ADAPTABLE HOUSE: ANTI-SWAY CONTROL
MECHATRONICS

INTRODUCTION

Background
This project aims to develop a mobility assistance system for individuals with mobility challenges by providing supportive environments.

Problem Definition: The goal of Anti-Sway is to develop a system that supports lateral movement at varying levels of weight support, while providing as little hindrance to the user as possible.

Design Requirements
- Safe during operation
- Provides various degrees of support
- Intuitive control (hands off when possible)

DESIGN & IMPLEMENTATION

Controls

Tracking Mode
System Follows User

Anti-Sway Mode
System Follows Remote Control

Mechanical

Frame/Support:
- A Modified Laser Printer!!!!
- Trolley & Pendulum

Control Logic/Instruments:
- Angle Sensor
- Motor & Encoder
- MyRIO Microcontroller

Electrical

Potentiometer (Angle):
- 1% tolerance linearity
- 6mm shaft diameter
- 10k resistor
- Amplifier Circuit to reduce noise

Motor Requirements:
- max RPM: 1671
- max torque: 80mN*m
- max amp: 0.728 A
- max voltage: 1.775 V

Software

Features:
- Finite State (Turing) Machine to navigate Modes
- Auto Position/Angular Calibration
- Multipurpose Control Library
- Keypad Control (Anti-Sway Mode)

Limits:
- Positional: 0.350 m x 0.350 m
- Velocity: 1 m/s

RESULTS/VALIDATION

Mechanical

Tracking Mode

Figure 8a: User v. Theoretical v. Experimental Tracking Mode Position Comparison

Figure 7: Integrator Data Structure

Software

typedef struct {
    double prev_input;
    double prev_output;
} Integrator;

Figure 7: Integrator Data Structure

Capstone Outcomes
- Control Logic match theory with near negligible error
- High Accuracy sensors are necessary for controllers
- Encoder Signals fail for mysterious reason

Future Work
- Integration with Lift Control for full 3D support
  - Substitution of rod for rope
  - Data Control (Mutual Exclusion) for Parallel Modes
- Build & Test System at Full Scale

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CONCLUSION

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