Microcontrolled Irrigation System (MIS)

College of Technology

University of Houston

Senior Project

Team 4:

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Executive Summary

- Objective: Design a Useful Innovative Product
  - Cost effective and environmentally conscious
  - Time and money saving device

- Research: Existing Watering Systems & Components
  - Manual and automatic watering systems
  - Soil and rain sensor components

Product Requirements

- **Theoretical Full System Model**
  - Zoned watering areas
  - Embedded soil sensors and rain sensor
  - Control box with 8051 microcontroller

- **Add-On Component**
  - Install soil and rain sensor
  - Replace timer unit with Control Box

Product Requirements

- ■ Prototype Model
  - Control Board with 8051 Microcontroller
  - Control Unit Housing
  - Toro Rain Sensor
  - Moisture Soil Sensor
  - RainBird Automatic Sprinkler Valve
  - Sprinkler Base
  - RainBird Pop-Up Sprinkler Head

Design Alternatives

- Moisture Soil Sensor
  - Construct a soil sensor
  - Cost effective sensor found for $45

- Demonstration Model
  - Indoor demonstration with 5 gallon water jug
  - Outdoor demonstration with portable sprinkler base

Design Alternatives

- Signal Interpretation by the Microcontroller
  - ADC interpretation
  - Input port saturation signaling

- Saturation Response Delay
  - Vantage Pro Moisture Sensor
  - Team's moisture soil sensor implemented in presentation model
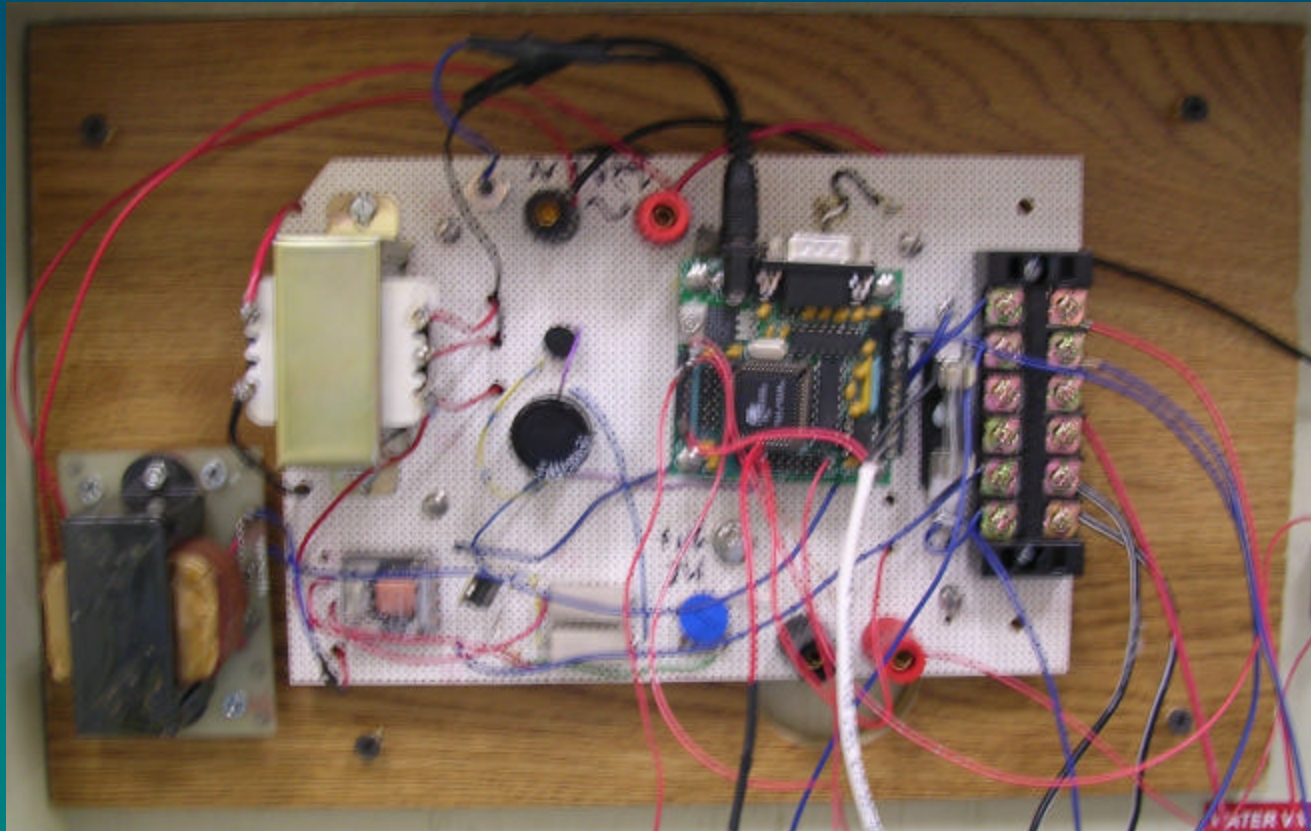
Design Specifications

- Mini-Max 51-C2 8051 Microcontroller
- Indicator LED's (Red, Yellow & Green)
- On/Off & Manual Override Switch
- PVC Pipe Sprinkler Base
- RainBird Pop-Up Sprinkler
- RainBird Automatic Sprinkler Valve
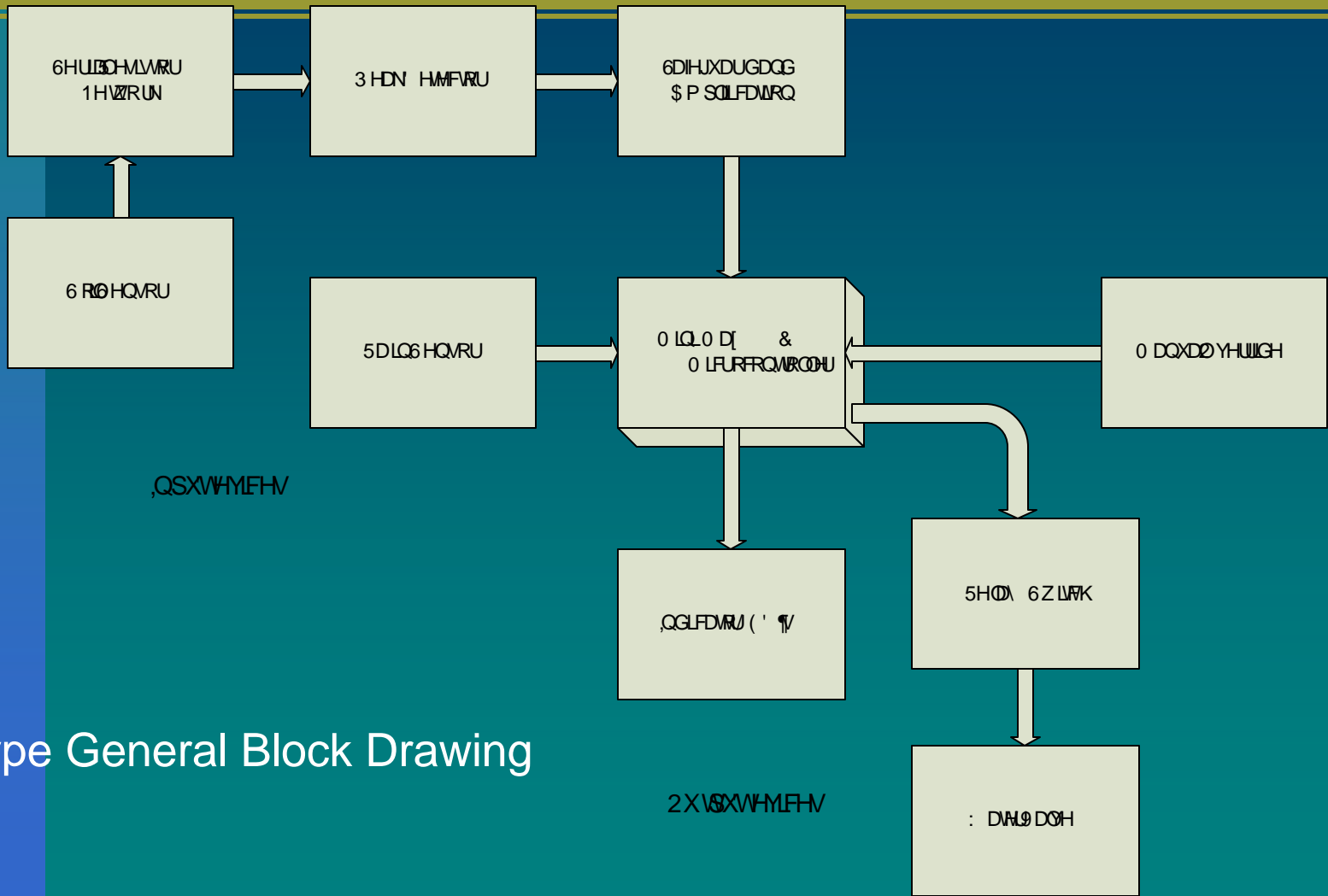- Toro Rain Sensor
- Soil Sensor

Design Description
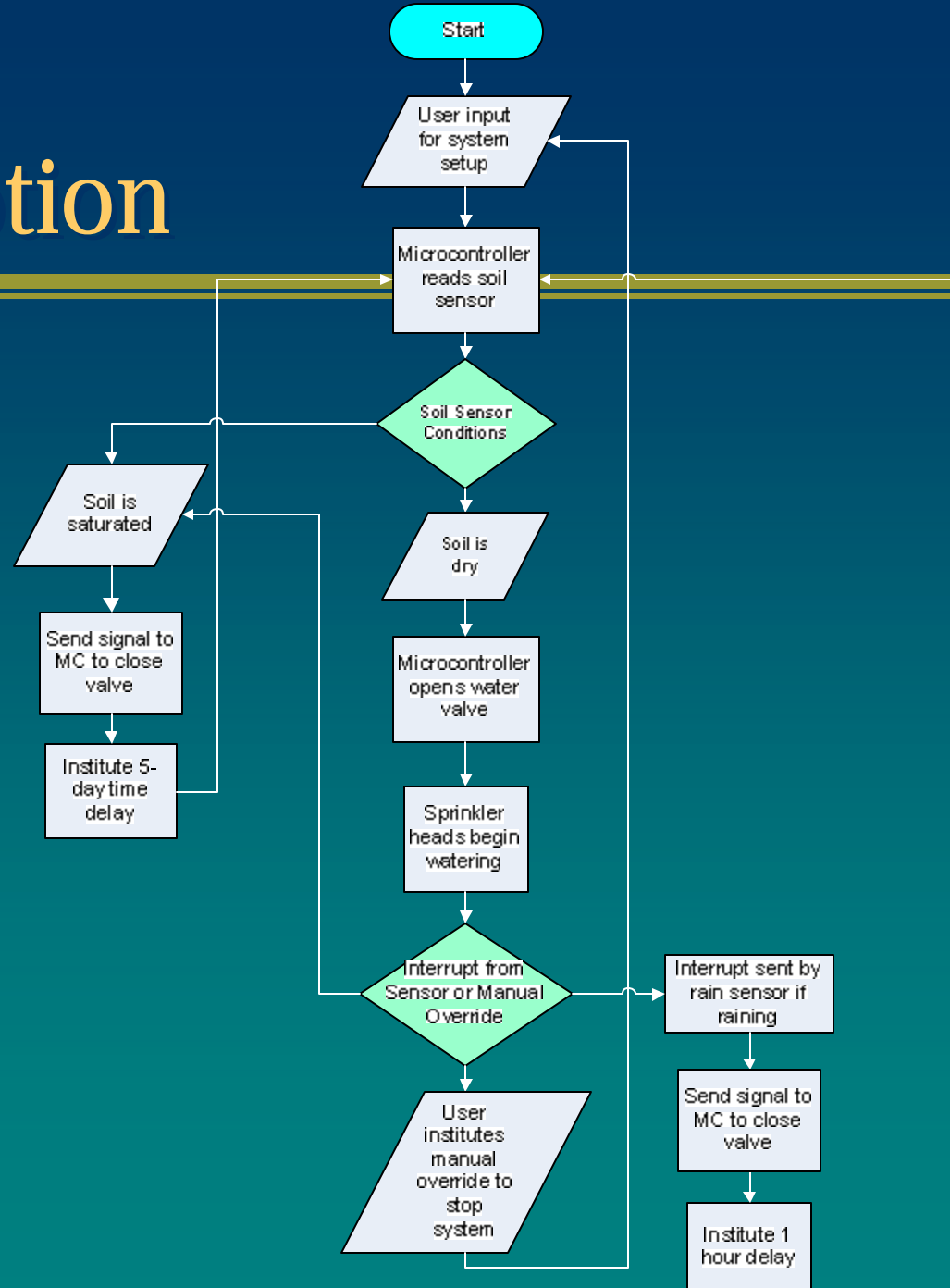
- MIS Control Board

Design Description

Prototype General Block Drawing

Design Description

MIS Programming Algorithm

Construction Details

■ Control Unit Housing

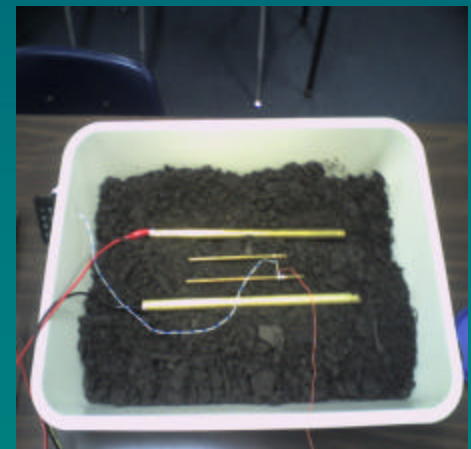■ Sprinkler Base

Construction Details

Verification & Testing

- **Component Testing**
  - Relay Switch & Peak Detector Circuits
  - Rain & Soil Sensor

- **Integration Tests**
  - Microcontroller & Automatic Sprinkler Valve

- **Full System Testing**
  - Simulated Full System Test
 - Full System Tests

Verification & Testing

Costs

■ Parts Total Cost $ 224.67
  – Home Depot, EPO, Discount Awards
  – Hardware, electrical components donated by team members
  – Component nameplates, parts and labor donated by John Tedesco

■ Labor Total Cost $ 25,987.50
  – Labor to build electrical circuitry
  – Labor to build prototype model
  – Labor to complete the paperwork and documentation
  – Total of 866.25 labor hours @ $30.00 per hour

Costs

■ Tools & Lab Equipment Cost $ 4333.44

  – Meters, power supplies, oscilloscope, PC

  – Table saw, drill, soldering kit and other tools

• Calculating $800 worth of Travel Expenses incurred by team members

Total Cost $ 31,345.61

Project Cost Comparison

2.65%   0.75%   2.65%

	Parts
	Equipment
	Labor
	Travel

82.2%
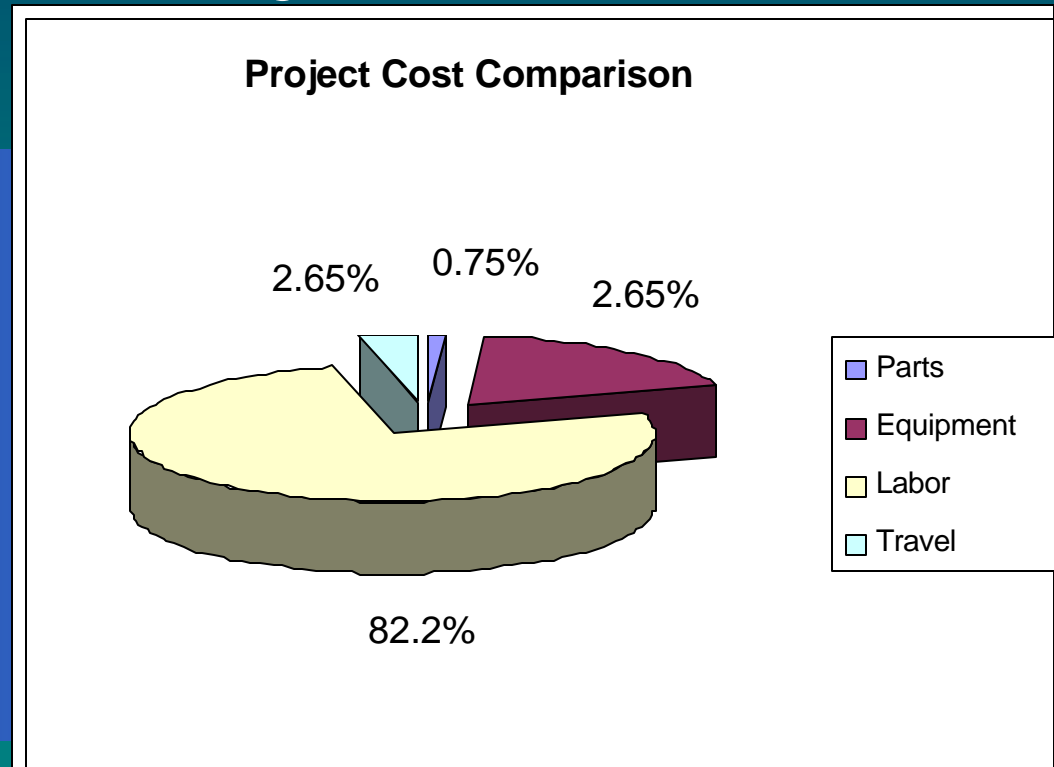
Conclusions

- Project was completed a week ahead of schedule with few delays
- Setback due to performance of soil sensor
- Testing revealed design flaws that caused system adjustments to be made

- Follow-up project includes installation of full system at team members home as time and money allow
- Due to the power of the capability of the 8051 Microcontroller system upgrades in the future are almost limitless

Questions & Comments