# Introducing!
# The
# Solar Panel Protector

## An Automatic Solar Panel Protection System

# Section 1
# Product Overview

## presented by John Seiver

# Introducing!
# The <u>Solar Panel Protector</u>

**What is the Solar Panel Protector ?**

**The Solar Panel Protector or SPP is:**

- ❖ **a fully-automated**
- ❖ **self-contained**
- ❖ **solar panel protection system that will:**
  - ✓ **continually protect solar panel installations**
  - ✓ **with a minimum of expense**
  - ✓ **and a minimum of maintenance**

# Introducing!
# The Solar Panel Protector

**Why a Solar Panel Protector ?**

**Solar panels are vulnerable to hail**

**A solar panel is a solar cell enclosed in a metal frame with a glass cover**

**During extreme weather conditions, the moderately impact-resistant glass cover will fail**

# Introducing!
# The Solar Panel Protector

**How does the SPP work ?**

- **the SPP detects severe weather using the NOAA SAME weather radio broadcasting system**

- Photo resistor monitors light conditions

- NASA - designed rain sensor monitors rain fall

# Introducing!
# The Solar Panel Protector

- Variation & Testing
  - ❖ Set values for light conditions
  - ❖ Weather radio triggering
  - ❖ Rain triggering
  - ❖ Motor system timing
- Full system test
  - Test light and weather radio gate triggering
  - Gate remains closed while in rain conditions
  - Motor timings

# Introducing!
## The Solar Panel Protector

- **The Solar Panel Protector detects severe weather using NOAA's SAME radio warning technology**

- **The Solar Panel Protector closes when it is dark**

- **The Solar Panel Protector is self-power; requiring no external energy use**

- **The Solar Panel Protector requires no regular maintenance**

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# The Solar Panel Protector

**Why a Solar Panel Protector?**

- **reduces moisture buildup by eliminating the complete enclosed construction design**

- **allows the use of tougher materials for the SPP panel**

- **allows more light by eliminating the permanent glass covering**

# Section 2
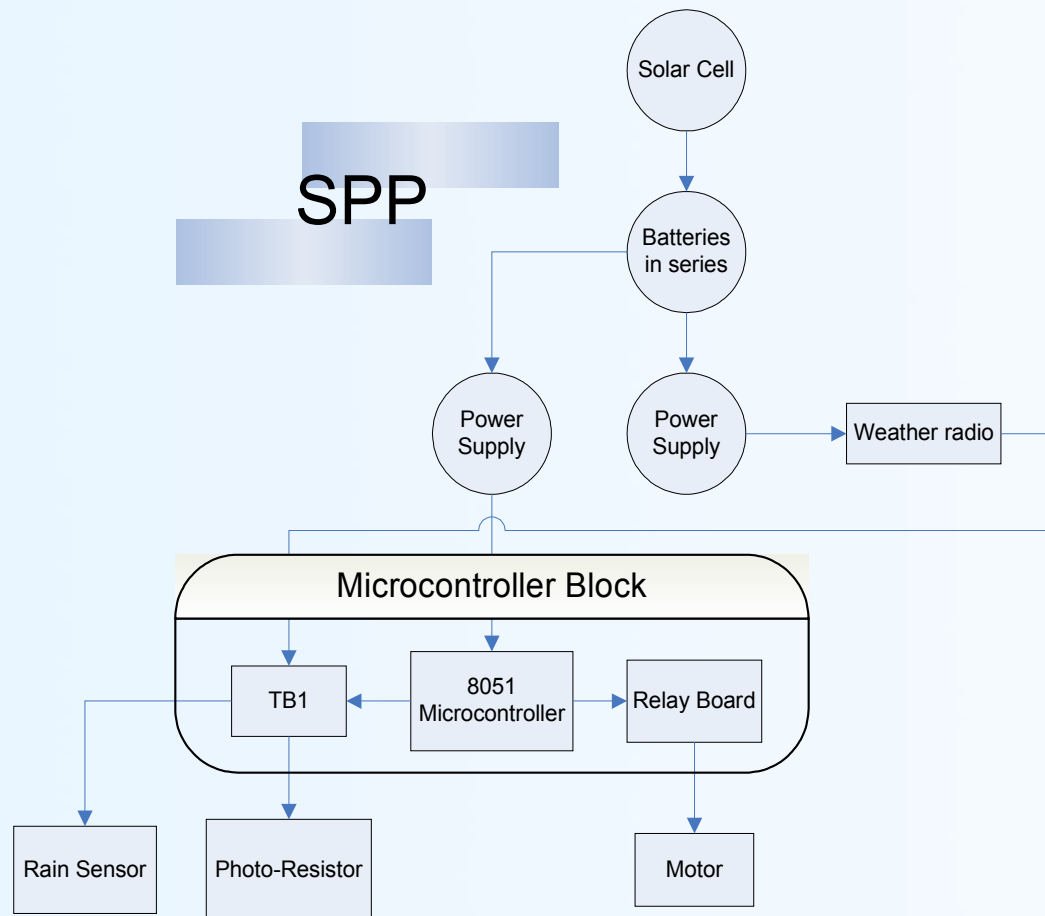# Construction and Cost Overview

## presented by Justin Cegielski

# Introducing!
# The Solar Panel Protector

- **Construction Overview**

  - **Construction Stages**
    - **Framing**
    - **Protective Panel Installation**
    - **Equipment Installation**
    - **Final Testing and Adjustments**

# Introducing!
# The Solar Panel Protector

## Hardware Design Description



SPP

Solar Cell → Batteries in series → Power Supply / Power Supply → Weather radio

Microcontroller Block: TB1, 8051 Microcontroller, Relay Board

Rain Sensor, Photo-Resistor, Motor

11

# Introducing!
# The Solar Panel Protector

## Construction Overview

# Framing the SPP

# Introducing!
# The Solar Panel Protector

## Construction Overview

## Framing the SPP

# Introducing!
# The Solar Panel Protector

## Construction Overview

## Framing the SPP

# Introducing!
# The Solar Panel Protector

## Construction Overview

## Protective Panel Installation

# Introducing!
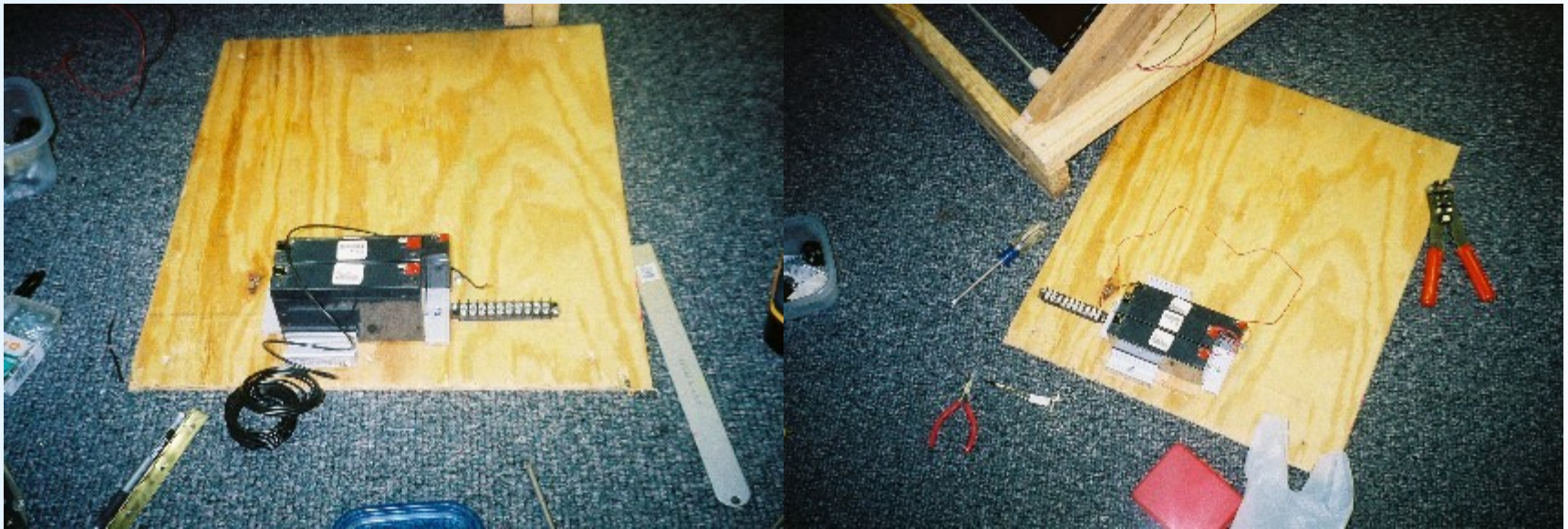# The Solar Panel Protector

## Construction Overview

### Protective Panel Installation

# Introducing!
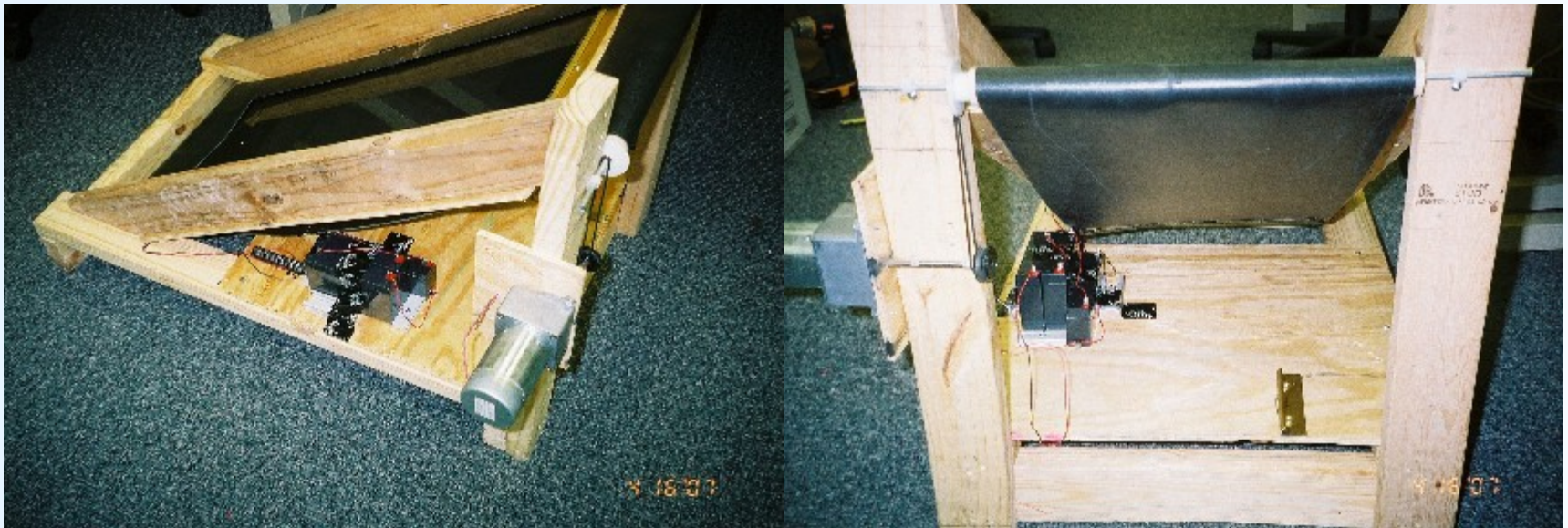# The Solar Panel Protector

## Construction Overview

## Equipment Installation

# Introducing!
# The Solar Panel Protector

## Construction Overview

# Equipment Installation

# Introducing!
# The Solar Panel Protector

## Construction Overview

## Final Testing and Adjustments

# Introducing!
# The Solar Panel Protector

## Construction Overview

## Final Testing and Adjustments

# Introducing!
# The Solar Panel Protector

## Construction Overview

# Final Testing and Adjustments

# Introducing!
# The Solar Panel Protector

| Parts Total Cost | | | | Labor Total Cost | | | |
|---|---|---|---|---|---|---|---|
| Bipom products | | **Total Cost** | | **Names** | **Hours Work** | **Labor Cost at $25 an hour** | |
| | 8051 Microcontroller | $69.00 | | Justin | 478 | $11,850.00 | |
| | TB-1 | $39.00 | | John | 527 | $13,000.00 | |
| | RELAY-2 | $29.00 | | James | 562 | $14,025.00 | |
| | LCD242 | $29.00 | | **Total** | 1567 | $38,875.00 | |
| Batteries | | | | | | | |
| | 12 volt | $12.00 | | **Total Cost** | | $39,087.00 | |
| | 6 volt | $11.00 | | | | | |
| | 6 volt | $11.00 | | **Cost to University** | | $200.00 | |
| **Total** | | $200.00 | | **University saves** | | $150.00 | |
| **Donated Part Cost** | | | | | | | |
| solar panel | $60.00 | $0.00 | | | | | |
| Wood | $20.00 | $0.00 | | | | | |
| Cabinet liner | $7.00 | $0.00 | | | | | |
| Weather radio | $55.00 | $0.00 | | | | | |
| Gear system | $12.00 | $0.00 | | | | | |
| Power Strip | $6.00 | $0.00 | | | | | |
| | | $0.00 | | | | | |
| **Cost of Donated Parts** | $160.00 | $0.00 | | | | | |

# Section 3
# SPP Function and Software Overview

## presented by James Milling

# Introducing!
# The Solar Panel Protector

- **SPP Function Overview**

  - **Continually monitors the NOAA SAME broadcast**

  - **Closes the protective panel when severe weather is detected**

  - **Closes the protective panel when darkness is detected as a backup in the event of SAME system failure**

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# The Solar Panel Protector

**Design Alternatives**

- **Crop protection**

- **Roof protection**

- **User settings for light and other weather conditions**

# Introducing!
# The Solar Panel Protector

- **Hardware Component Testing**
  - ❖ **Sensor Testing**
    - ✓ **Light tests for photo resistor**
    - ✓ **Water tests for rain sensor**
    - ✓ **Voltage output test for weather radio**
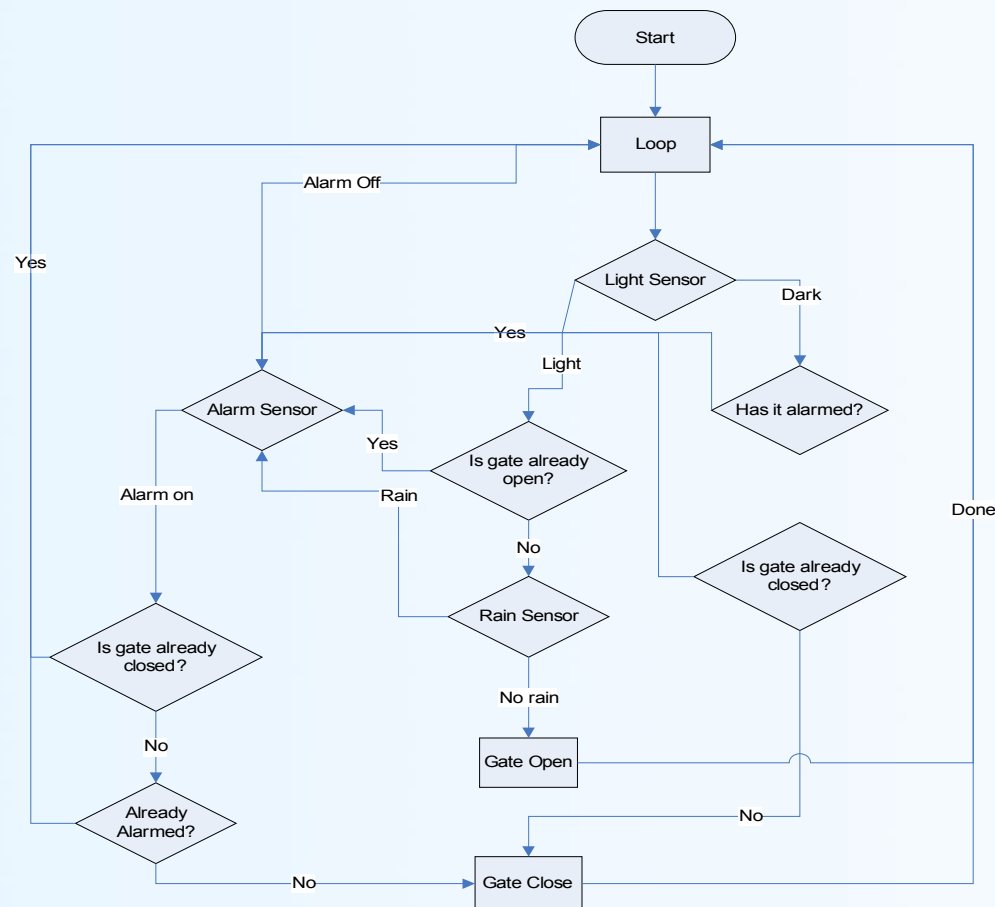
# Introducing!
# The Solar Panel Protector

**Prototype Product Requirements:**

- ❖ **weather radio to monitor severe weather**
- ❖ **microcontroller-based gating system**
- ❖ **back up sensors to detect severe weather in event of weather radio failure**
  - ✓ **Rain sensor**
  - ✓ **Photo resistor**

# Introducing!
# The Solar Panel Protector

- **Software**

  - ❖ **Timing control for motor**

  - ❖ **Sensor calibration**

  - ❖ **Relay activation**

# Introducing!
# The Solar Panel Protector

## Software Design Description

Produced by

Spring 2007 Team 6

Justin Cegielski

James Milling

John Seiver

Microprocessor Technical Advisor

James Milling

Sensor Technical Advisor

Justin Cegielski

C++ Programming Advisor

Dr. Farrokh Attarzadeh

Hardware Technical Advisor

John Seiver

- THIS HAS BEEN A TEAM 6 PRODUCTION -

Questions