

A System Architecture for Hand Gesture Control of Robotic Technology: A Case Study Using a Myo™ Arm Band, DJI Spark™ Drone, and a Staubli™ Robotic Manipulator

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Abstract : Industrial robotic manipulators have been commonplace in the manufacturing world since the early 1960s, and unmanned aerial vehicles (drones) have only begun to realize their full potential in the service industry and the military. The omnipresence of these technologies in their respective fields will only become more potent in coming years. While these technologies have greatly evolved over the years, the typical approach to human interaction with these robots has not. In the industrial robotics realm, a manipulator is typically jogged around using a teach pendant and programmed using a networked computer or the teach pendant itself via a proprietary software development platform. Drones are typically controlled using a two-handed controller equipped with throttles, buttons, and sticks, an app that can be downloaded to one's mobile device, or a combination of both. This application-oriented work offers a novel approach to human interaction with both unmanned aerial vehicles and industrial robotic manipulators via hand gestures and movements. Two systems have been implemented, both of which use a Myo™ armband to control either a drone (DJI Spark™) or a robotic arm (Stäubli™ TX40). The methodologies developed by this work present a mapping of armband gestures (fist, finger spread, swing hand in, swing hand out, swing arm left/up/down/right, etc.) to either drone or robot arm movements. The findings of this study present the efficacy and limitations (precision and ergonomic) of hand gesture control of two distinct types of robotic technology. All source code associated with this project will be open sourced and placed on GitHub. In conclusion, this study offers a framework that maps hand and arm gestures to drone and robot arm control. The system has been implemented using current ubiquitous technologies, and these software artifacts will be open sourced for future researchers or practitioners to use in their work.

Keywords : human robot interaction, drones, gestures, robotics

Conference Title : ICHRI 2018 : International Conference on Human-Robot Interaction

Conference Location : Rome, Italy

Conference Dates : September 17-18, 2018