Dwight Look College of
ENGINEERING
TEXAS A&M UNIVERSITY

Team 60: Solar Lighting System
Final Presentation

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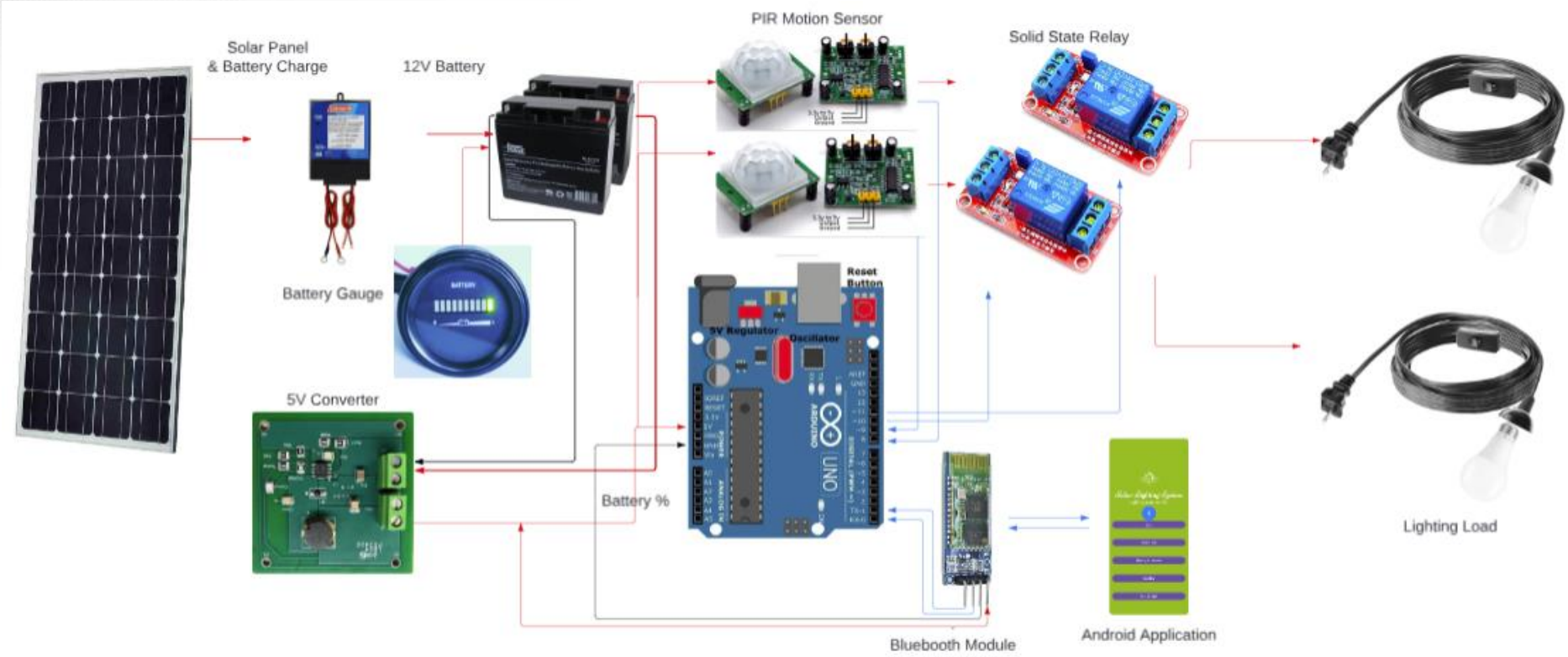
Project Summary

Project Deliverables

- Activation of lighting system based on motion sensing and manual input.
- Renewable power generation for self-powered system.
- Application for checking system battery percentage and setting operational modes.
- More?

Lyric Haylow	Jeb Malek	Josh George
Solar Charge Controller	Power Delivery/ Microcontroller	Mobile Application/ Microcontroller

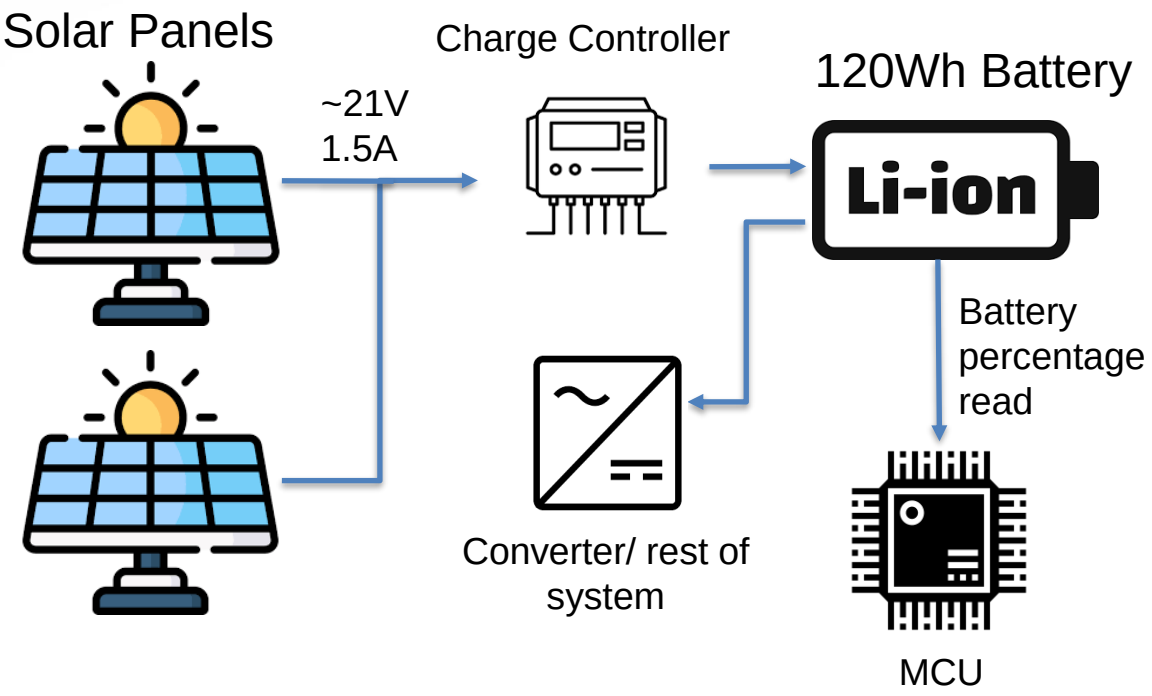
Integrated Project Diagram



Solar Charging Overview

Lyric Haylow

- Moderates input charge from solar panels to battery
- Reads battery percentage to Arduino for showing on Application



Solar Charging Subsystem

Lyric Haylow

Challenges

- Max voltage accepted for Arduino is 5V
- Initial board traces were incapable of handling current draw
- Charge Controller isn't drawing sufficient current

Solutions

- Created small circuit for stepping down voltage by factor of 0.175
- Remade board with improved design for testing and handling current draw
- Ordered Eval Board, have begun additional testing to check for faults

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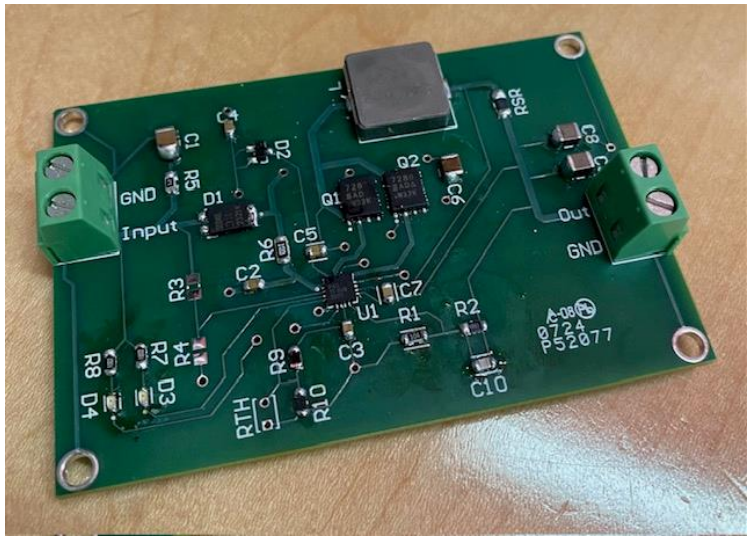
Solar Charging Results

Lyric Haylow

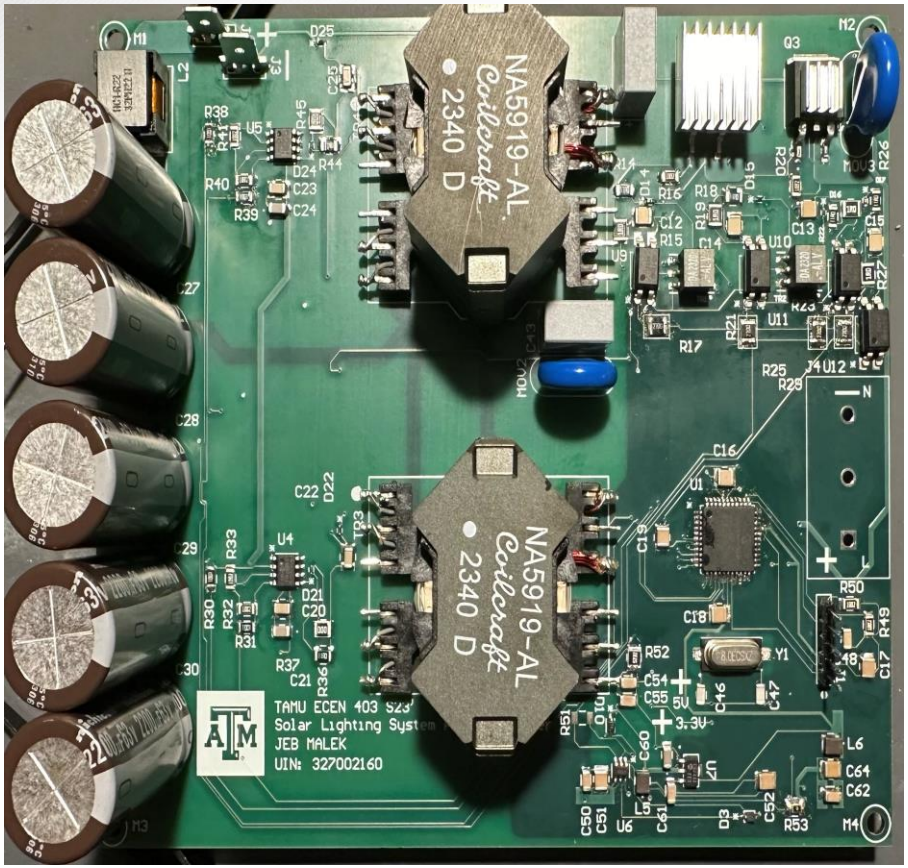
Specification	Min	Nominal	Max
Solar Panel Input Voltage (V)	5	21	25
Solar Panel Input Current (A)	1	1.2	1.5
Charge Controller output current (A)	0.5	2	10
Battery Voltage (V)	2.1	12	26
Estimated Battery Life (hours)	5.4	9	27

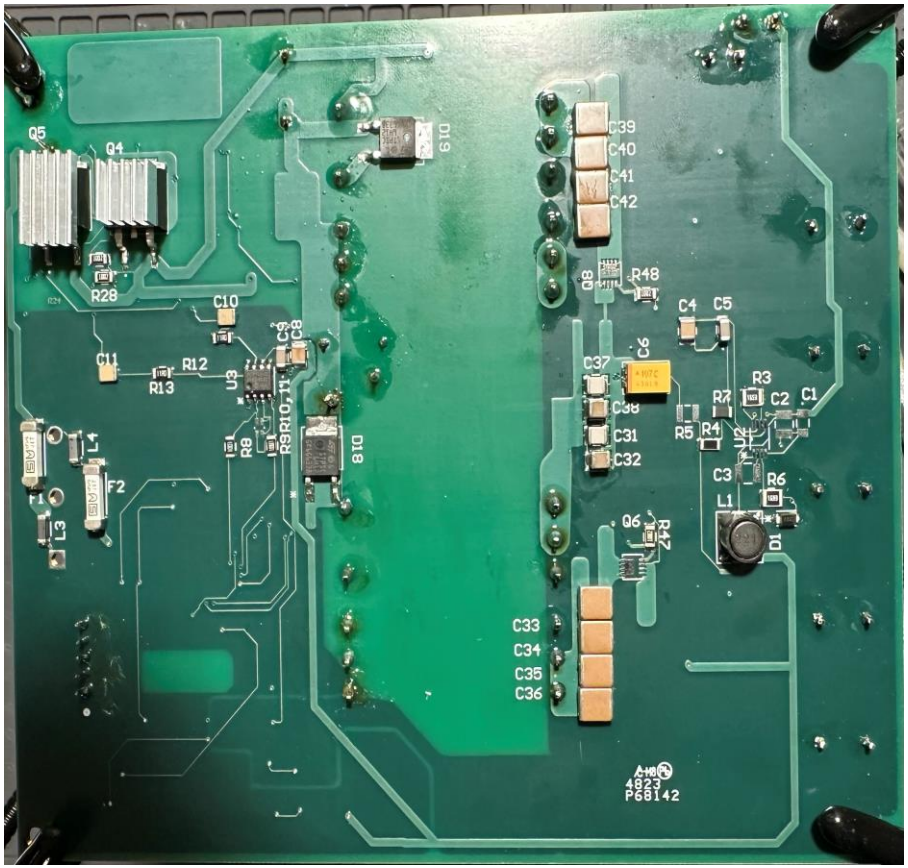
Item	Met
Controller recognizes both when to charge and when fully charged	Yes
Battery Voltage level sent to Microcontroller	Yes
Solar Panels give consistent current and expected Voltage	Yes
Controller actively charges Battery	No



Power Delivery Subsystem

Inverter





Power Delivery Subsystem

- Power Supply needed for Arduino, Bluetooth Module, Motion Controllers , Switches & AC Light Load

Supply	Voltage	Current	Power
Bluetooth Module	4.91 V	40mA	185mW
Arduino	4.91 V	37-40 mA	185-200 mW
Switches	4.91 V	10mA	180mW
Sensors	4.91 V	1-2mA	4.91-9.82 mW
		DC Total	550-565 mW
AC Light Load	120V RMS	180-200 mA	21-22W
		Nom. Total	23W

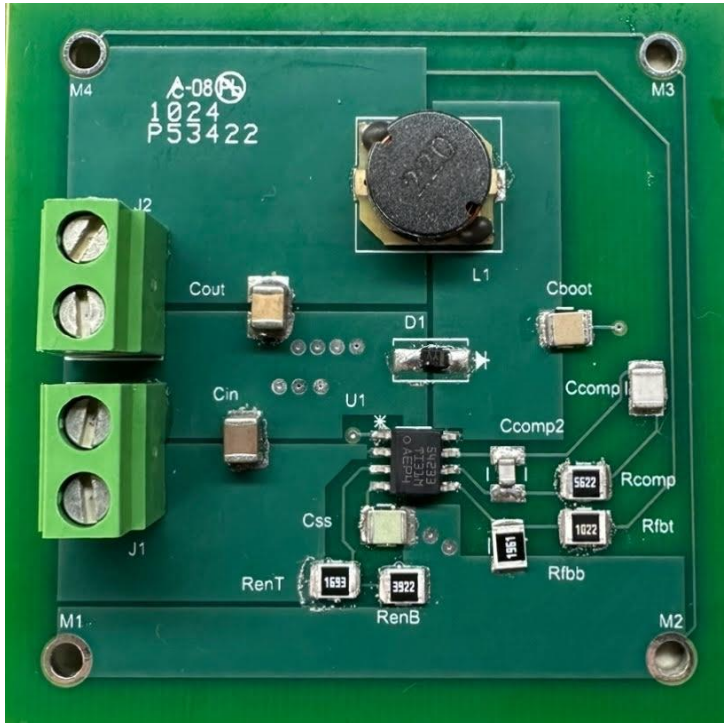
Power Delivery Subsystem

Testing & Verification of 12-5V Converter

Load : Switch & Sensor Switch , Sensor , Arduino , & BT Module

Supply : Battery

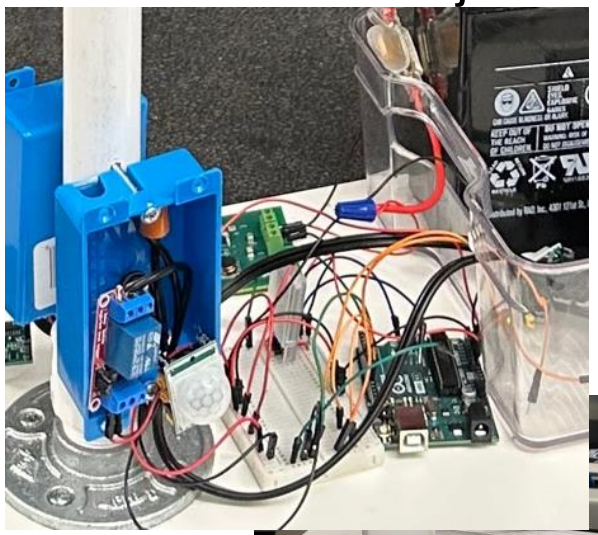
Supply	12.27V 1A
Voltage	4.91 V
Current	18.183 mA

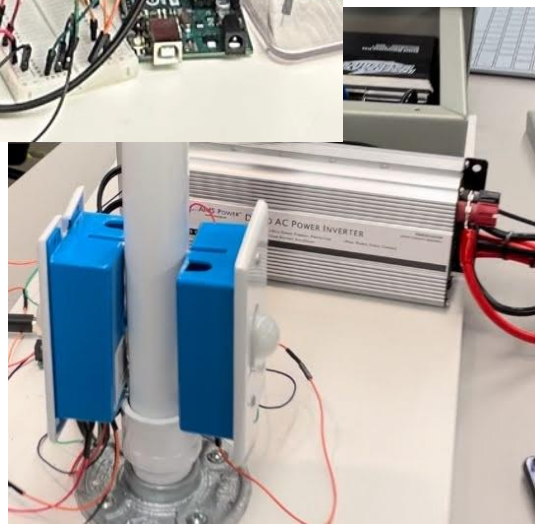


Microcontroller Subsystem

- Switch and Sensor correlation validated with software adjustable delay timer

Synchronization	Sensor Pin 1	Sensor Pin 2
Digital Timing	~1s	~1s
Switch Delay Timer	100s	100s





Android Application Subsystem

Outputs to the System:

- Sets mode of operation for the lighting system
- Manual command

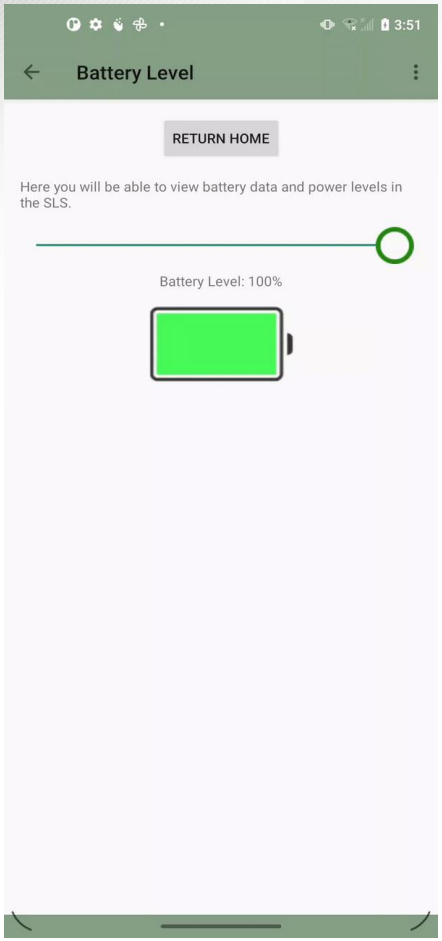
Receives from System:

- Current battery percentage

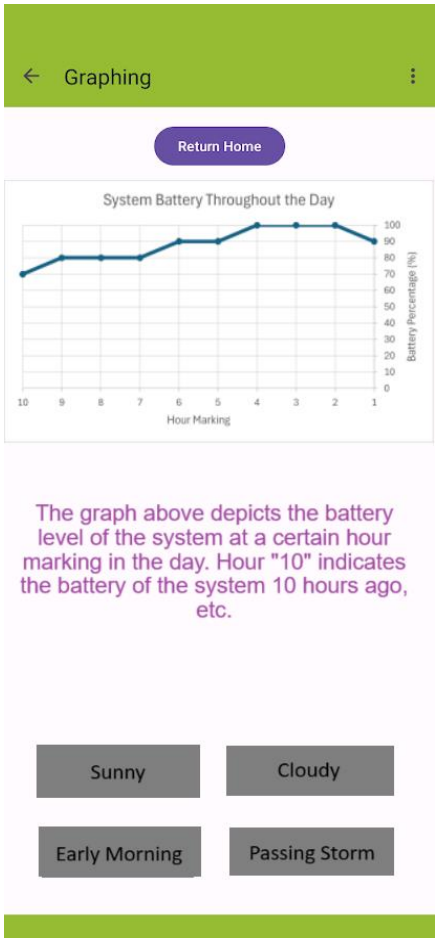
Miscellaneous:

- 10 hour battery percentage graphing using database
- Custom logo and design
- 5 different pages, 3 pages with direct integration to system

Android Application Subsystem



- Tested receiving voltages from Arduino.
- Have not yet validated with values from battery.



- Tested with example values from Arduino board
- Have not yet validated with values from battery.

Android Application Subsystem

- Complete integration with microcontroller and sensor relay system

Android Application Subsystem

Challenges

- Bluetooth module trouble connecting to Android app
- Spamming buttons on app caused Arduino cross-talk
- App occasionally encounters crashes when loading Bluetooth connection

Solutions

- Created a separate app and then combined with pre-existing
- Added delay to user inputs to "dummy proof" system

Integrated System Results

System Integration	Success/Fail	Validation
Solar Panel to Battery	Success	Battery charged from 10.6V to 11.2V in one hour.
Battery to Microcontroller	Success	Arduino read battery voltage accurately within error percentage of 5%
Arduino to App	Success	App can successfully read data and provide input to the microcontroller.
Battery to App	Failure	Battery can interact with MCU, MCU can interact with App, but complete data transfer was not established.
Microcontroller to Sensors and Lighting Load	Success	Validated lights turn on when person moves in front of sensors.

Conclusions

Issues Encountered:

- Faulty board design for inverter, so store bought industry type being used.
- Flood lights were too power heavy, so we removed them from the project.
- Charge controller TI design proving to be faulty, so using on-hand Charge Controller for system integration testing.

Current status : Bluetooth Integration complete, Repeating testing for motion sensing and switch timing, charge controller testing, integration/validation to be completed in 3 days.