Team Exo Actuator

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Overview

- Project Description
- Background
- Customer Requirements
- Engineering Requirements
- Appendix

Project Description: Problem

- Our team was tasked with the challenge of creating a test stand for a robotic actuator.
- The stand will be made to test the robot actuator
- In order to test we must learn how to communicate with the actuator
- The actuator uses the CAN bus protocol
- The actuator has an integrated MIT Mini Cheetah controller

Who and Why

- This test stand is to be built for the Biomechatronics Lab on campus.
- The Biomechatronics lab creates lower limb exoskeletons to help people with motor neuron diseases.
- The lab would like to retrofit a lower limb exoskeleton with these new actuators because they have variable dampening, stiffness, and use the CAN bus protocol.
- These new actuators could lead to more advanced control modes for the exoskeleton, thus increasing the effectiveness of physical rehabilitation attempts for persons with various motor neuron afflictions and/or diseases.

Background/Current SOTA

- Currently the most common machines used to test motors are all industrial sized, and are used to test large motors that then will be used in industrial applications.
- The price of these motor testing devices is not provided and are primarily sold to companies in the industry.
- Imc Dataworks is a manufacturer of various sizes of motor testers, along with the software accompanying them

Turnkey test stand for electric motors produced by IMC Dataworks

Customer Requirements

The customer asked that the team:

- Build a test stand for the actuator that will be able to withstand peak operating conditions
- Provide a method of measuring torque and speed of the motor
- Measure the amount of power that the actuator requires during different conditions
- Some additional requirements include: programming/validating various control modes, and (If time permits.) retrofitting the exoskeleton

Note: These requirements have been listed in priority.

Engineering Requirements

The customer requirements were mapped to engineering requirements via inspection. If the team had some more laymen customer requirements the team would have used a house of quality to map and rank customer requirements.

Our primary engineering requirements are:

- Strength (MPa): The test stand must survive peak operating conditions
- Deflection (mm): The test stand should not effect measurements
- Cost ($): The stand should not consume the majority of the budget
- Power (Watts): The stand should measure the amount of power that the actuator requires

Appendix

https://www.imcdataworks.com/products/electric-motor-testing/

https://biomech.nau.edu/