The Solar Sun Chaser

Group 3 Progress Report 1

ECE 511 Fall 2014

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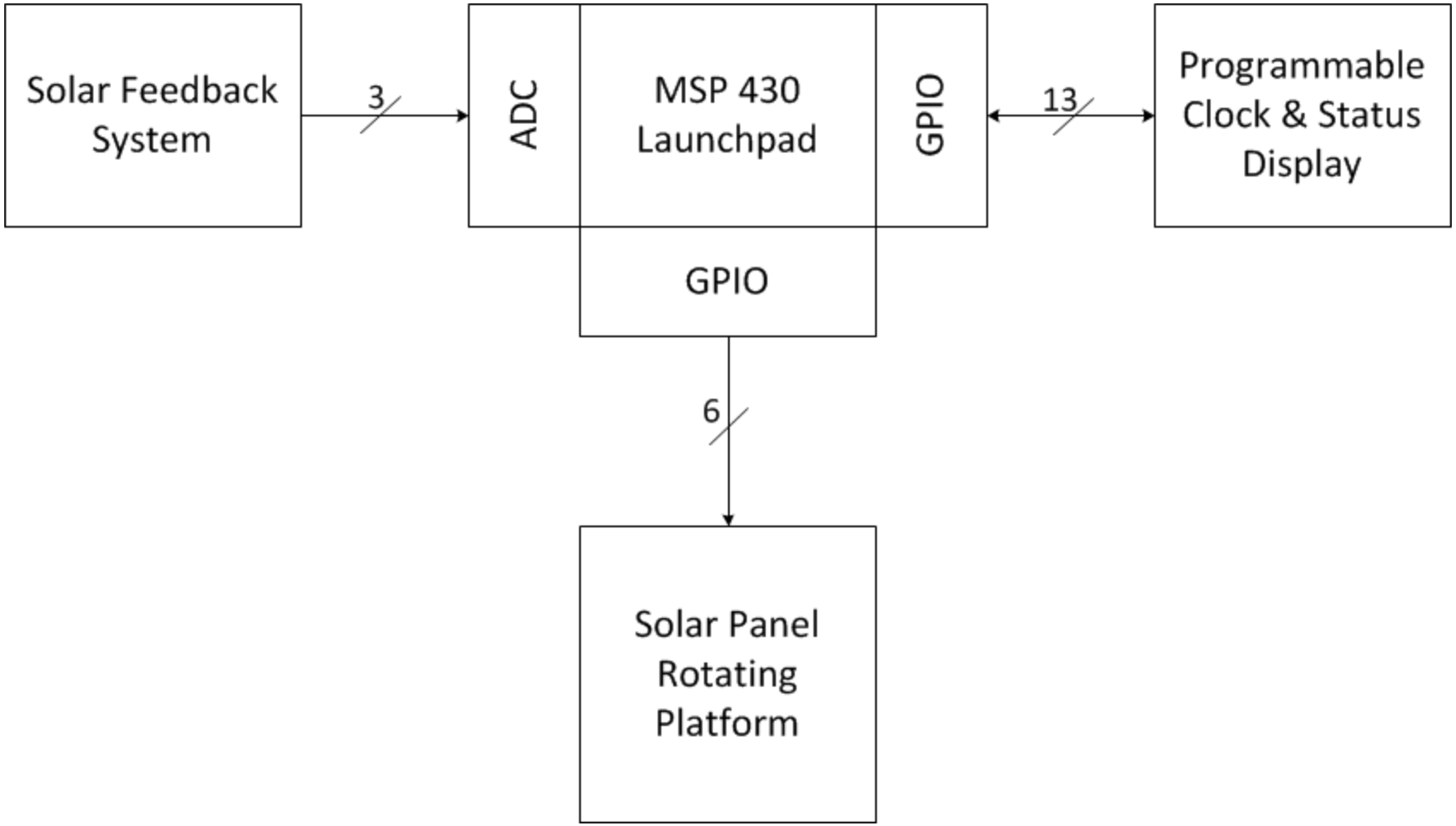
Agenda

- Introduction (Joe)
  - The Solar Sun Chaser
  - System Overview Diagram
- System Overview
  - Solar Feedback System (Joe)
  - Solar Platform (Jason)
  - Programmable Clock & Status Display (Ahmed)
- Conclusion (Ahmed)
  - Project Status
  - Plan B

The Solar Sun Chaser

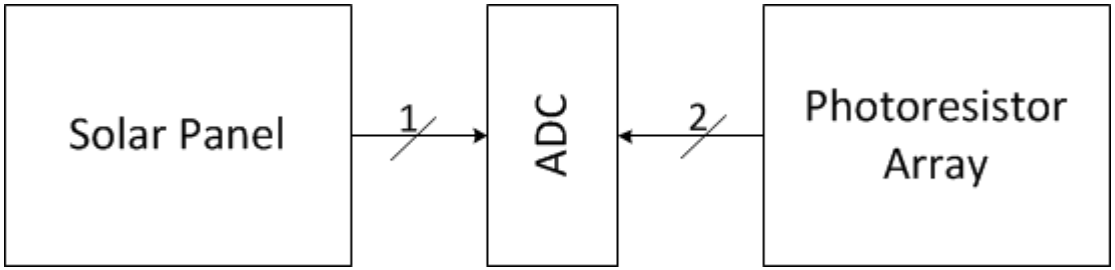
- The MSP430 will be used to continuously reorient a solar panel array towards the sun.
- Repositioning the solar panel throughout the day will maximize the amount of energy collected.
- Photoresistors will be used to determine which direction a stepper motor should move the array.
- Status and the current panel voltage will be displayed on a low-power LCD.

System Overview Diagram



Solar Feedback System

- Solar Panel
- Photoresistors



Solar Panel

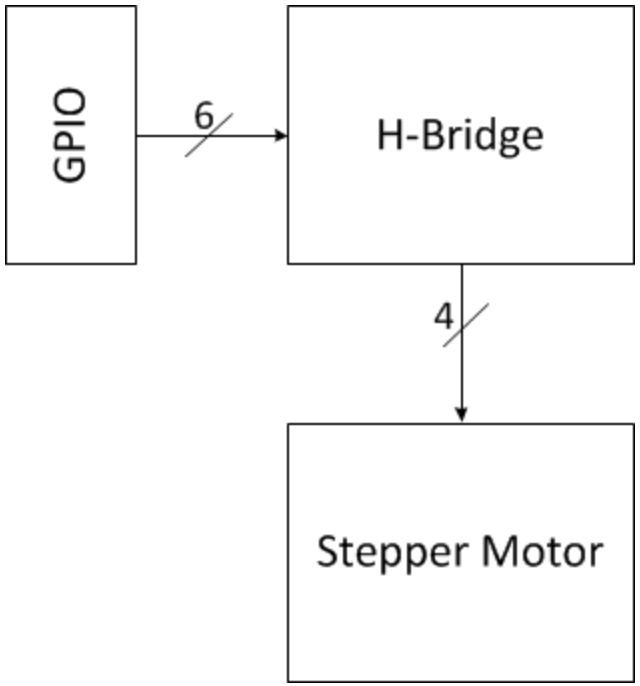
- Hardware: Wired through a voltage divider circuit to an ADC12V input. Maximum solar panel output is 8.5V, so reduce to a safe level for the ADC12
- Software: A timer will trigger an ADC sample which the MSP430 will read and store
- Status: Acquired, initial testing complete
- Problem: Convert ADC reading into actual panel voltage

Photoresistors

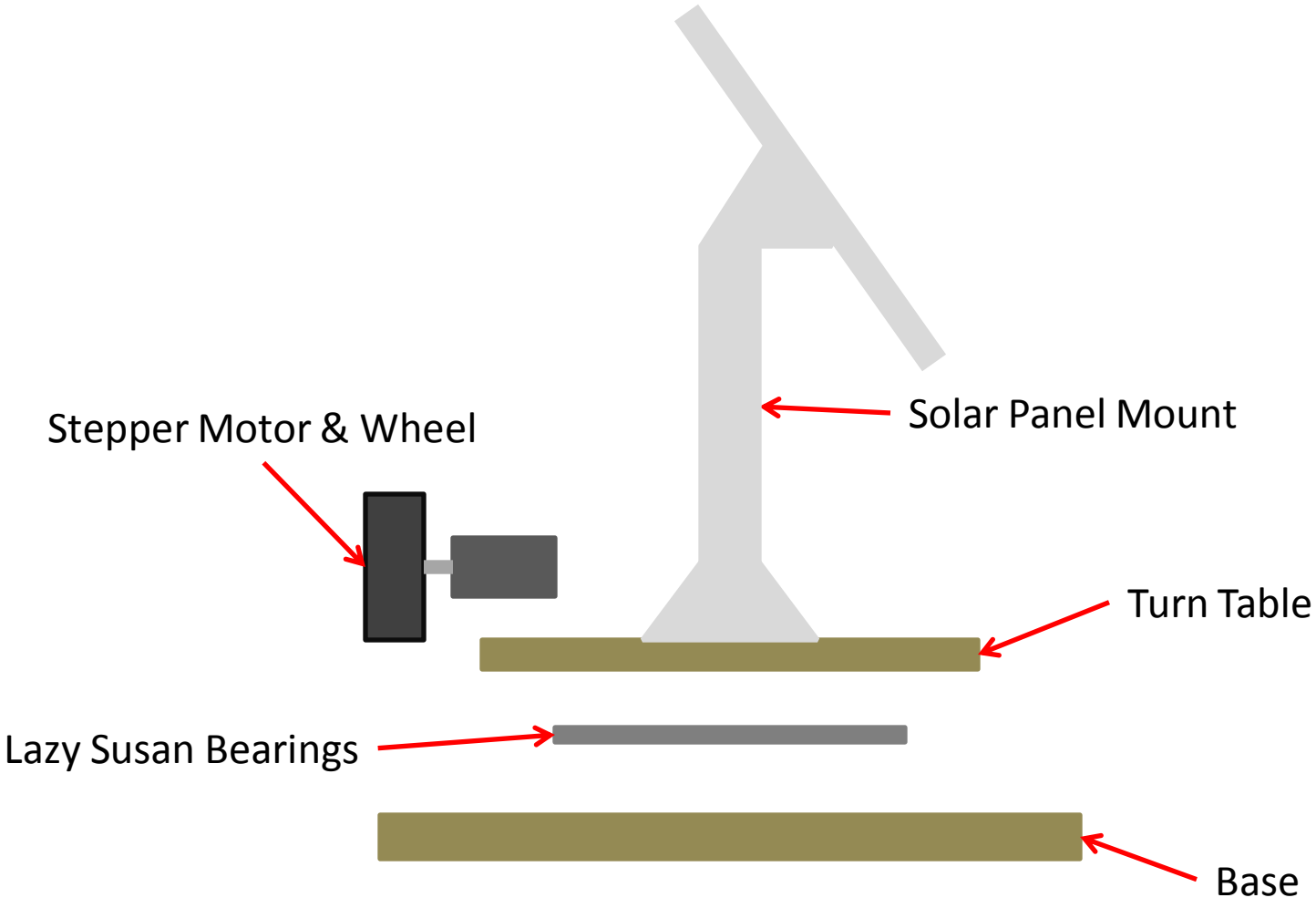
- Hardware: Two photoresistors each wired to Port 3 and an ADC input.
- Software: A timer interrupt will turn on Port 3 and trigger a measurement on each ADC. The MSP will read the values and reposition panel
- Status: Acquired
- Problem: How to position/isolate the sensors. Need to determine movement threshold.

Solar Platform

- Platform
  - Solar Feedback System mount
  - Rotation with stepper motors and H-bridge



Solar Panel Mount with rotation



Bipolar Stepper Motor

- Step Angle: 1.8° = 200 Steps
- Rated Voltage 4.56V
- Current/Phase 0.67A
- Status: Stepper Motor controlled by MSP430 Through H Bridge.
- __delay_cycles currently walking through the step sequence, next step is to have a timer walk through the step sequence with duty cycle controlling the torque and speed.

http://www.robotshop.com/en/456v-bipolar-stepper-motor.html

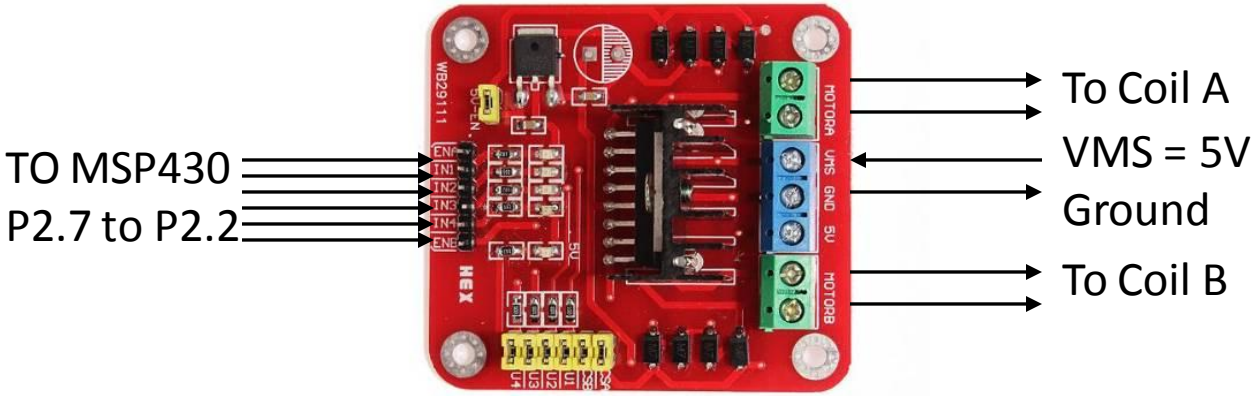
Step Sequence

Step	Out1A	Out1B	Out2A	Out2B
1	1	0	0	0
2	0	0	1	0
3	0	1	0	0
4	0	0	0	1

Step Sequence and Pseudo Code Reference:
http://www.8051projects.net/stepper-motor-interfacing/step-sequence.php

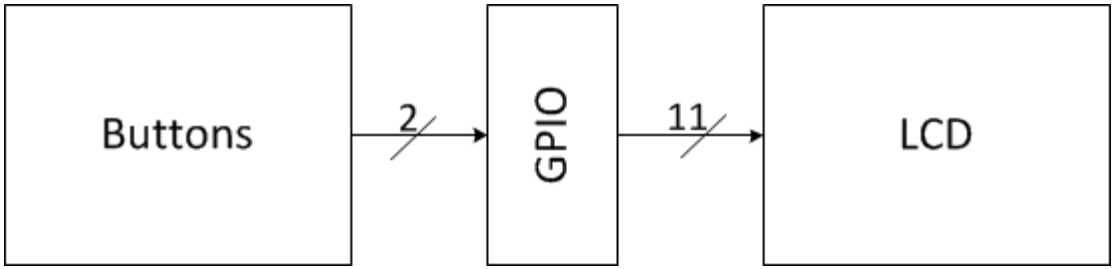
H-bridge

- Step angle: 1.8° = 200 steps
- L298N Dual H Bridge Motor Driver IC
- Terminal Supply Voltage: VMS 5V ~ 35V
- Peak Current IO: 2A per bridge
- Operating Current Range: 0mA ~ 36mA
- Input Voltage Range: 4.5V~5.5V(high)/ 0V (low)
- Size 55 x 60 x 30mm
- Status: MSP430 successfully sending step signals to H Bridge.



Programmable Clock & Status Display

- Programming Buttons
- SC1602Z 2-row LCD



Program Buttons

- Launchpad buttons will be configured to program clock and iterate over status messages.
- Hardware: (see right)
- Software: Programmer, status iteration, debounce
- Status: Acquired

Push buttons 1.1, 2.1

SC1602Z 2-Row LCD

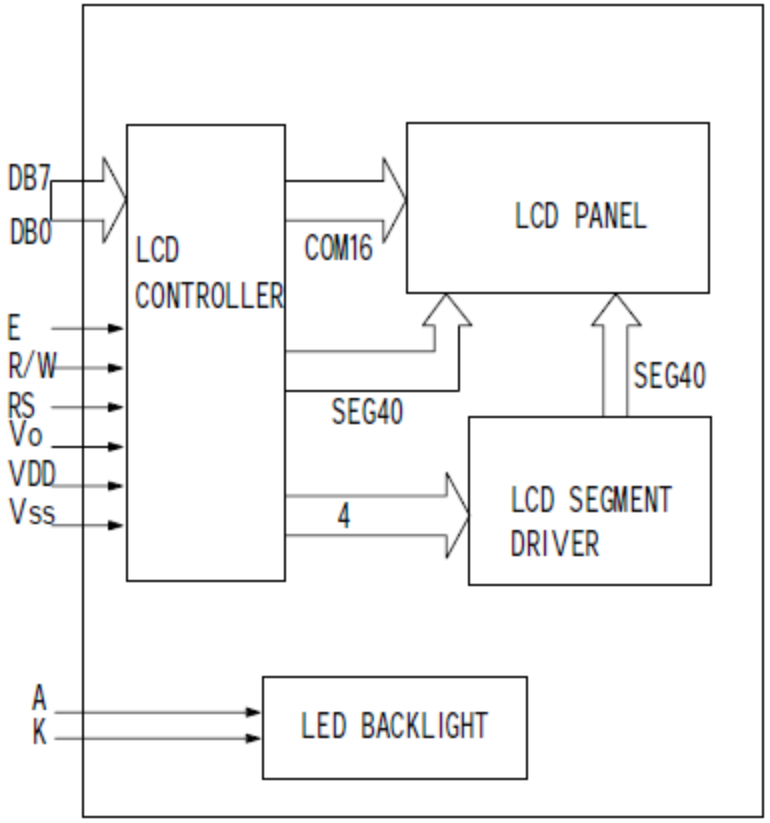
Hardware:

- 8-bit Data, E, R/W, RS
- RTC_A Interrupts with 32Khz ext clk

Software:

- LCD drivers (done)

Status: Acquired



Project Status

	Task Milestones
Joe	Solar Guidance Feedback Control System Development
Jason	Solar Panel Rotation Platform Fabrication
Ahmed	Programmable Clock and Status Display HW/SW Integration

- Independent development stage
- Team integration completed by next progress report
- Dynamic task divisions

Plan B

Potential Issues	Potential Alternative(s)
Insufficient isolation between photoresistors to accurately determine when to move	Add additional photoresistors
Stepper motor does not reliably move the platform the number of degrees commanded	Add a rotary encoder to verify degrees moved
High use of GPIO pins	Switch to SPI or investigate external registers to expand available GPIO