Robotics and Control (ME737)

Spring 2018 Course Project Presentation

Date: 05/01/2018 and 05/03/2018, Time: 9:30-10:45AM Place: Eng.B 202

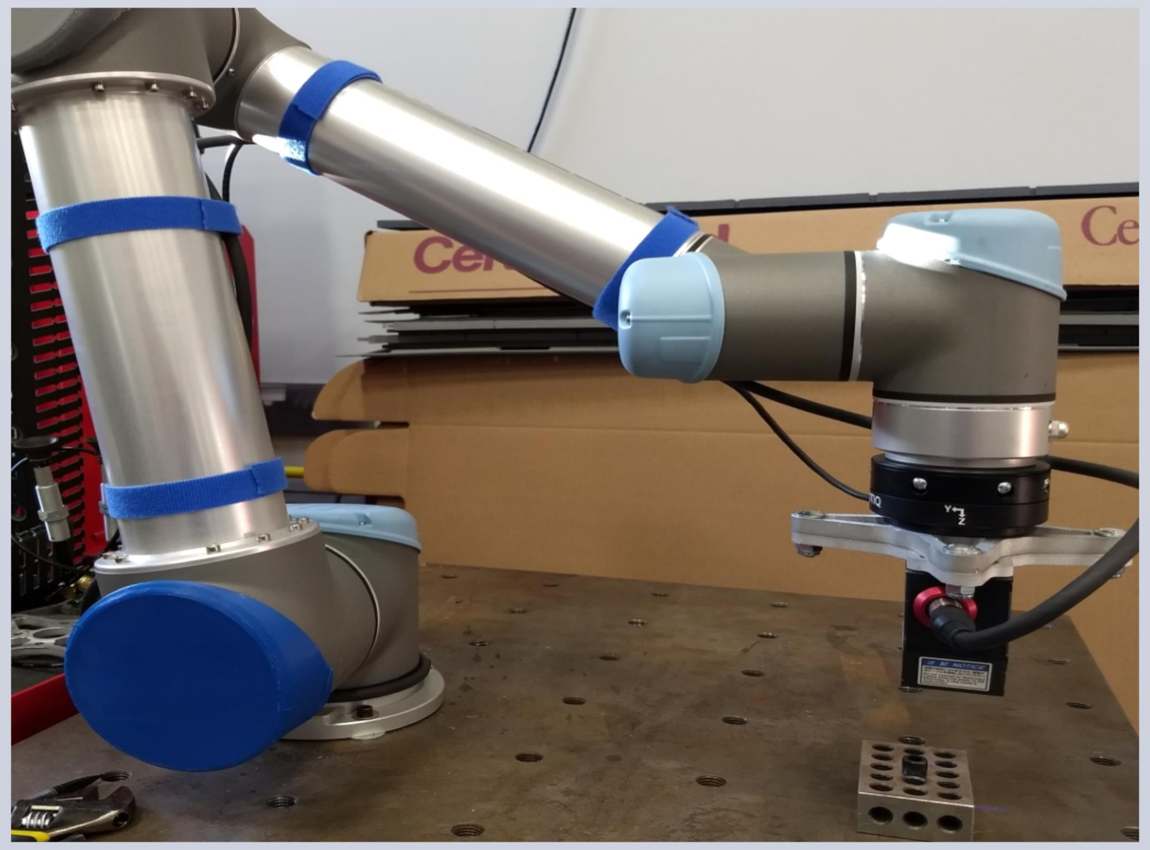
Course instructor contact: Yimesker Yihun (yimesker.yihun@wichita.edu)

Feasibility Analysis of Automated Line Scanning Techniques using UR5

Alexander Van Pelt, Homar Lopez-Hawa, Suveen Emmanuel

Abstract

Part inspection is an almost universal aspect of manufacturing which traditionally requires human observation. Advanced metrology techniques, such as scanning, allow greater inspection capabilities, but still require a human operator and require significant capital investment. Using off the shelf line scanners in conjunction with small collaborative robots can completely automate the inspection process while minimizing cost. This project seeks to investigate the feasibility of utilizing a UR5 robot with a Keyence line scanner for scanning inspection in an industrial setting. Data from the line scanner will be gathered, along with the position and rotation of the end effector. This data will be collected, combined, and analyzed in MATLAB to generate surface geometry. A user interface will allow viewing of the specific points gathered. A professional grade scan of the test part will be used for comparison of experimentally gathered data. Feasibility will be based on cost, effectiveness, ease of programming and operation, and development difficulty. In the allotted time, it was found that the UR5 and line scanner provide a cheap and easily programmable and automated solution to line inspection. However, effectiveness and difficulty of development may pose challenges that require future research.

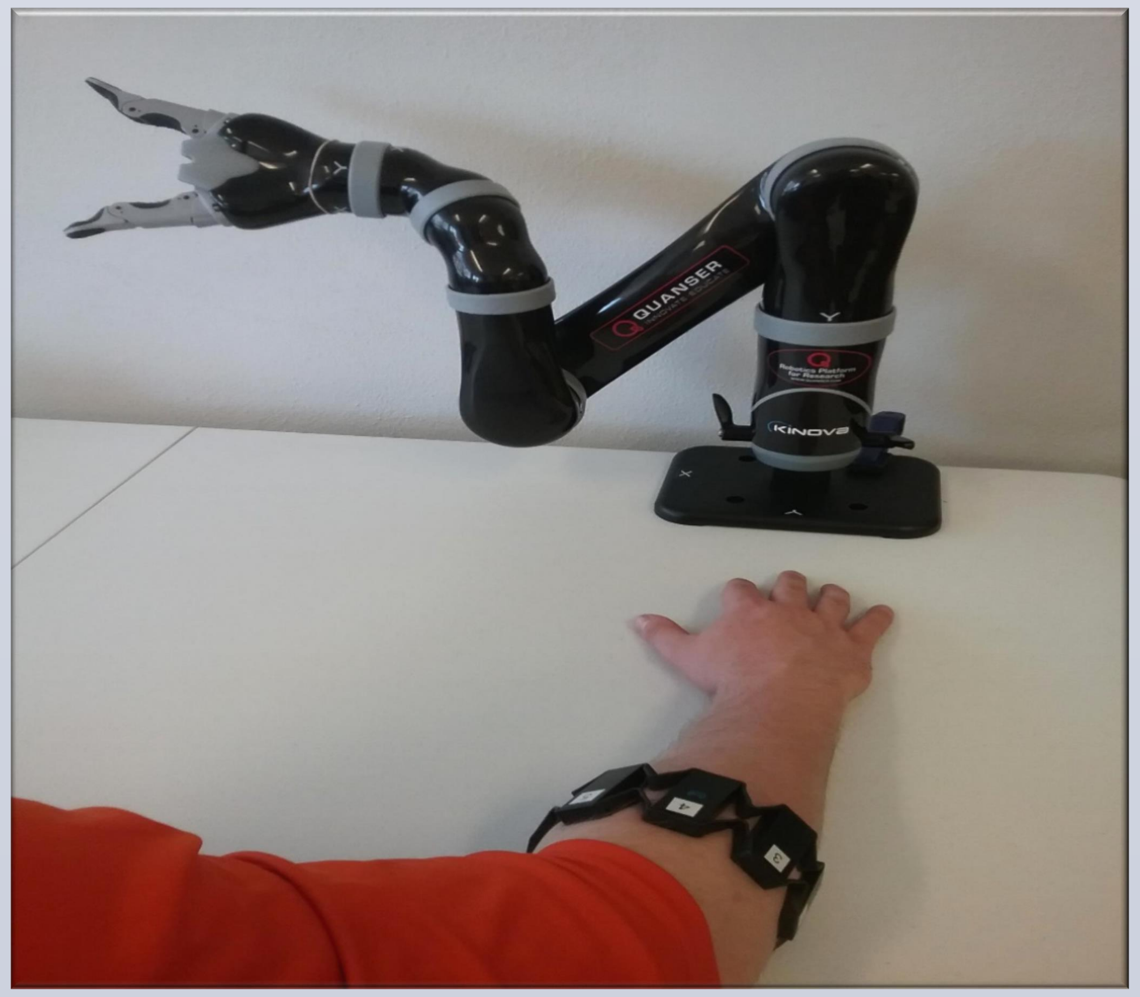


EMG Controlled Assistive Robotic Arm

Adam Reust, Bridget Schabron, Roshantha Perera

Abstract

Patients with issues such as cerebral palsy, spinal cord injury, and multiple sclerosis have difficulties with activities of daily living (ADL). Their abilities to perform these can be improved through vigorous physical therapy. When that therapy is either not effective or lacking in its progression an assistive robotic device can be used to improve patients' quality of life and help them in accomplishing ADL's. This study proposes implementation of an EMG controlled assistive robotic arm to aid patients with upper limb mobility limitations. Using the MYO armband, eight EMG signals were obtained from three test subjects and were analyzed in MATLAB® Simulink®. Post signal acquisition, signals were classified to be used as inputs for a Kinova MICO 6 DOF manipulator. A control system is being developed which uses EMG inputs and inverse dynamics equations to actuate the robot through a pick and place operation. Current results of the project show positive outlook, as the classification accuracy of the EMG signals to control commands for the robot was greater than 80%. The classification accuracy was achieved through the use of a pattern recognition neural network. This preliminary investigation demonstrates the possible future implementation of the system for its intended application.

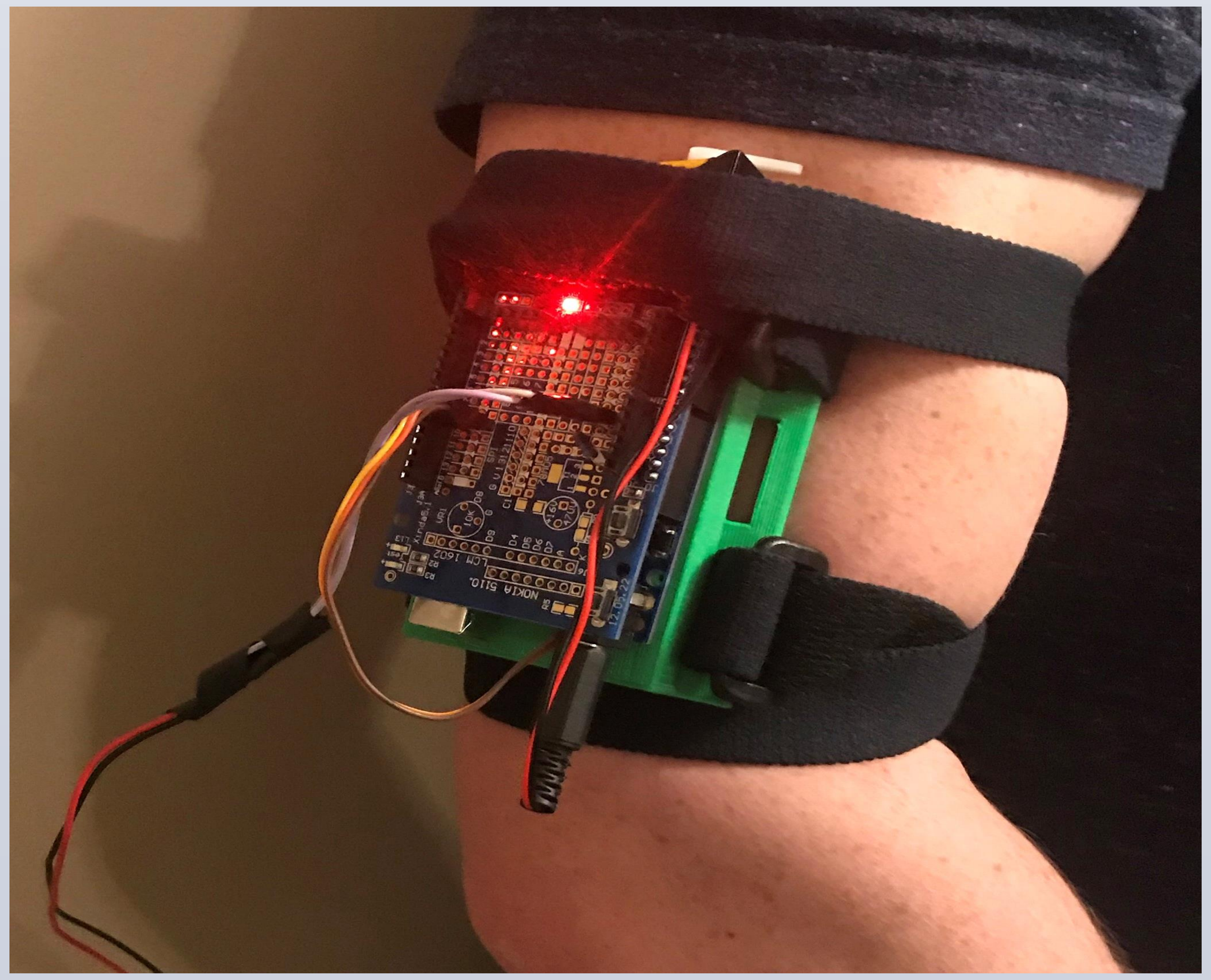


Providing Sensory Feedback to a Prosthetic User via Dermal Stimulation

Colby Camp, Josh Dean, Scott Marmillion, Trey Garrett

Abstract

Significant advancement has been made in recent years in the field of prosthetic limbs. Devices are more controllable, more lifelike, and more useful than ever before. However, one area that has lagged is prosthetic sensory feedback. Sensory feedback is a critical component that makes it possible for human extremities to perform many daily activities. Without feedback, simple tasks like holding a cut or picking up a piece of food become exponentially more difficult. We designed a simple concept device that allows a prosthetic user to close the loop on their control actions through touch feedback provided via topical stimulation. In our testing, users were able to recognize sensory feedback with minimal training. This investigation is preliminary, but it shows promise for the concept, and opens the door for future research.



Robotics and Control (ME737)

Spring 2018 Course Project Presentation

Date: 05/01/2018 and 05/03/2018, Time: 9:30-10:45AM Place: Eng.B 202

Course instructor contact: Yimesker Yihun (yimesker.yihun@wichita.edu)

Implementation of an Ultrasonic Proximity Sensor for Collision Avoidance in a Dynamic Human-Robot Collaborative Environment Using a UR5

Garba Subedi, Md Tanzimul Hasan, Michael Luteganya, Thomas Thibodeaux

Abstract

As robots have become more prevalent in manufacturing, human-robot collaboration has become more common and more important to the manufacturing processes. For example, a robot is useful to perform repetitive or monotonous tasks while a human is better suited for tasks requiring a certain amount of finesse. The collaboration presents unique challenges since the potential for collision between a robot and a human or other obstacle may cause damage to robot or injury to the human counterpart. The paper considers a specific collaborative task where a human performs work on a work piece and a UR5 robot concurrently performs a task where it must move and dwell and specific points on the work piece. To prevent collision between the robot and the human, an ultrasonic sensor is used to detect an obstacle in close proximity to the UR5 linkages. Upon detection of an obstacle, the UR5 moves away from the obstacle until the obstacle is clear of its path, at which point the robot will continue its task from where it left off.

A depth space vision based approach for collision avoidance using a UR 5 robot

Prasham Maniar, Shan Xingjian, and Zackary Long

Abstract

With advent of the fourth industrial revolution, it is inevitable that human robot collaboration will increase. The research presented here is focused on making this technology more accessible to everyone. There are already basic 6 DOF robots, vision based sensing equipment that people can use. By combining simple algorithms like convex hull algorithm to reduce data points, minimizing the obstacle points in the depth space to reduce the computation power needed and generating avoidance with simple trajectory planning algorithm.

Keywords : Depth Space, simple computation, convex hull algorithm, point cloud.

Advancement of Bio-inspired Prosthetic Hand

Angus Morgan, Elliott Walker, and Trevor Ubert

Abstract

Recipients of prosthetic hands often have a tough time adjusting to daily life with the new hand. The biggest issue is that they must watch the hand to control the hand. There has been extensive research into the feedback system from the user to the hand, but limited research has been done with the feedback system from the hand back to the user. This study looks to bridge the gap in the hand to user feedback area of prosthetics. By implementing the necessary combination of technology and ingenuity, solutions can be found. The equipment used in this study includes Interlink Electronics force sensors, the MYO band, and a vibrational armband to interface with the prosthetic hand. The MYO band provides an input signal to hand for position and orientation, the force sensors determine the forces the hand is experiencing, and the vibrational band relays vibrational patterns to tell the user orientation and configuration. The vibrational band also utilizes intensity to tell the user the amount of force being applied to any object. By implementing the technology into the Raptor Reloaded prosthetic hand by E-Nable, prosthetic hand recipients would have a sense of proprioception. This will increase their quality of life and help reduce the amount of concentration needed to easily and accurately utilize the prosthetic to its fullest potential.