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Tactile Gesture Interpretation for Safe Human-Robot Handovers

Stanford researchers have developed a technique to interpret contact events between a human and a device equipped with a force sensor. It can detect and classify distinct touch interactions such as tap, touch, grab, and slip.

The technique is simple and practical because it relies only on data processing of force measurements (such as from wrist or joint force sensors on a robotic arm, or from an onboard force sensor in any device that requires human input). The approach is less complex and more durable than traditional tactile sensor arrays.

Application of this technology is useful, for example, when a human and a robot transfer an object from one to the other (known as "handovers"). The developed technique enables more subtle, robust, and safe handovers to be accomplished without relying on crude threshold detection or reliance on external sensing, as with current practice.

The technique can be applied in other contexts. For example, the developed technique could turn a screen equipped with a force sensor into a fully interactive touch screen display, with no requirement for the additional sensors typical of a touch screen. Additionally, the developed techniques can be extended to detect and classify other types of contact besides taps that occur during communication with a tablet or other force-sensitive surface, expanding the possible ways to communicate via touch with devices.

Stage of Development - Prototype

Applications

- Robotics

- Data Entry (Cell phone, tablets)
- Wearable and Remote Robots
- Prosthetics
- Consumer products

Advantages

- Low cost, robust, and low complexity - uses robust force sensors to inform handover process rather than fragile tactile sensors
- Increases safety - allows humans and robots to safely pass objects
- Enables new data entry gestures

Publications

- Bianchini, Elizabeth Bibit, Kenneth Salisbury, and Prateek Verma. "Human Tactile Gesture Interpretation for Robotic Systems." *arXiv preprint arXiv:2012.01959* (2020). https://arxiv.org/abs/2012.01959

Patents

- Published Application: 20230173669

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