workers without technical expertise. Additionally, it supports continuous data collection to expand the LfD model, covering a broader range of materials, users, and gestures. This innovation is invaluable for construction safety, robotics, industrial automation, and material handling applications.