The Self-Spotter

Introduction

- The purpose of this project is to eliminate the necessity of having a human spotter, allow assistance to improve results, and increase safety while performing a workout.

- The Self-Spotter is an automated squat rack designed to replicate the basic functionalities of how a human spotter would help you perform a lift at the gym.

- This system is capable of assisting a user with any barbell-based workout.

- The structural design is based off a standard squat rack with modifications to implement a motor-to-chain pulley system to lift the side rails.

Materials & Methods

- Programmable Logic Controller (PLC) - Do-more BX-DM1E-18ER3-D

- Human Machine Interface (HMI) - C-more EA3-T4CL Touchscreen

- Voice Command System - Arduino UNO & Easy VR Shield 3.0

- Motor Control - Variable Frequency Driver (VFD), 0.5 Horsepower AC Electric Motor, & Electromagnetic Motor Brake

- Position Feedback - Absolute Incremental Encoder (safety side rail position) & Photoelectric Sensors (barbell position)

- Chain Pulley System – Mechanical system to convert angular motion from the motor to linear motion to lift the side rails

System Diagram

Conclusion

- Increased safety while performing any standard barbell lift

- Offers the reliability and strength needed to lift high amounts of weight when necessary

- User-defined settings to perform a spot for any standard barbell lift that the user desires

- Vocal command system to give the user full control during the lift

- Maximizes performance by allowing the user to push past their normal limits

- Allows the lifter the same capabilities while working out as if they had a partner present

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