Active Suspension System Test Platform

By

Brian Groth and Melanie Hagar

Submitted To:

Mr. Steve Gutschlag

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Introduction:
Building an active suspension system test platform has been the topic of at least two prior senior projects. This year the project will build upon prior research, and will ultimately use a 1/3 hp dc motor to drive the test platform. Prior year's projects have yielded designs with significantly less driving power.

Our control system will use the EMAC Inc. Micropac 535 Development board to obtain user input as well as to provide control signals and timing to the power electronics. This year, we will be purchasing an integrated circuit H-Bridge to control the motor directions. An accurate model of the 1/3 hp motor and linear actuator combination will also be delivered.

Block Diagram:
Following Subsections Refer to Figure 2-2

EMAC Inc. Development Board Inputs:
Using the keypad will allow the user to select one of the internal pre-calculated output waveforms. If an external signal source is connected to the development board, specific waveforms and or a specific location for the output platform can be selected.

Power Electronic Outputs:
The output of the EMAC Inc. development board will control the power electronics. Appropriate power electronics that can handle 115[VDC] will need to be selected to drive the motor. The ultimate output of the system will be the user selected movement of the test platform which will include step, sinusoidal, and triangular waveforms. Prior years' overall block diagram as well as table of inputs/ outputs are shown as the overall goals have not changed.
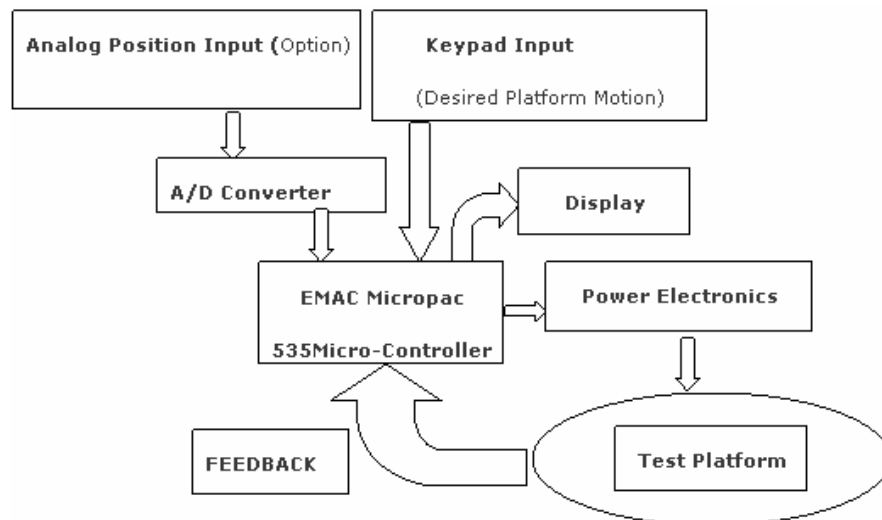

Figure 2-1: System Block Diagram

System

INPUTS	OUTPUTS
Desired platform motion	Platform movement

EMAC Micropac 535 micro-controller

INPUTS	OUTPUTS
Keypad	Platform movement
Waveform Generator	LCD Display
Feedback Sensor	

Actuator

INPUTS	OUTPUTS
Drive Signal From Controller	Platform movement

Figure 3-1: Overall Input / Output of system.
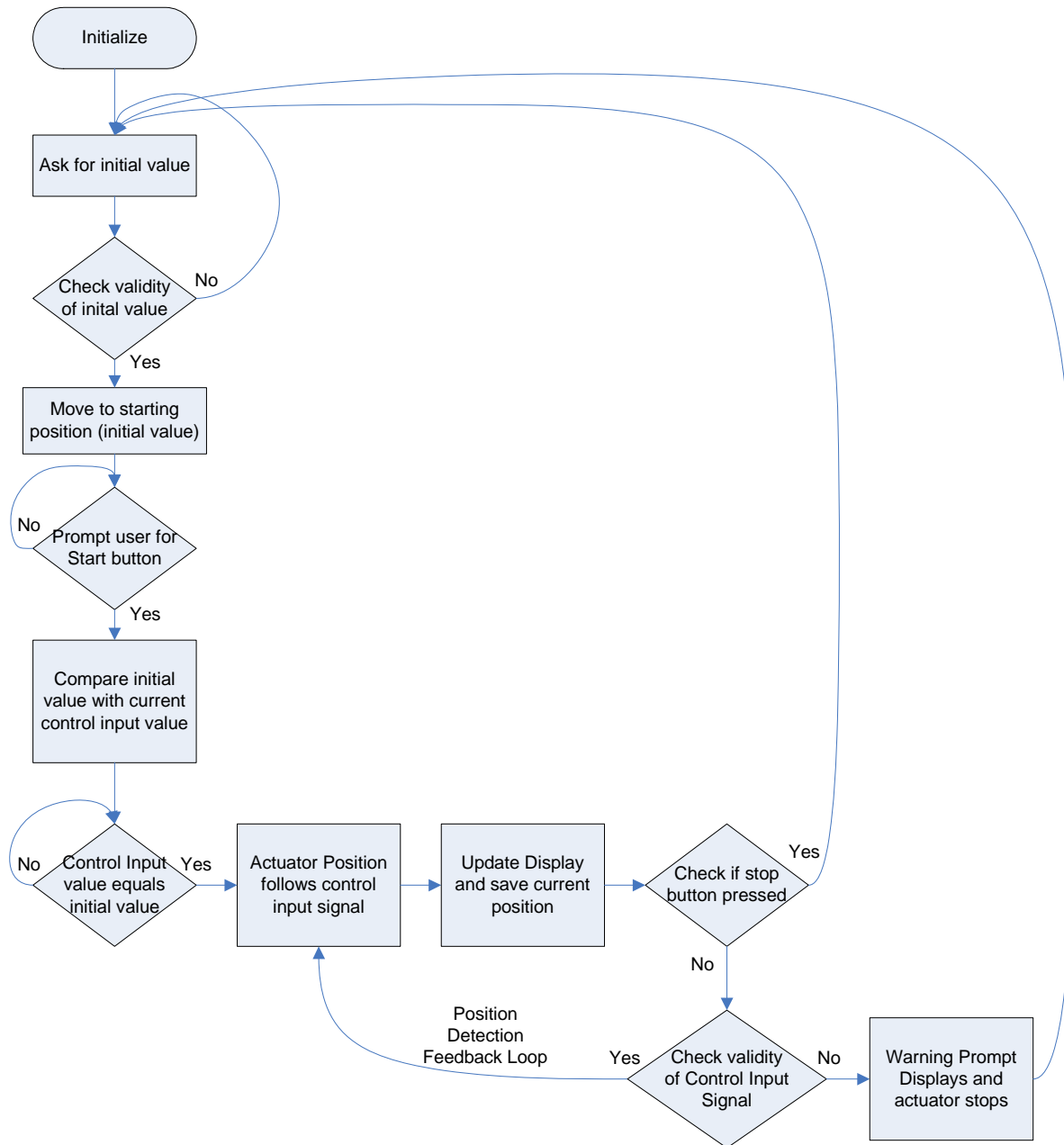
Software:

Figure 4-1: Software Flow Chart

After initialization, the LCD prompts the user to provide the desired initial value for the platform position via the keypad. Once the platform has moved to the starting position, the LCD will prompt the user to press start. After the start button has been pressed the linear actuator position will follow the applied control signal provided the value of the control signal is within the limit of the linear actuator. If the value of the control signal exceeds the maximum range of motion, the linear actuator will stop and the LCD will display a warning prompt. In addition the stop button can be pressed at any time to suspend operation. The position of the linear actuator will be updated and displayed on the LCD every time it stops.

Preliminary Results:

Efforts expended to date have consisted of modeling the 115[VDC] motor that will be used to drive the linear actuator. This was accomplished by finding the step response of the motor across a wide range of voltages. The motor model is shown in Figure 5-1 and has been verified to be accurate by comparing the step response in Simulink with the step response and RPM values found in lab.
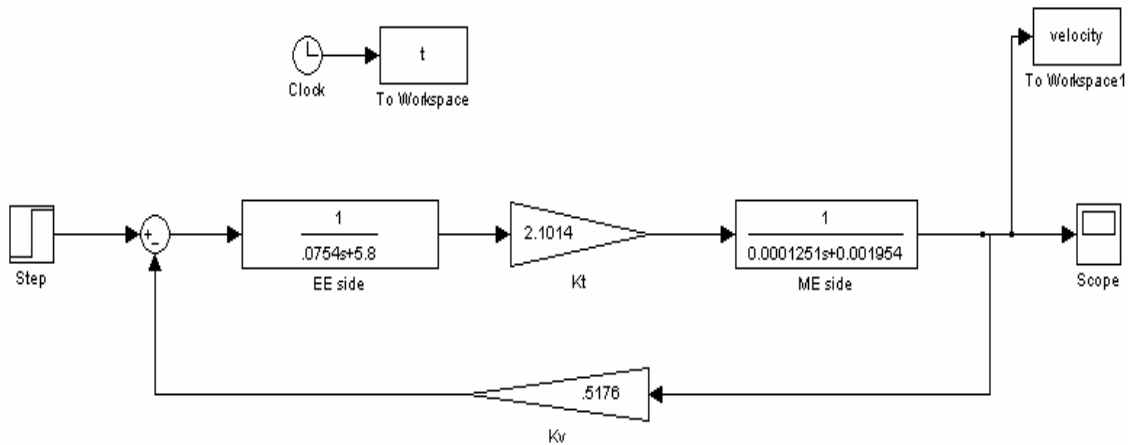
Figure 5-1 Simulink motor model

Parts List:

- Micro Pac 535
- 115 [VDC] Motor
- H-Bridge
- Linear Actuator

Work Schedule:

Fall Semester
- ACTIVEST Project Research

- 115 [VDC] Motor Modeling

Spring Semester
- Week 1-2 Software Design and Hardware Interfacing

- Week 3-4 Software Coding and Platform Construction

- Week 5-7 Software Debugging and Testing

- Week 8-10 System Integration of Hardware and Software Subsystems

- Week 11-13 Senior presentation preparation