An Exploration in Motion Interface Robotic Arms

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Robotic arms have been gaining global traction in numerous fields. Despite their utility, the barrier towards adopting this technology remains high; users face issues of cost, as well as a high level of difficulty to control robotic arms, requiring specialized skills such as teach pendant programming and similar methods to guide the arm towards specific coordinates. The final product of this project was the Motion Interface Robotic Arm (MIRA), a fully articulated robotic arm with 6 degrees of freedom, controlled by a Leap Motion controller. The Leap Motion controller is a new commercial sensor device that can detect hand positions and movements without requiring physical contact. MIRA uses the Leap Motion to map the operator's hand positions and gestures to the arm. Through testing, this natural motion interface was shown to reduce the learning curve over traditional programming methods and unintuitive controls needed for robotic arms. Users are able to successfully move and manipulate objects using MIRA. MIRA also has the capability to record and playback movements of the arm, analogous to the repetition needed for industrial robotic arms, but with the added benefit of the motion controller. In addition, an onboard camera allows for MIRA to be remotely operated over a distance. With the ease of use added through the natural motion control interface and remote operation, MIRA expands and improves the applications of robotic arms, including telepresence robotics, industrial robots, robot-assisted surgery, military bomb disposal vehicles, and scientific research vessels. Finally, the MIRA platform has been open sourced to further encourage the development of robotic arms to fit a broader range of possibilities.

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