

# Automated Clay Conditioning for Foundations “ACCF”

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Team No.: 12  
Course/Selection: ELET 4308/12652  
Instructor: Dr. Farrokh Attarzadeh

University of Houston  
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Semester: Fall 2006  
Date: 11-30-06



# ACCF = Automated Clay Condition Foundation

presented by: Kevin Aldridge

- **How is foundation damaged by simple weather conditions?**
  - Cracking
  - Expulsion
  - Tilting
- **Why do we need this system?**
  - To prevent foundation damage due to high expansive soil such as clay
  - Specially designed system that works better than a simple time based system.
- **How does it work?**
  - Resistive Sensors used to measure moisture
    - Microcontroller
    - Watering time
    - Servo settings

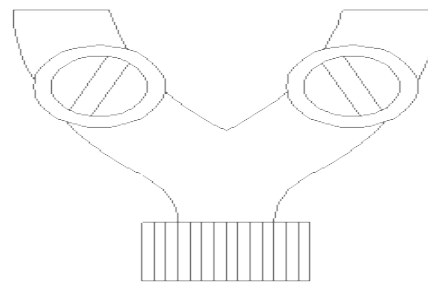
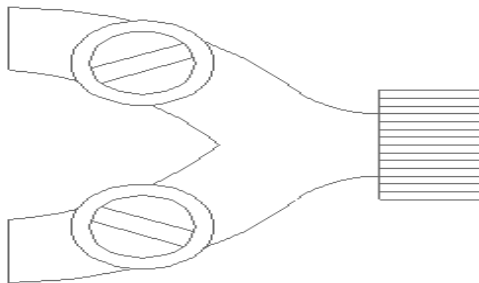


# Product Requirements

presented by: Sevin Phu

- **Prototype**

- at least 2 specific watering zones
- Controlled weather sample
- Microcontrolled watering system
- Statistical foundation movement chart
- Soil analysis of a designated area

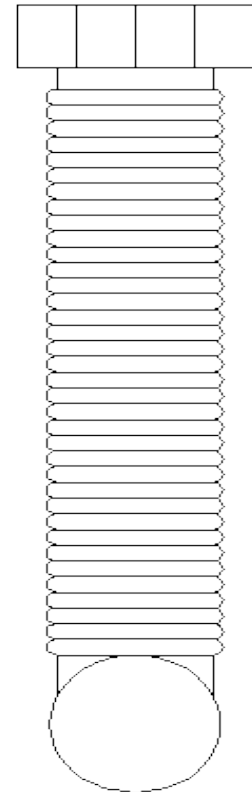


# Product Requirements

presented by: Sevin Phu

## Theoretical Disruptive Model

- ACCF is designed for residential usage
  - Control box
  - 2 or more watering servos
  - 2 or more moisture sensors
  - PVC piping
  - Soaker hose
  - Shovel and or digging material
  - Water splitter
- Additional components
  - 120V 60Hz AC input
  - AC to DC transformers
  - Digital logic device
  - Time based clock





# Design Alternatives

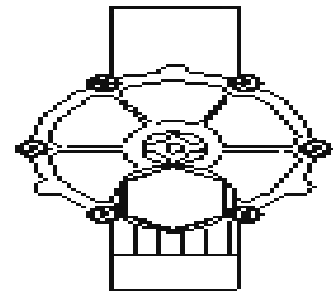
presented by: Sevin Phu

- Streets and road management
- Connect to the current systems
- Single power supply
- Different sensors
- A user specified minimum watering time

# Hardware Design Specification

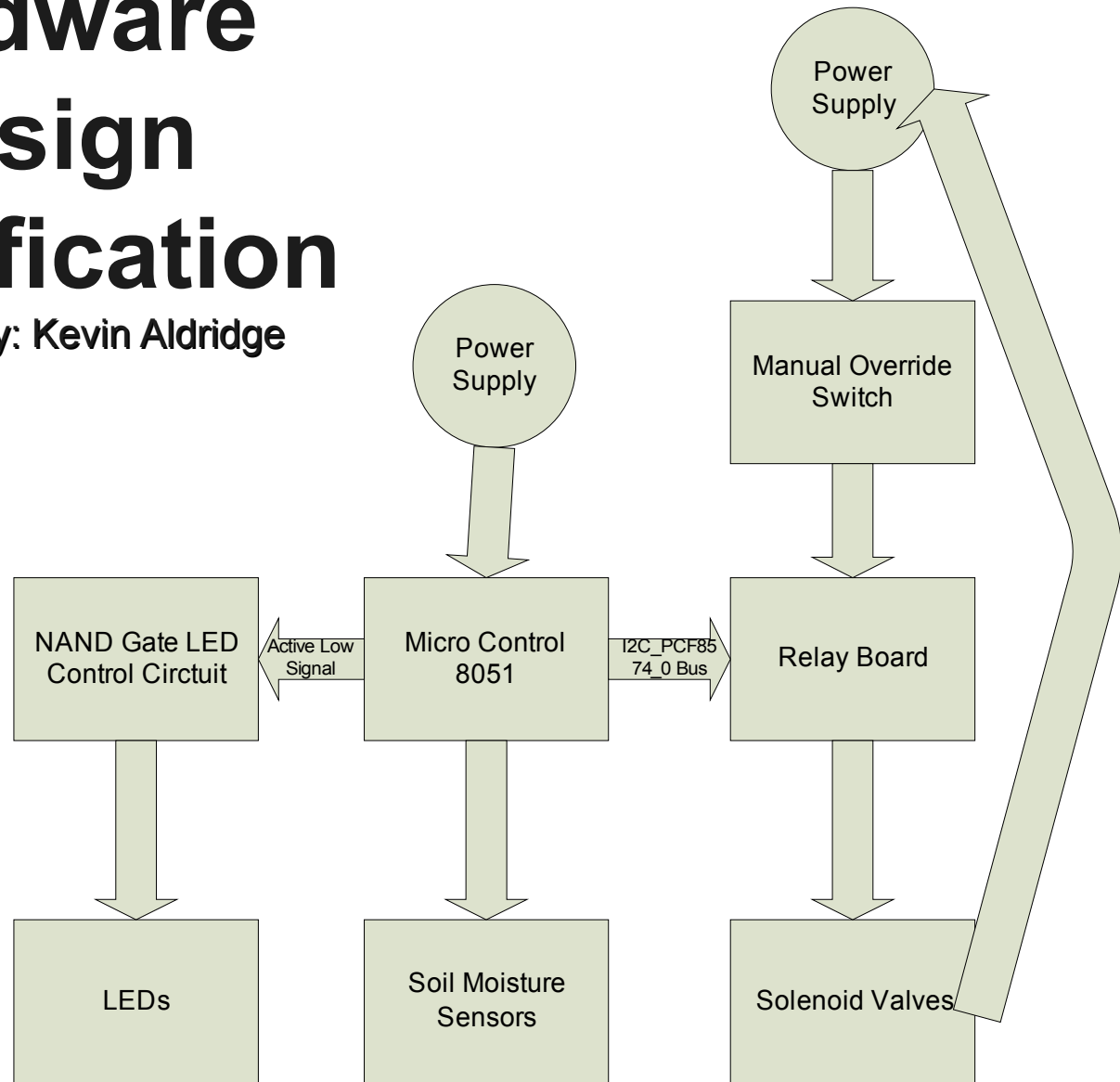
presented by: Kevin Aldridge

- BiPom - Mini-Max 51-C2 8051 microcontroller
- BiPom – 8051 training board
- BiPom – 4 reed Relay Peripheral Board
- 24V AC 650mA Transformer
- 2 Rain Bird automatic Sprinkler Valve
- 2 Water Mark Moisture Sensors
- PCB – Printed circuit board
- 74LS00 NAND gate
- PVC piping



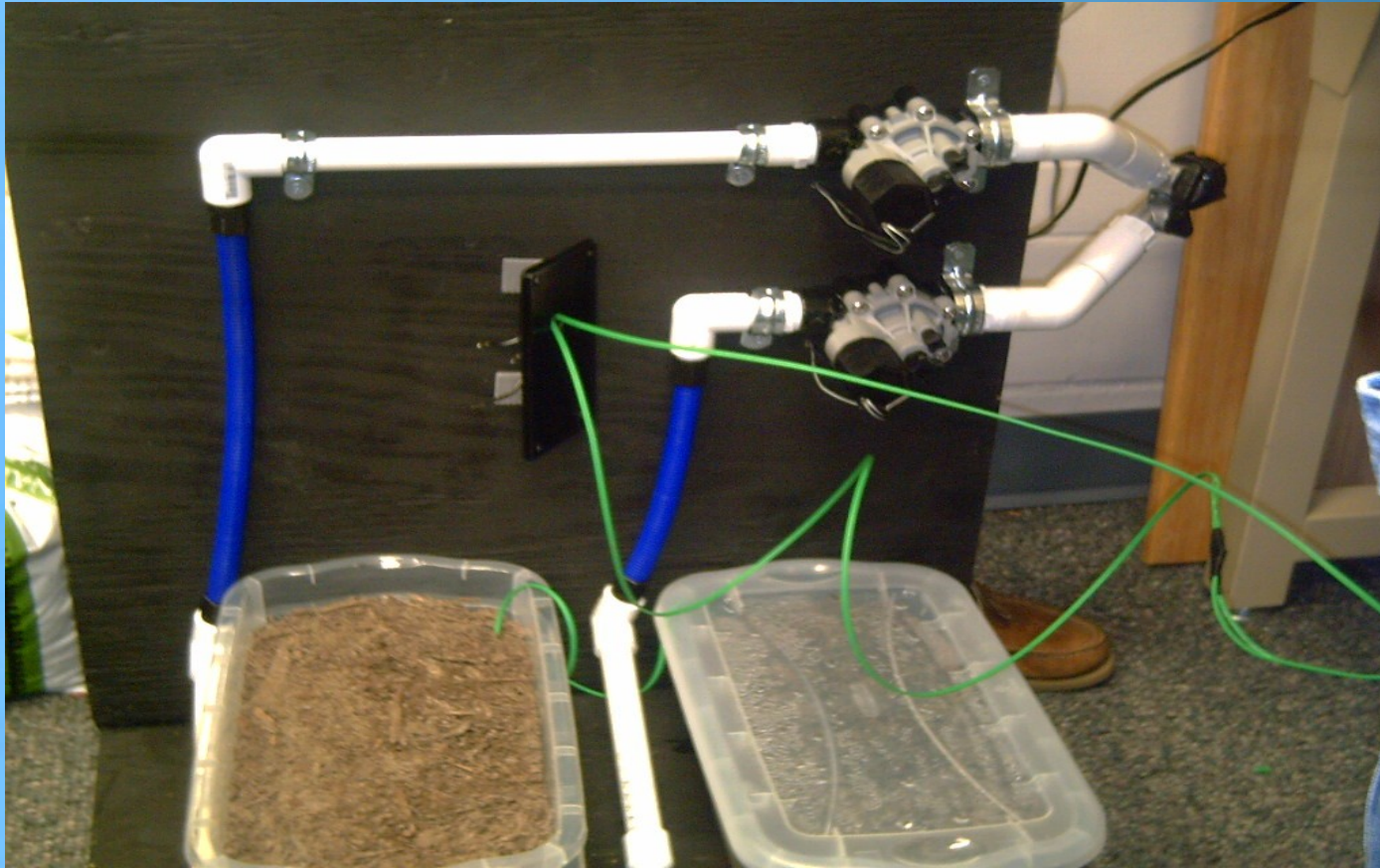
# Hardware Design Specification

presented by: Kevin Aldridge



# Hardware Design Specification

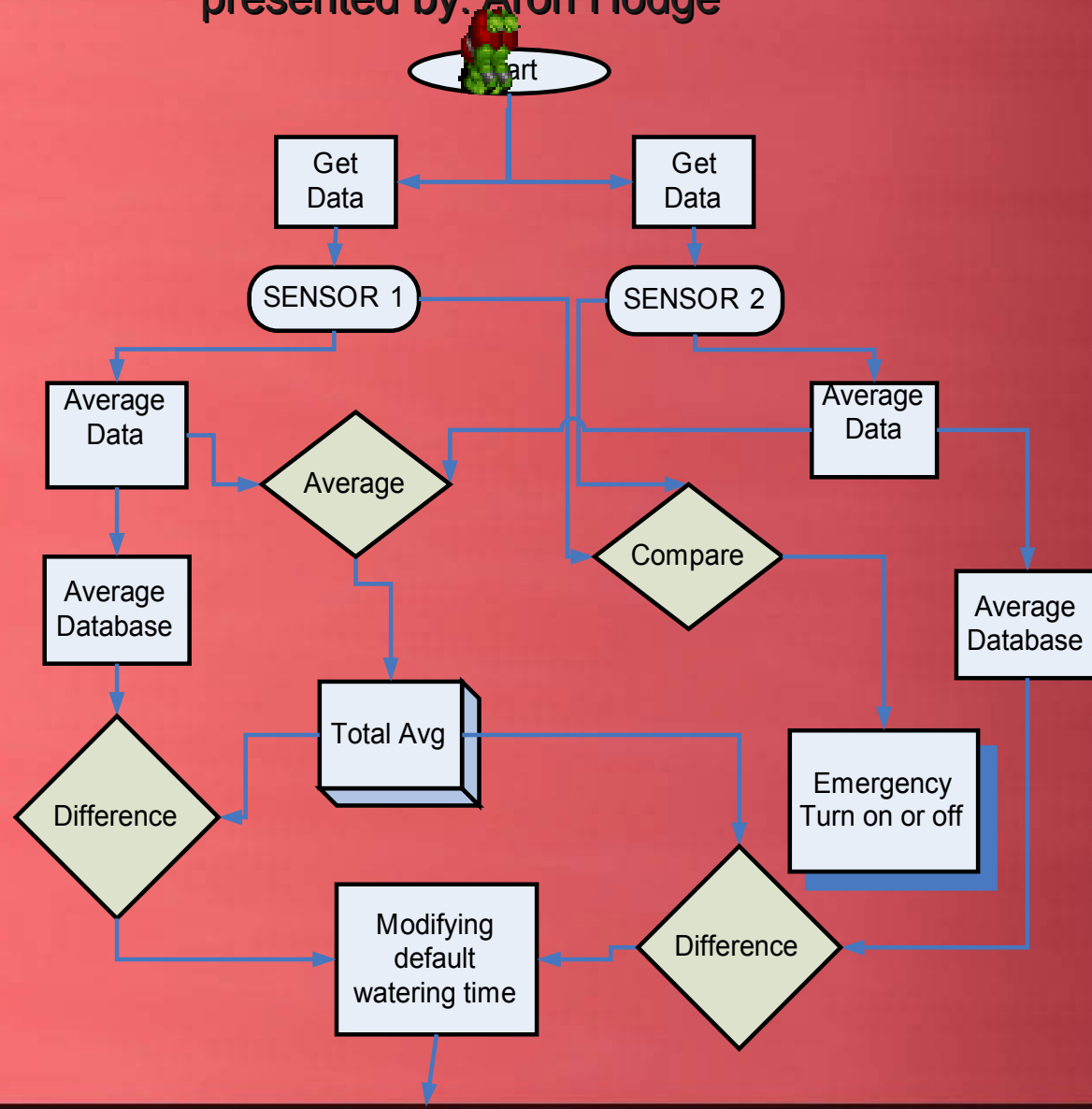
presented by: Kevin Aldridge





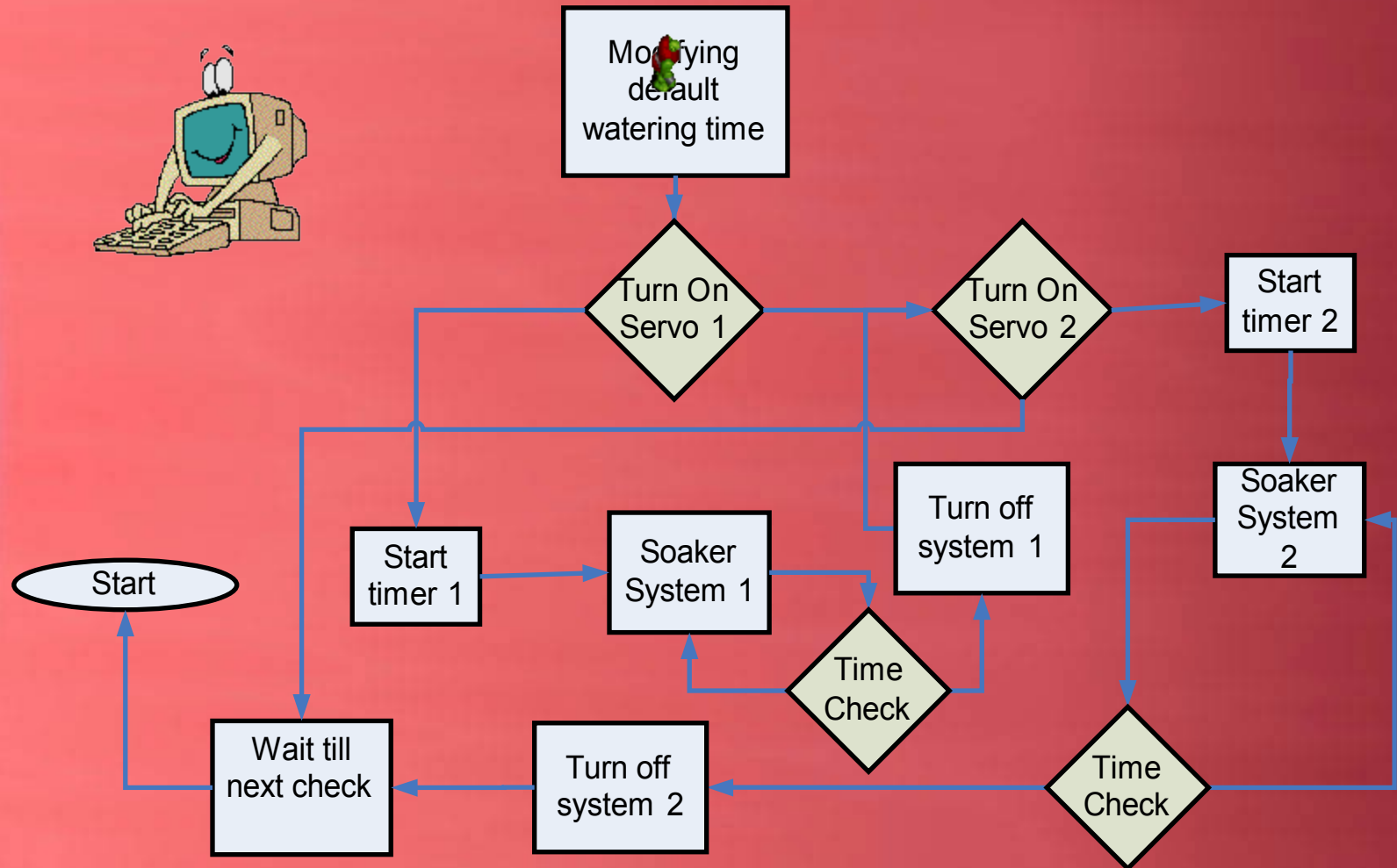
# Software Design Description

presented by: Aron Hodge



# Software Design Description

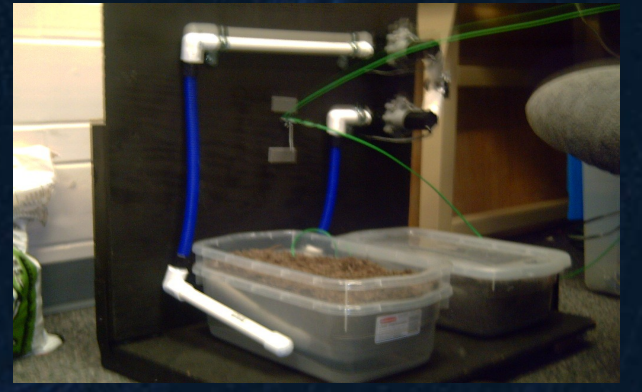
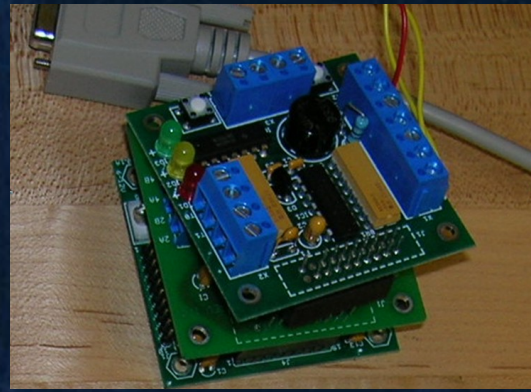
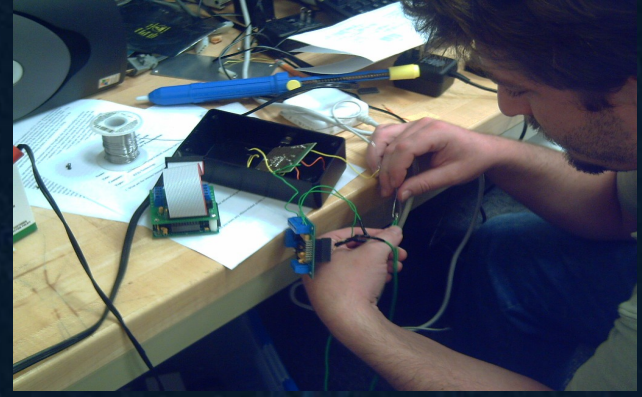
presented by: Aron Hodge





# Construction Details

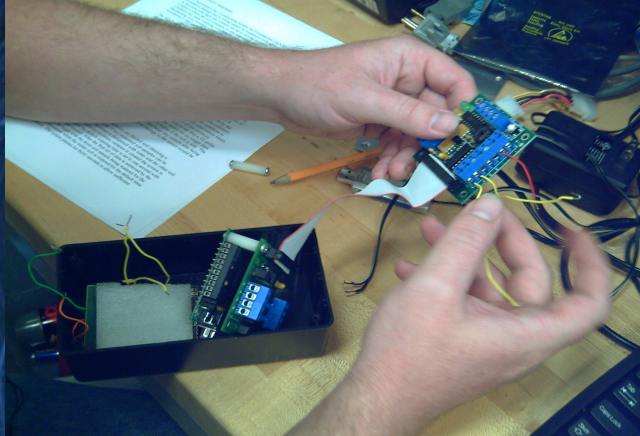
presented by: Collin Gallagher





# Construction Details

presented by: Collin Gallagher





# Variation & Testing

presented by: Collin Gallagher

- **Component testing**
  - **Hardware**
    - Sensor monitoring
      - Servo control
      - PVC leakage
      - LED connection
  - **Software**
    - Timing control
- Mathematical calculations
  - Relay activation
  - Sensor input

# Variation & Testing

presented by: Collin Gallagher

- **Integration**
  - Set values for moisture sensor
  - LED activation
  - Servo Activation
  - On / off system Timing
  - Voltage distribution
- **Full system test**
  - Watering quantity
  - Watering timing
  - Equivalent moisture monitoring
- **System Analysis**
  - Maximum voltage drop
  - Longevity of equipment used



# Cost

presented by: Collin Gallagher



- **Parts Total Cost \$ 310.67**
  - **Lowes, EPO, Radio Shack, etc**
  - **Hardware & Electrical Components**
- **Labor Total Cost \$ 22,500.00**
  - **Estimated \$ 25 per hour pay rate**
- **Tools and Lab Equipment Cost \$ 4,294.00**
  - **Meters, power supply, oscilloscope, pc**





# Conclusion

presented by: Aron Hodge

## **ACCF is:**

- **Cost Effective**
  - \$10,000 home improvement
  - Component cost is comparable to current systems being placed in homes with less than a 10% increase in cost.
- **An “improvement”**
  - Time-based systems damage homes as much as prevent damage while ACCF is an actual improvement that prevents damage.



# Questions & Comments

