



Web Enabled Wind Tunnel System



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Presentation Outline

- Overall Project Summary
- Wind Tunnel Description
- Overall System Block Diagram
 - Subsystems
- Progress
- Suggested Future Work
- Equipment
- Questions

Overall Project Summary

- Web Interface for User Interaction
- Controller for Wind Tunnel Operation
- Hardware Interfacing
- Networking Setup to Support Aforementioned Functions

Goals

- Allow for Remote Starting, Stopping, and Control of Wind Tunnel
- Improve Existing Capabilities of the Wind Tunnel
- Create an Interface that is Intuitive and Easy to Use

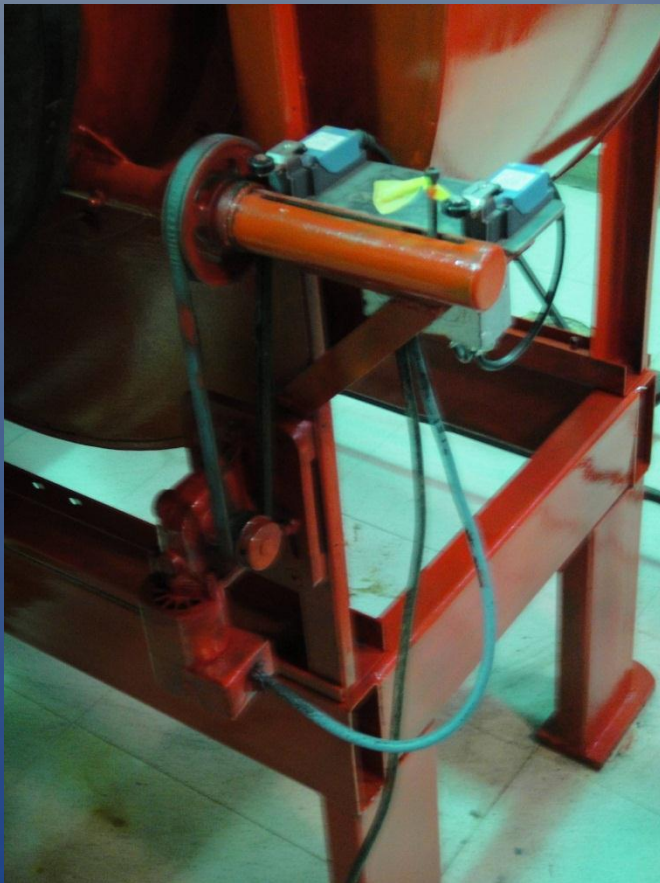
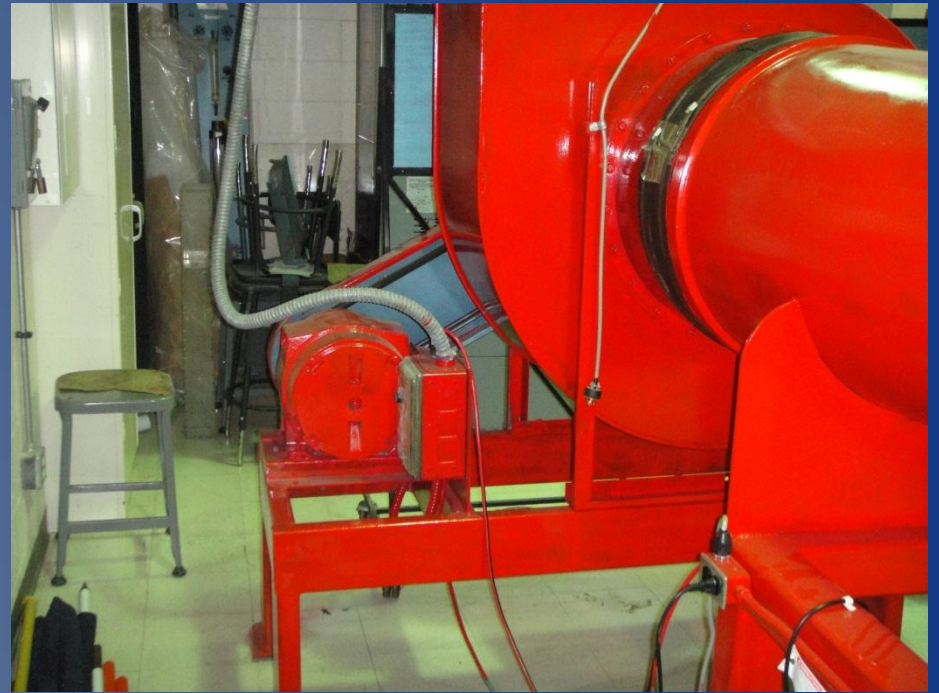
Project Significance

- Allow for More Accurate Control of Wind Tunnel Functions
- Increase the Level of Repeatability in Experiments Involving the Wind Tunnel
- Allow for Wind Tunnel Testing for Those Without Access to a Wind Tunnel(i.e. Schools or Small Businesses)

Wind Tunnel Description

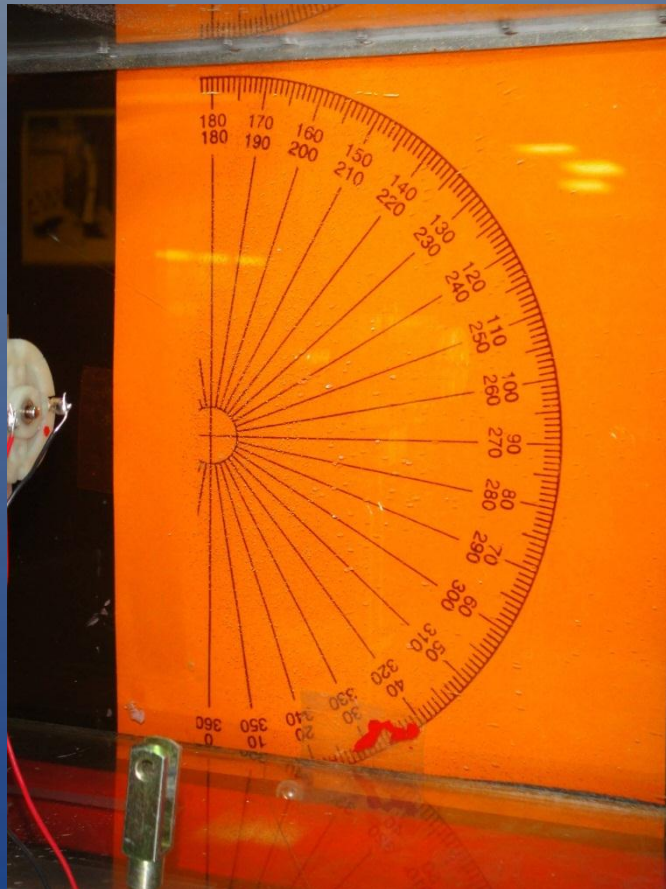
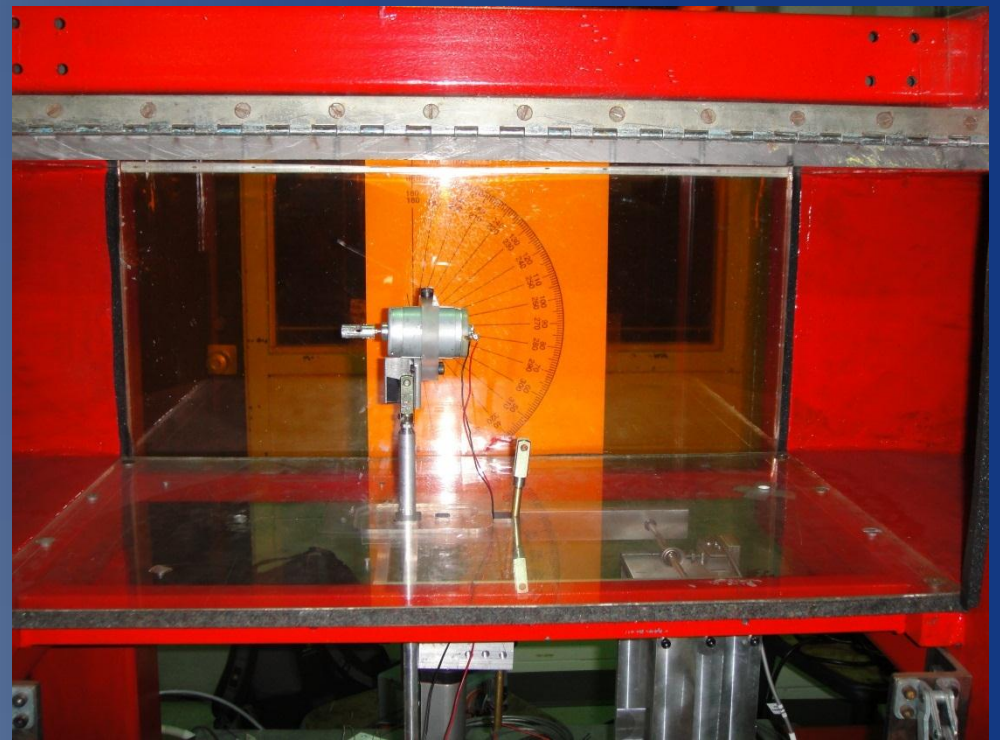


Blower Motor



Damper/Universal Motor

Testing Bed



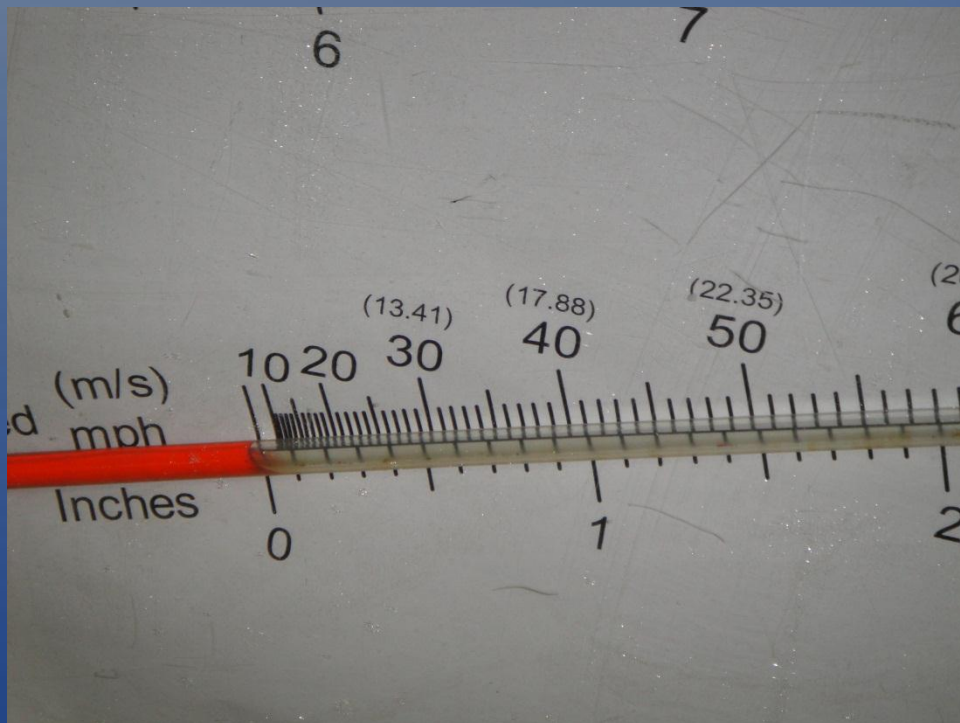
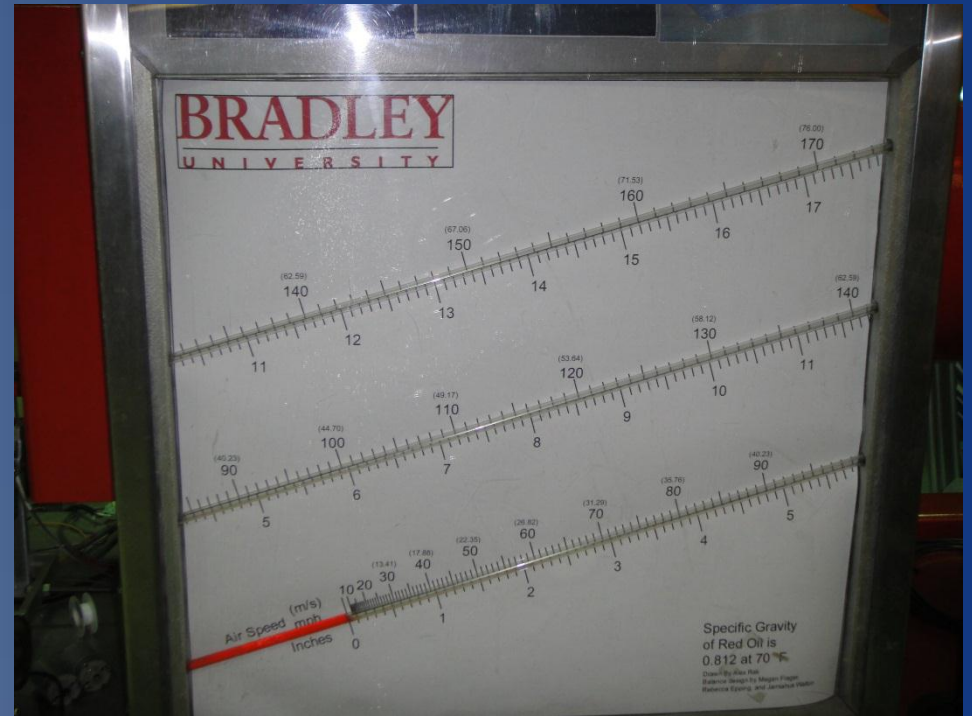
Component Angle Set

Lift and Drag Sensors



Linear Actuator

Wind Speed Feedback



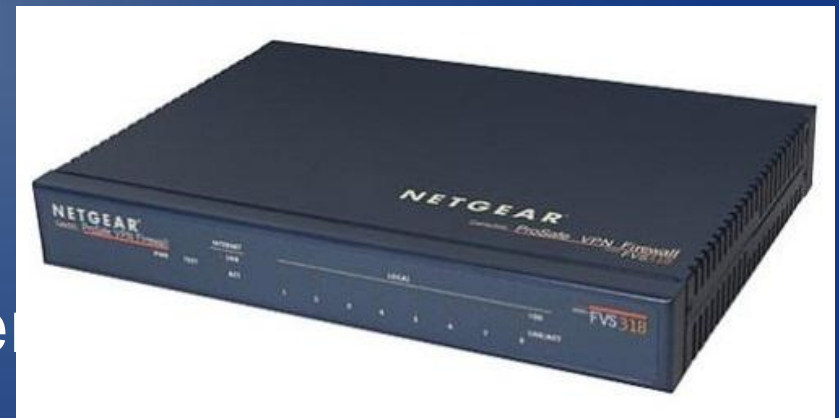
Close Up

Equipment Purchased

- DCS-910
 - Price: 67\$
 - IP Ethernet Webcam

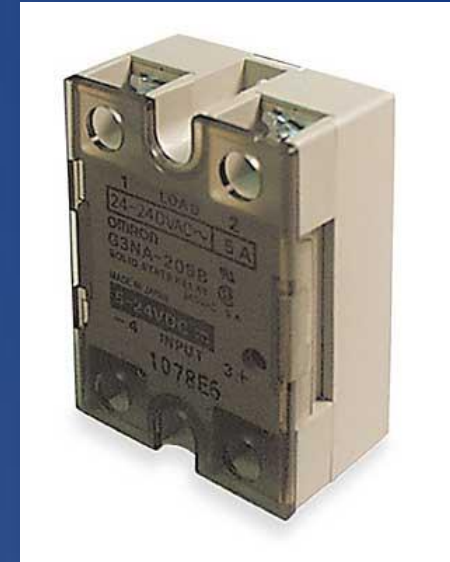


- FVS-318
 - Price: 89\$
 - VPN Firewall Router



Equipment Purchased

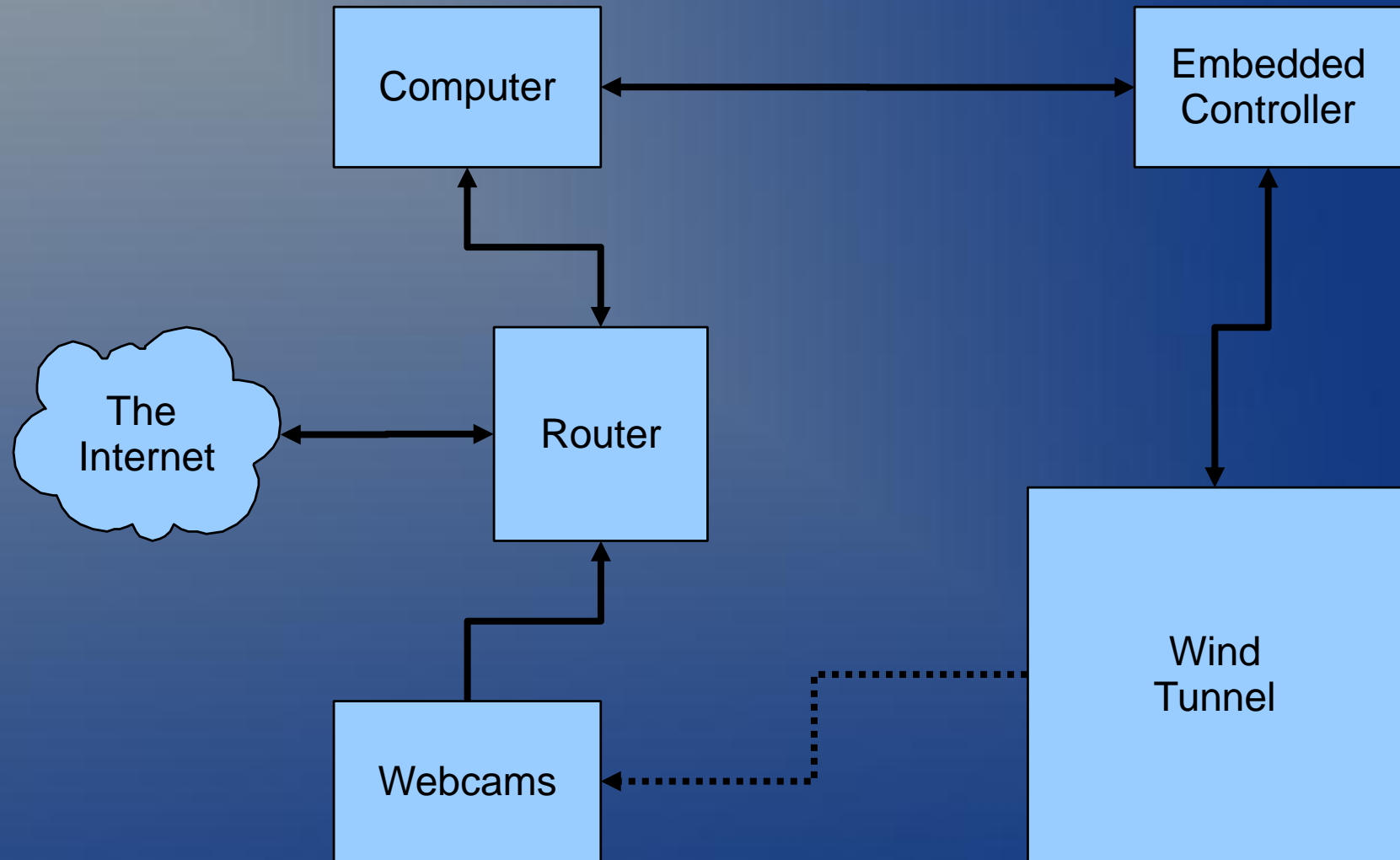
- OMRON G3NA-225B-DC5-24
 - Price: 26.50\$
 - SPST Solid State Relay



- Firgelli Automations FA-PO-150-12-8”(20:1)
 - Price: 139.99\$
 - 10K Ohm Potentiometer
 - Built-in Limit Switches

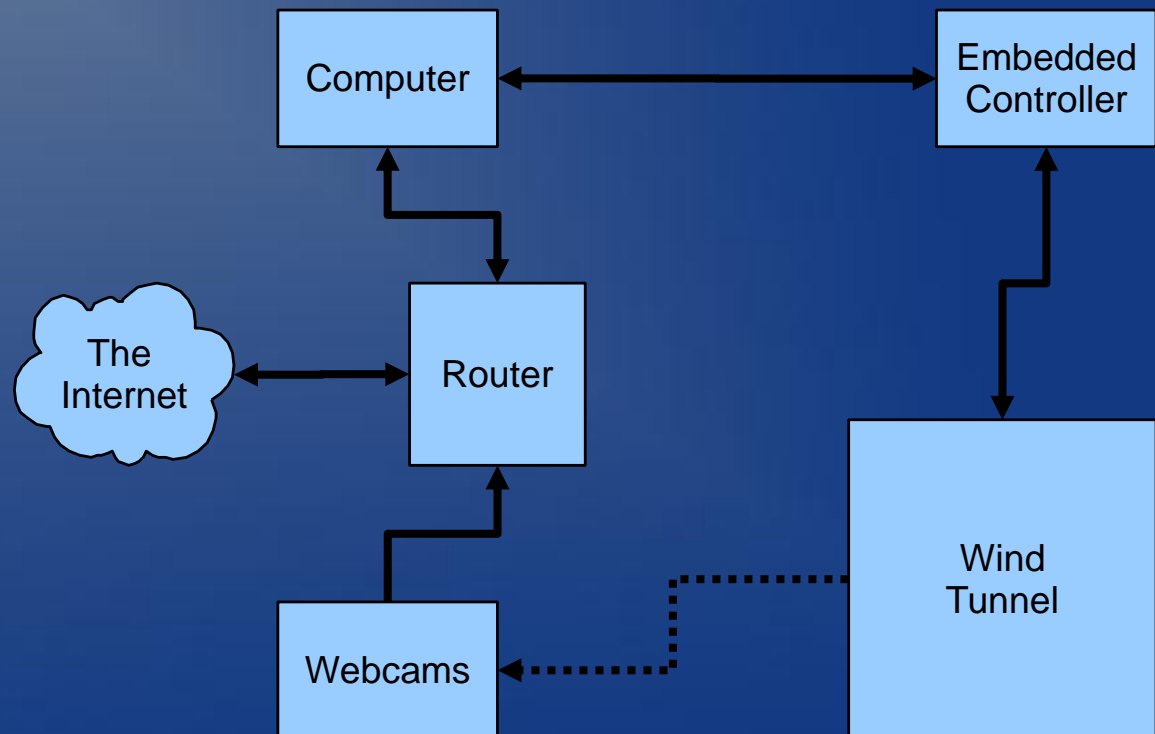


Overall System Block Diagram



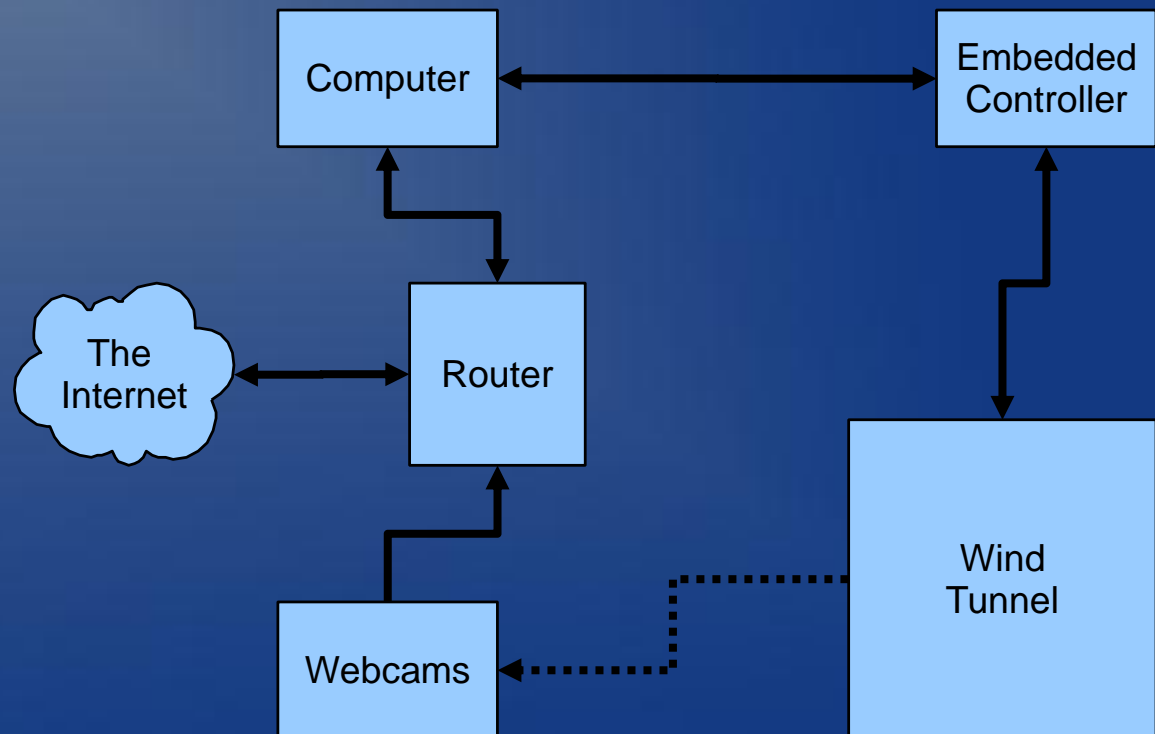
Subsystems

- Webcams
- Router
- Microcontroller
- User Interface



Subsystems Cont.

- Output Sensor Data
- PI Control for Position
- Wind Speed Controller

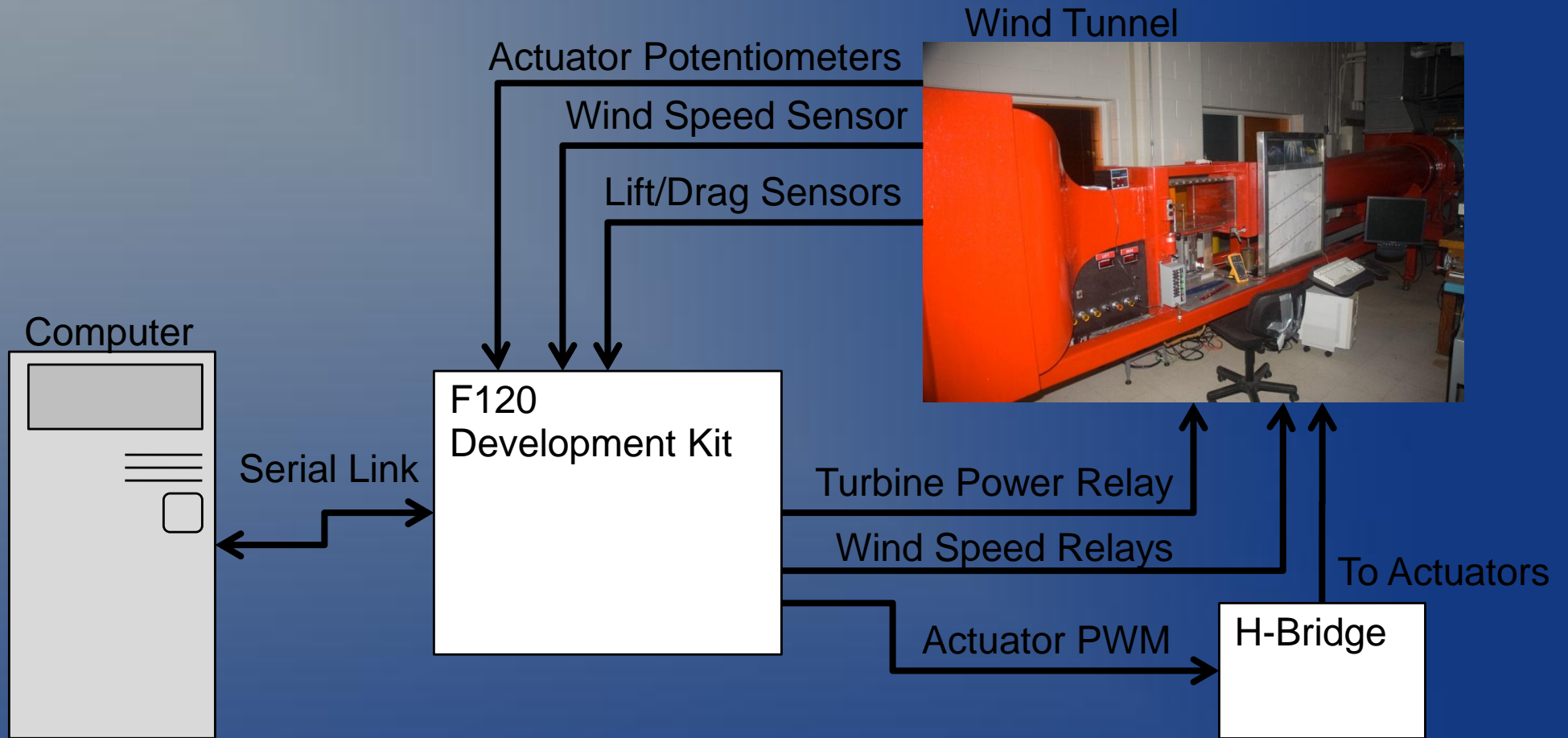


Silabs C8051F120 Development Kit

- Plenty of I/O Capability
- Prior Familiarity
- 8 Channel A/D



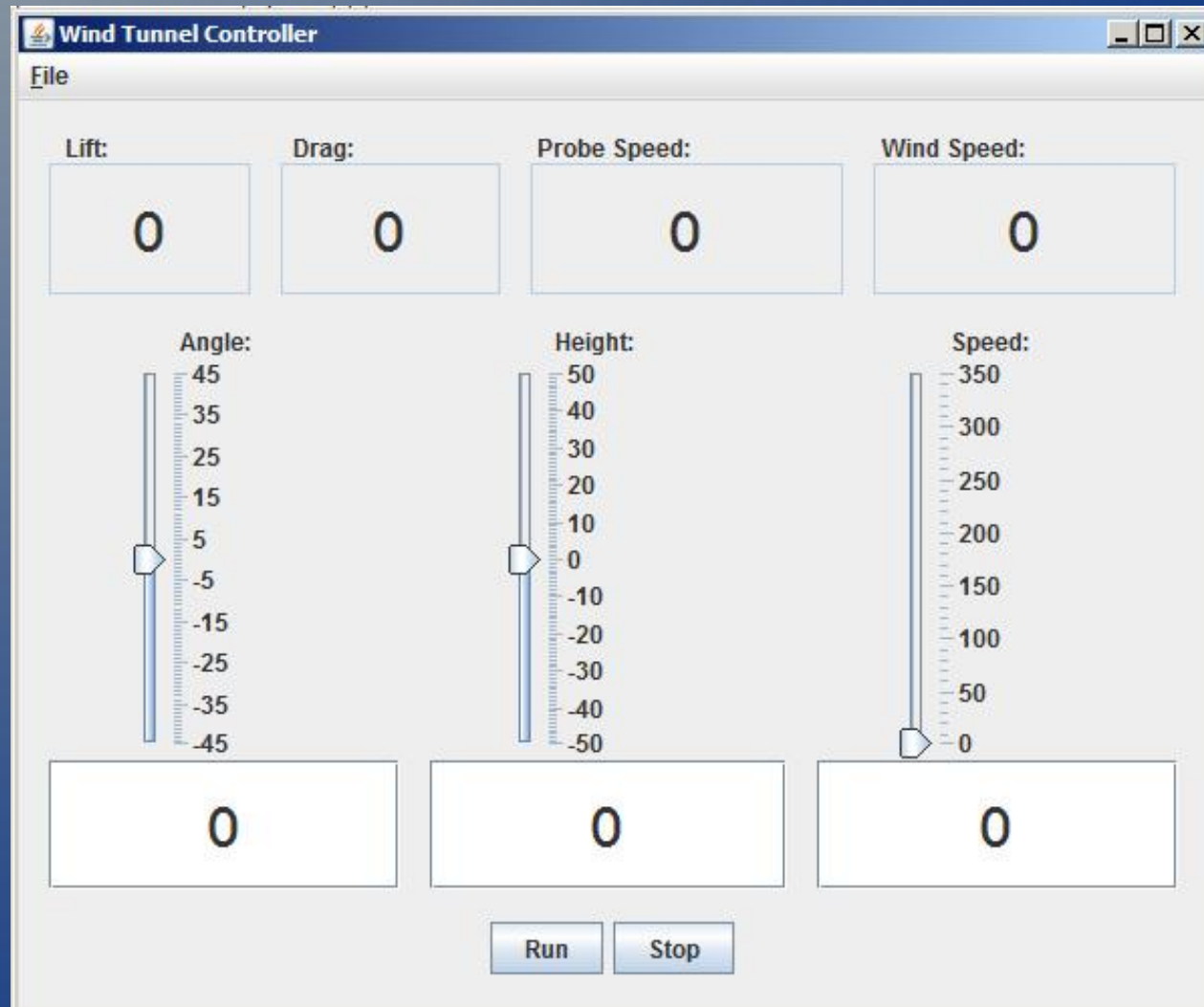
Microcontroller Setup



Progress Made

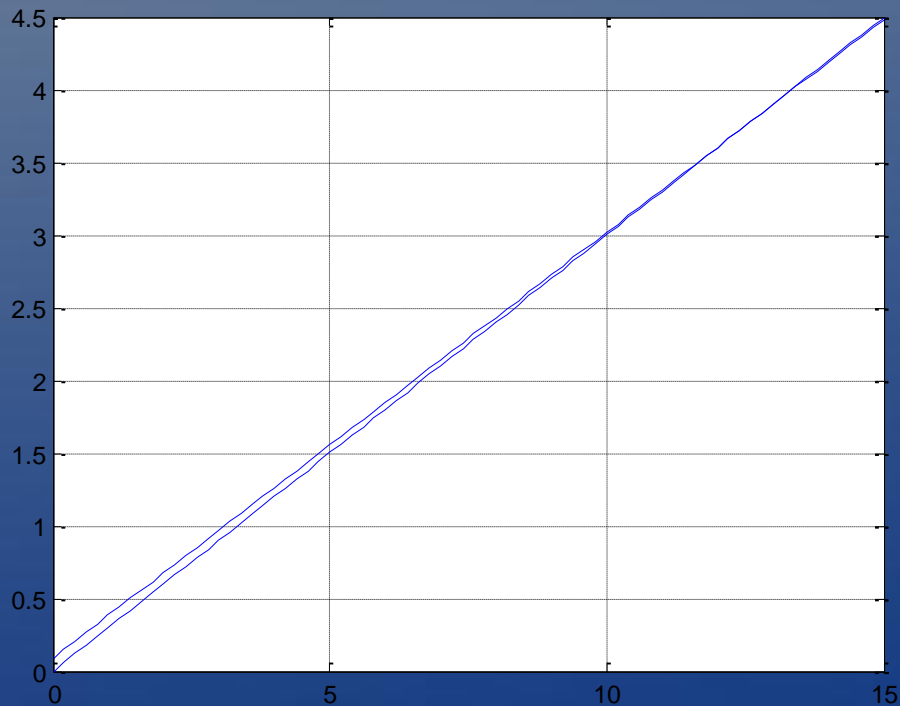
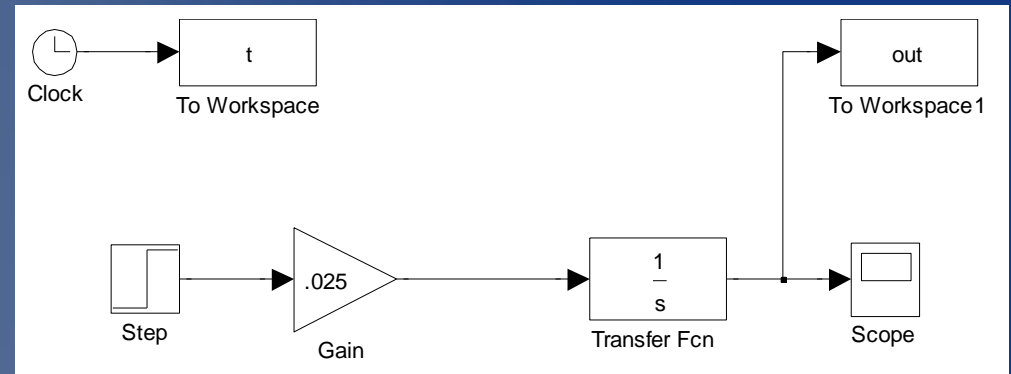
- Analyzed and labeled wind tunnel wiring
- Researched Webcam/Router
- Tested and configured VPN router
- Tested and configured camera
- Tested camera streaming capability

Initial JAVA GUI Designed



Linear Actuator Model

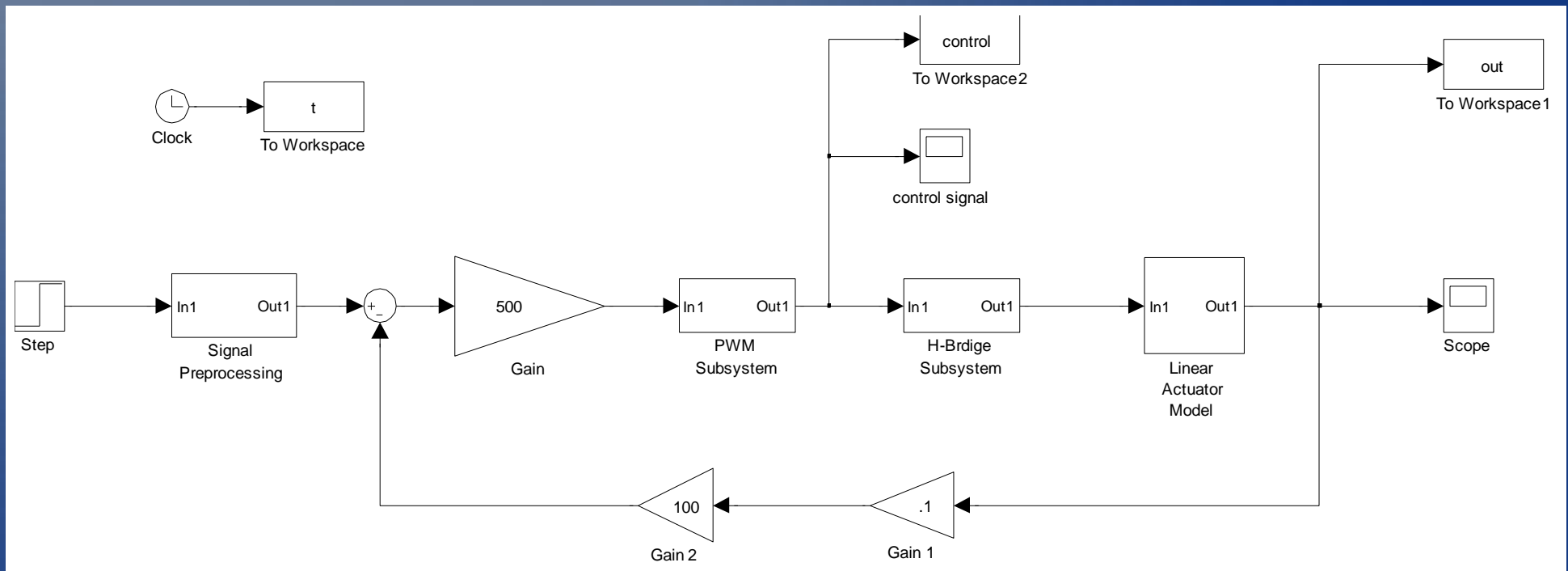
Linear Actuator Modeled in Simulink



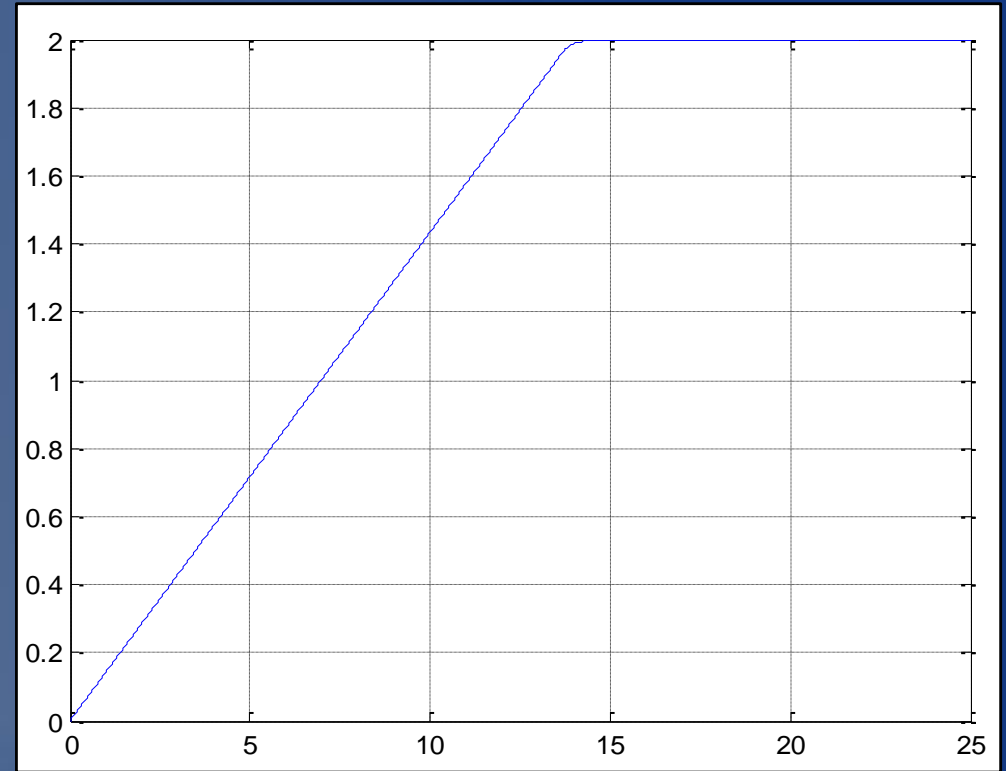
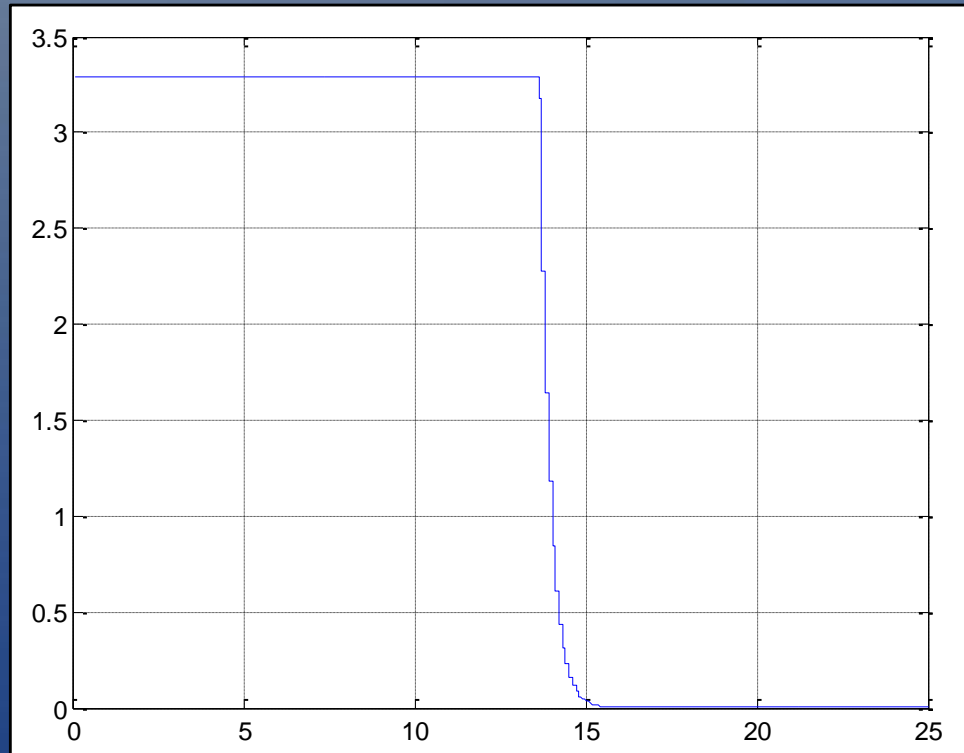
Simulink Model and
Actual Data Comparison

Closed Loop System Model

- Full Model of Closed Loop System
- Includes PWM and H-Bridge Models



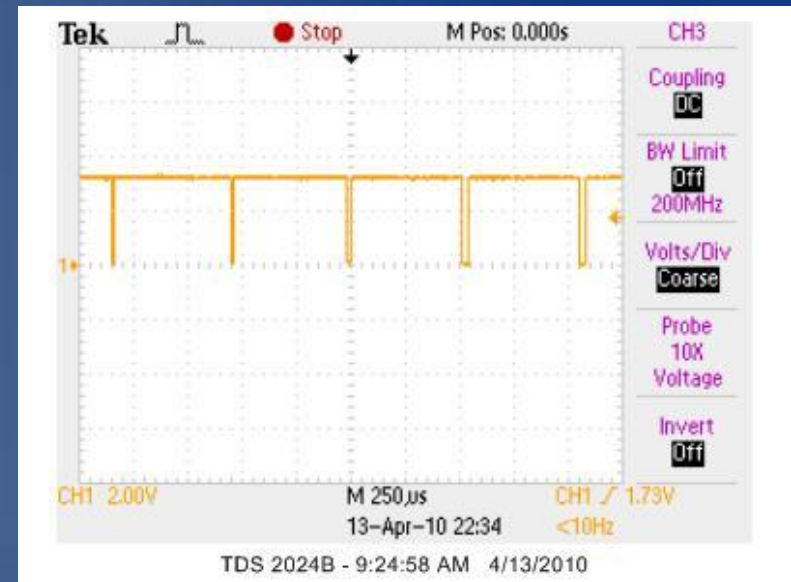
Closed Loop Output with 2V Step Input



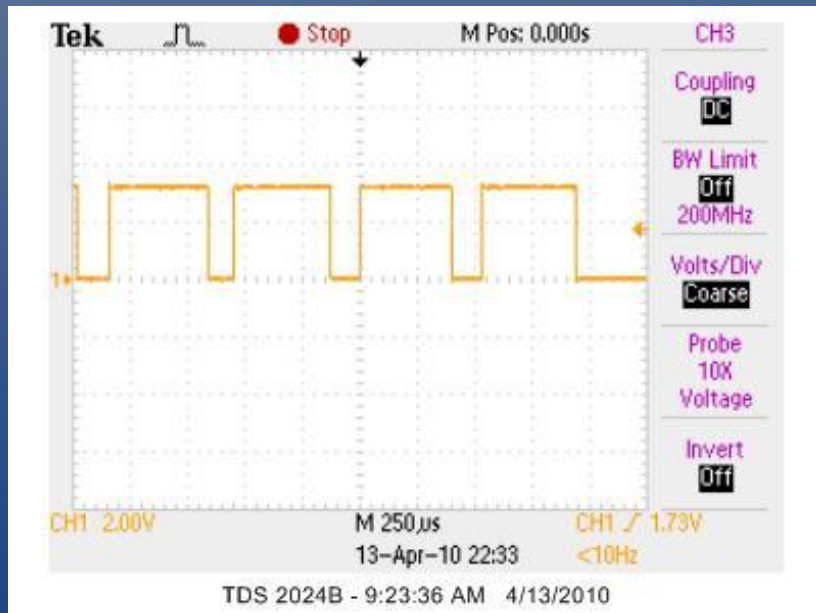
Closed Loop Control Signal with 2V Step Input

Closed Loop PWM

Approx. Open Loop PWM

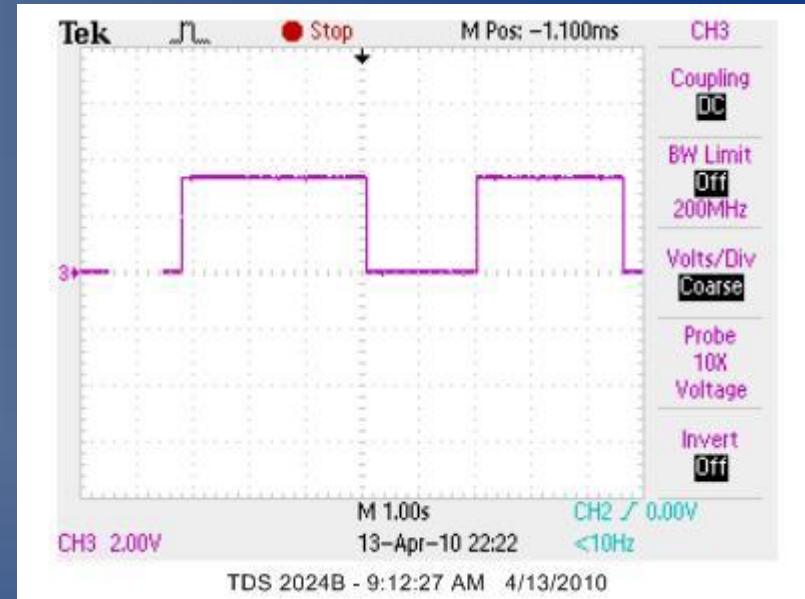


Closed Loop PWM



Progress Made Cont.

- Turbine Starting and Stopping from Microcontroller



- Wind Speed Control Methods Researched

Future Work

- Choosing Components and Designing the Wind Speed Controller
- JAVA User Interface
- Interfacing to Sensors
- Recording Sensor Data

Questions?

