FIT-UBC Workshop

Charging Supercapacitors Using Photovoltaic Cells

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Introduction

Timeline

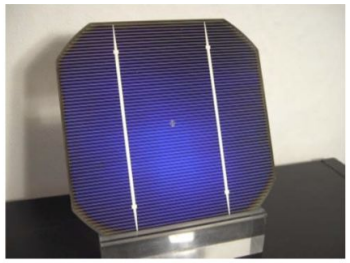
Schedule

Day1
9th Sep.

1. Group Discussion
Which materials are the best for solar concentrating ? (mirror, lens etc.)

Day2
10th Sep.

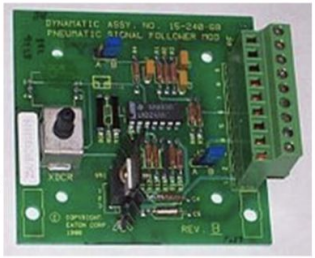
Optimizing angle of solar concentrator.
Choosing MPPT, DC-DC converter / DC booster for charging supercapacitors as energy storage.



Silicon solar cell

Day3
11th Sep.

2. Assembling and Connecting Device
Setting angle of solar concentrator.
Connecting solar cell, MPPT and power electronics circuit and supercapacitors.



Power electronics Supercapacitors

Day4
12th Sep.

3. Experiment and Measuring
Experiment of solar charging circuit at outside.
Measuring charging time and charged voltage.

Day5
13th Sep.

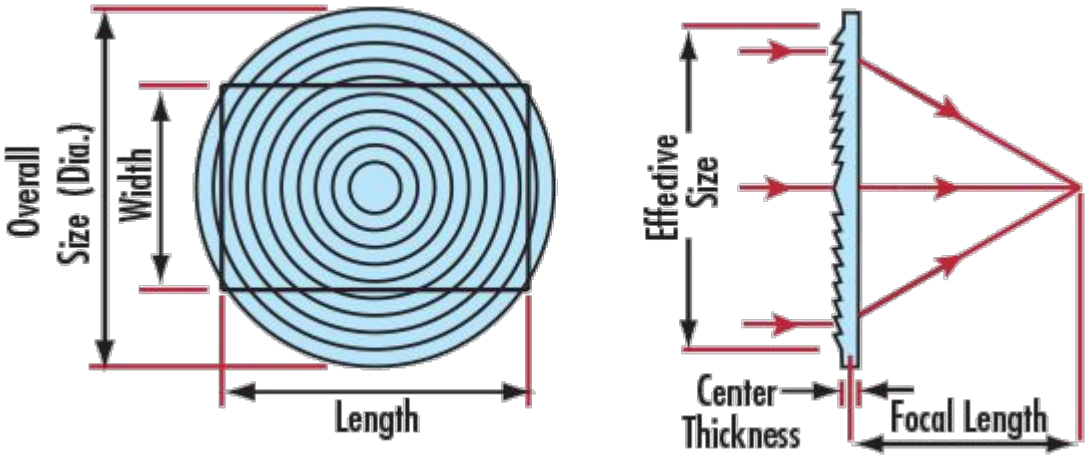
4. Group Discussion and Presentation
Finding problems and discussing.
Presenting group works for other groups.
What is the best way for optimizing energy?

How we decided each component?

Mirrors

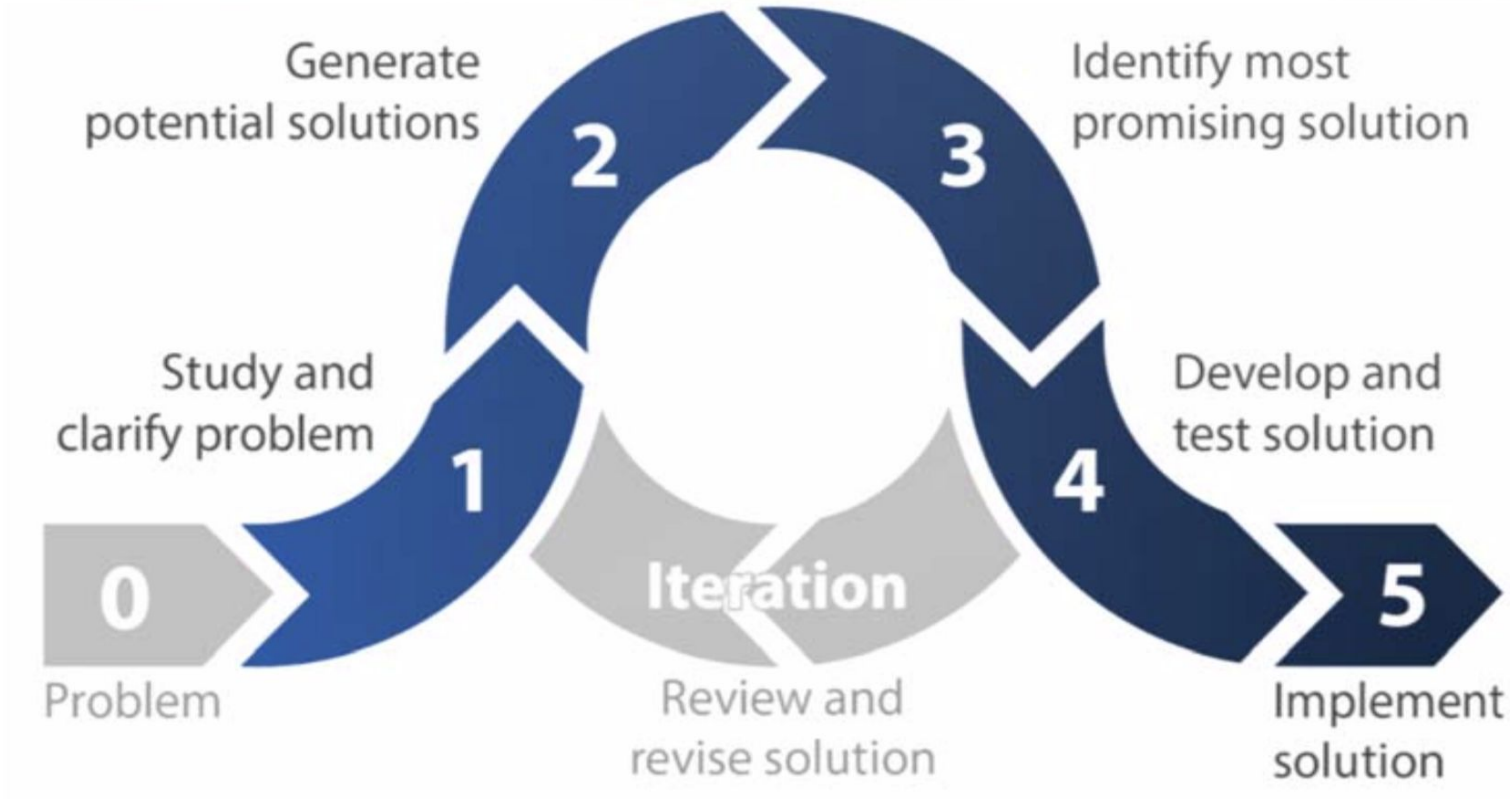
Or

Fresnel Lens



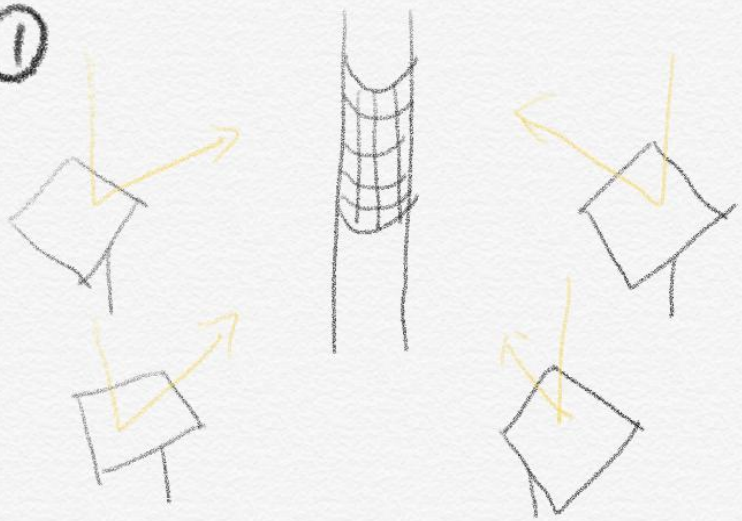
UBC Engineering APSC 100 / 101

Engineering Process



Proposed Solutions

1



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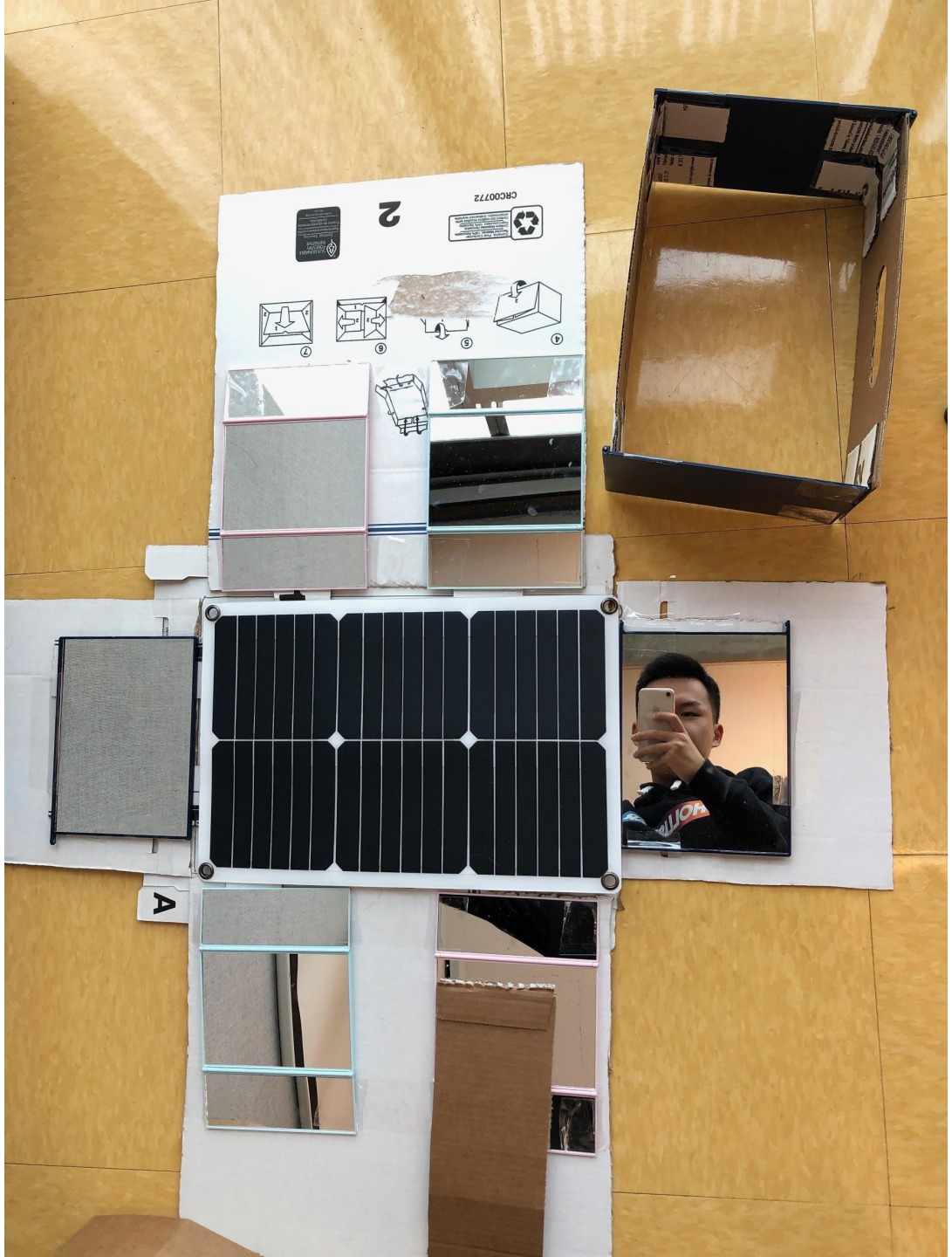
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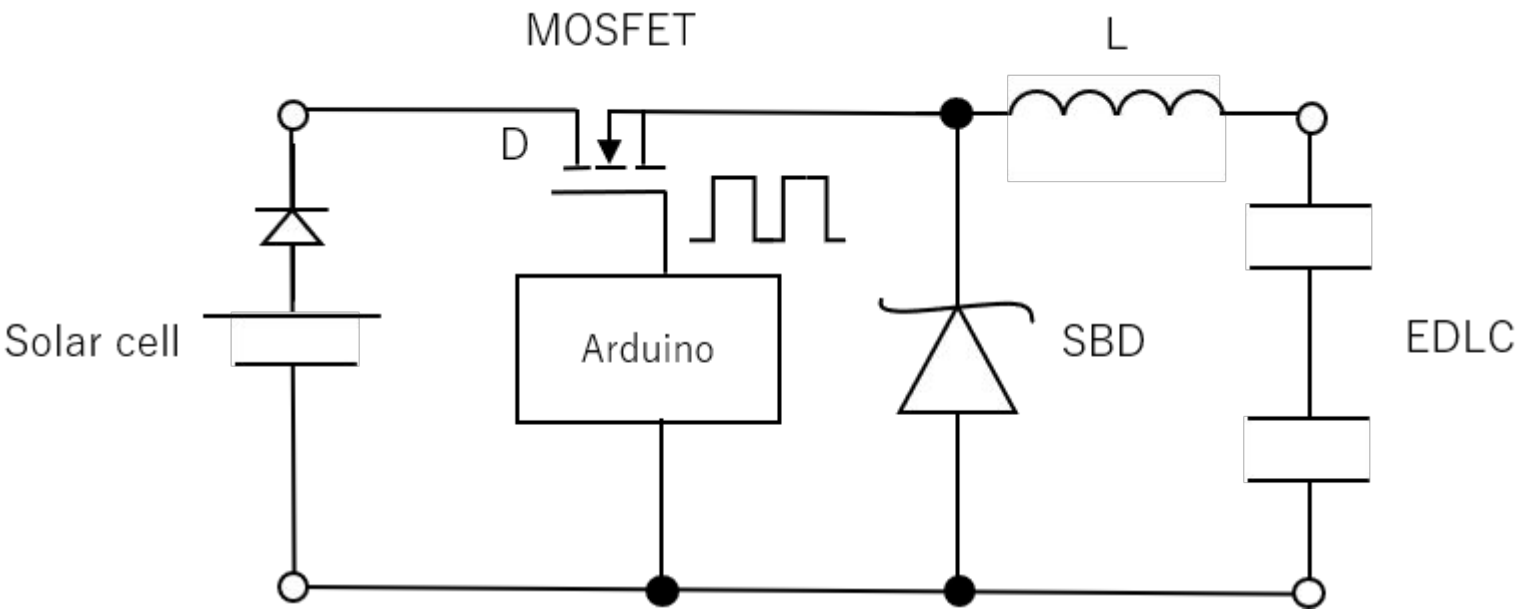
Circuit

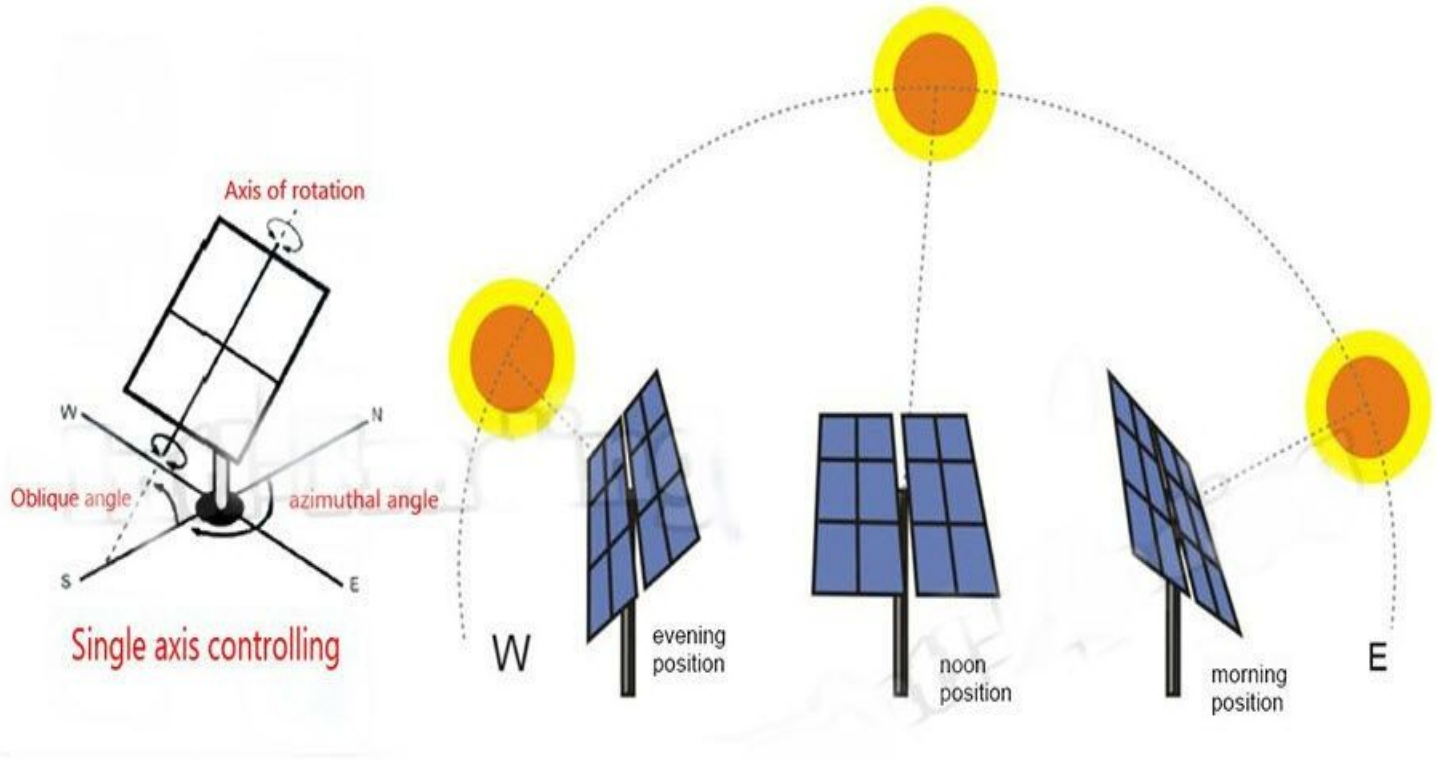


A buck converter is built to lower the 18V from the solar panel to 5V.

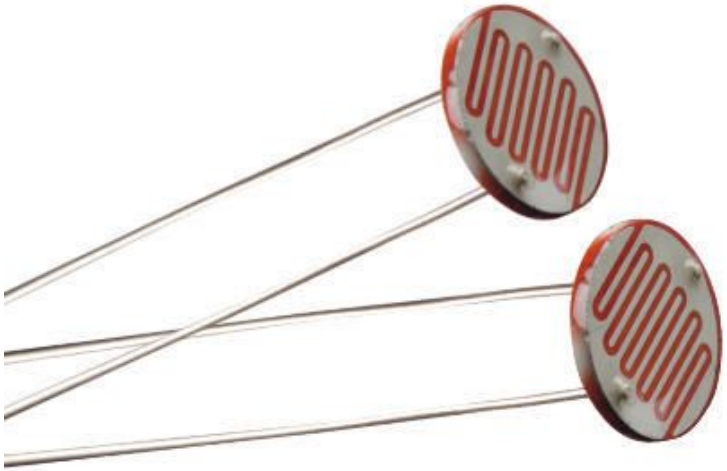
Arduino Code

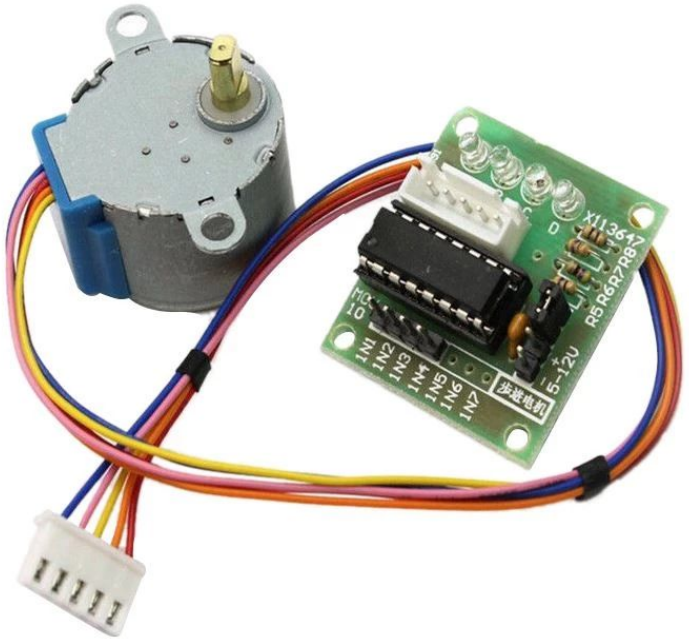
```
#include <avr/io.h>

#define PWMPin 10

unsigned int frq = 440; // 周波数
float duty = 0.5; // 指定したいデューティ比

void setup() {
  pinMode(PWMPin, OUTPUT);
}

void loop() {

  // モード指定
  TCCR1A = 0b00100001;
  TCCR1B = 0b00010010;

  // TOP値指定
  OCR1A = (unsigned int)(1000000 / frq);

  // Duty比指定
  OCR1B = (unsigned int)(1000000 / frq * duty);
}
```

ONE MORE THING

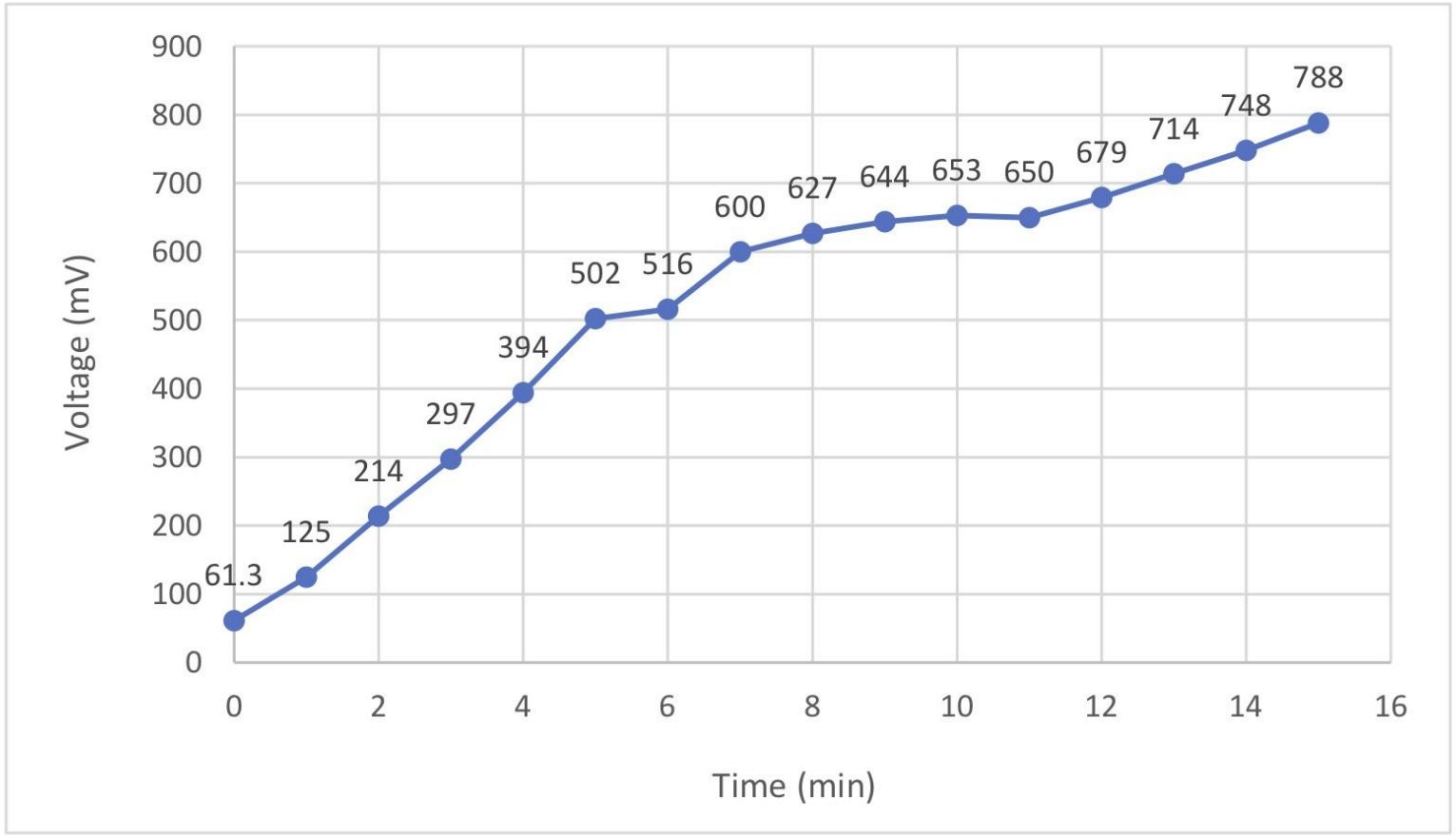


How we are using it?





Test Result


Voltage (mV)
900
800
700
600
500
400
300
200
100
0
0
2
4
6
8
10
12
14
16
Time (min)
61.3
125
214
297
394
502
516
600
627
644
653
650
679
714
748
788

But, why?

“A solar panel system with a single-axis solar tracker installed sees a performance gain of 25 to 35 percent.”

Problems Encountered

1. Output voltage lower than expectation
2. The readings from the light sensors fluctuate significantly
3. Move & Lock Mechanism

Conclusion

Thank You