8 DOF Robotic Arm Manipulator (RAM)

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Abstract

This project involved the designing of a fully actuated, 8 DOF, Robotic Arm Manipulator. The arm's purpose is to help guide development and research for the Smart Handle Controller. The arm has 3 main joints and attempts to mimic human motion as closely as possible. DC motors, servos, and Bowden cables are utilized in order to facilitate actuation of each DOF. The motors are controlled by using an Arduino microcontroller, motor driver when applicable, and the LabVIEW interface.

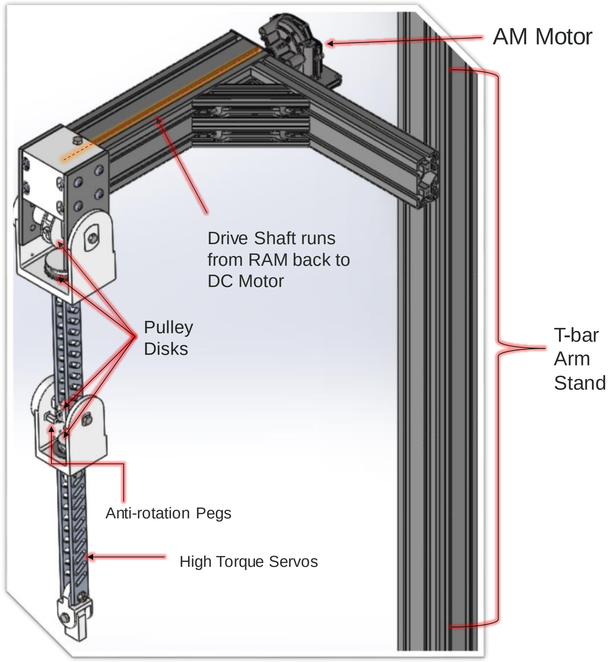

Figure 1: Robotic Arm Manipulator

Introduction

The main goal of this arm is to assist the development of the smart handle, which is a novel and intuitive human-machine interface that senses inputs from a user via stress/strain measurements. In the future, it will replace the current motor control systems.

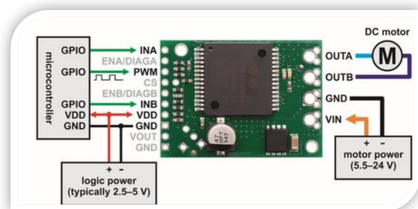

Figure 2: Pololu Motor Driver

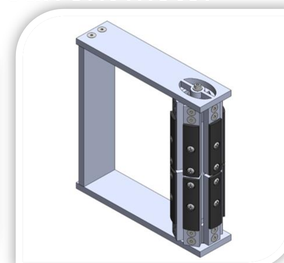

Figure 3: Smart Handle Prototype

Methods and Materials

The RAM needed every DOF to be fully controlled and actuated in order to compliment the inputs of the Smart Handle.

Figure 4: 214 AM Motor (DC)

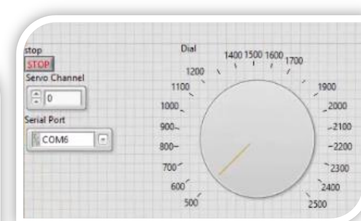

Figure 5: DC Motor Control

Discussion

The normal ranges of motion of a human arm include flexion and extension of the elbow, abduction and adduction of the shoulder and wrist movements. The RAM is designed to properly imitate these movements.

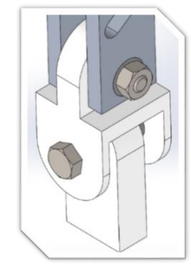

Figure 6: Wrist Joint

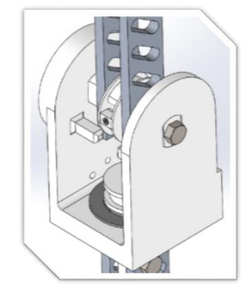

Figure 7: Elbow Joint

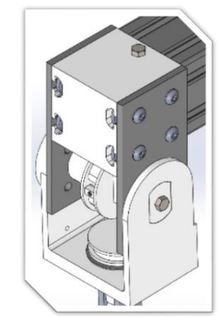

Figure 8: Shoulder Joint

Conclusions

Once developed, motion can be dictated by user input using smart handle technology. Once conjoined, the RAM along with the smart handle technology is applicable for fully actuated occupational exoskeletons, tele-operation as well as for rehabilitation and assistive devices.

Acknowledgements

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