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EMG Controlled Biped Robot

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ABSTRACT

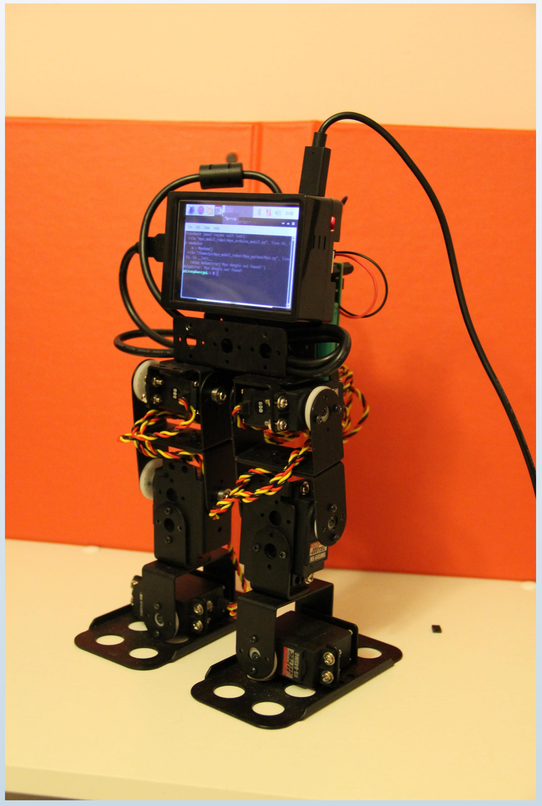
In this project, a 6 DOF Biped Robot was controlled via bio signals. The robot has been adapted for remote control via a Bluetooth MYO armband which uses electromyography (EMG) signals from the upper forearm to communicate motion to the robot. There are two fields for application of this work that are in rehabilitation and military.

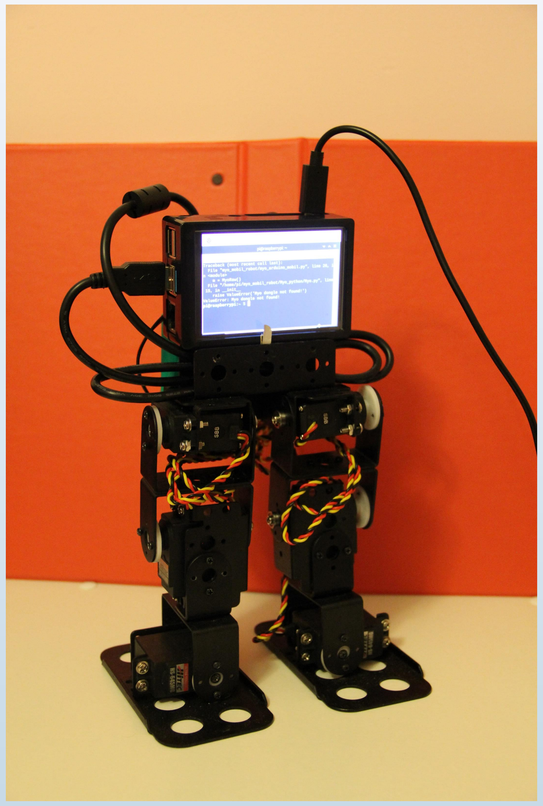
INTRODUCTION

Devices have been developed in the medical field for rehabilitation of patients who have lost use of the lower limbs, yet none of these devices allow the user a simple and easy method to control the device/exoskeleton. Current research is steering away from complex control systems and moving towards a simple wearable tool which the user can easily understand and learn to use. There are two fields for application of this work that are in rehabilitation and military.

In rehabilitation, the robot could be used as an exoskeleton for paraplegics, where walking is easily controlled leaving the hands available for other tasks.

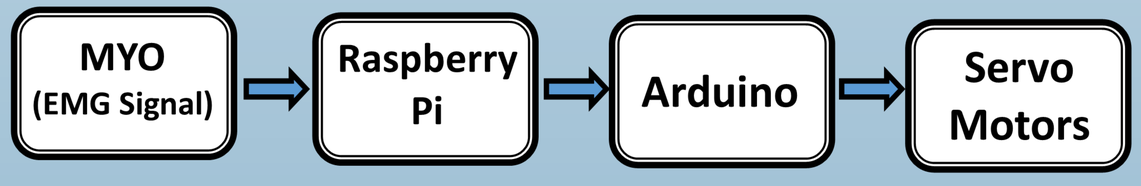
The military application would allow a soldier to move the robot into dangerous areas without the distraction of using a handheld controller, thus providing another level of safety. Both applications utilize the Bluetooth MYO armband for simple robotic control while providing enhanced freedom for the operator.





RESULTS

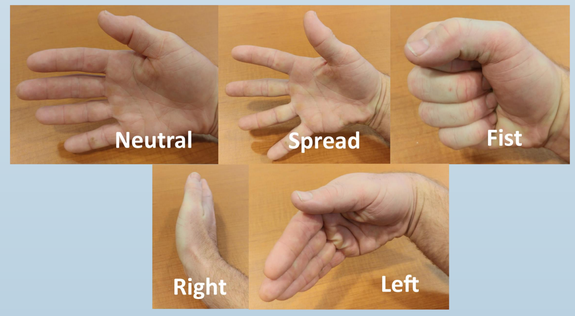
The control system of the biped robot via wearable MYO armband with a fast and simple algorithm called finite state machine for hand gesture classification using EMG signals was realized. For the real time control system, a Raspberry Pi is used as a micro controller, providing Bluetooth communication between the mobile robot and MYO armband.



METHODS

There are three steps for the control system. The first step uses a Raspberry Pi to read the EMG signals from the MYO armband attached to the forearm. The following step, classifies the five functions (move forward, backward, left, right, and stop) of the mobile robot to the five gestures measured by the MYO armband. The gestures are fist, spread, wave left, wave right and double tap. The final step involves the control of the servo motors via Arduino, which is used to control movement of the biped robot.

Hand Gestures



CONCLUSION

With the controller being a wearable device, placed on the forearm taking bio signals (Electromyography) from arm muscles, the user has full awareness of their surroundings, and as a result, the movement of the biped robot has been successfully controlled according to the user's hand motions.