Solar Powered LED Blinds
Mock Design Review

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ECE 445

February 15, 2016
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1.0 Block Diagram & Description

1.1 Block Diagram

![Block Diagram](image)

Figure 1: Block Diagram of components planned for use in our project.

1.2 Block Description of Rechargeable Battery

The rechargeable battery is what will be supplying the power to all the components of the Solar Powered LED Blinds, except of course for the solar panels themselves, which will be charging the battery through the day. The battery needs to be slim enough in terms of size to be housed at the top of the blinds, but large enough in charge capacity to supply power for several hours of LED use; this way the user can have sufficient light production during the night hours. The rechargeable battery will be connected to the PCB, which will regulate the voltage and current that each component receives. Through the use of transistors, the microcontroller will allow power from the battery to be delivered. That way the
power directly from the battery cannot damage any other circuit components connected.

1.3 Requirements and Verifications

<table>
<thead>
<tr>
<th>Module</th>
<th>Requirement</th>
<th>Verification</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rechargeable</td>
<td>1. Output 11.1 V &amp; 5.7 A to supply sufficient voltage and current to the</td>
<td>1. Process for 1:</td>
<td>8</td>
</tr>
<tr>
<td>Battery</td>
<td>microcontroller, RGB LED array, and motor. [3]</td>
<td>a. Measure voltage and current output of battery and check if it is within 1-3% of its specified values.</td>
<td></td>
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<tr>
<td></td>
<td>2. Maintain charge for several hours</td>
<td>2. Process for 2:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Fully charge over the course of the day</td>
<td>a. Measure how much charge is lost over time when the battery is not under any load.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Measure how much charge is lost over time with a full system load.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>3. Process for 3:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Allow battery to charge for 8 hours and measure charge capacity.</td>
<td></td>
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2.0 Circuit Schematic, Simulation, & Calculation

2.1 Circuit Schematic

![Circuit schematic of solar panel array charging the battery.](image)

Figure 2: Circuit of solar panel array that will be charging the battery.
2.2 Calculations

As shown in the circuit above, in order to get the required power to charge the rechargeable battery, we will use an array of 14 pairs of solar panels. Each individual solar panel is rated for 6 V and 70 mA. Connecting two panels in series gives us a total voltage of 12 V. Since all panel pairs are connected in parallel, the voltage potential across all of them are equivalent. The following calculation reflects the voltage across each pair of solar panels.

\[ V_{SP_{series}} = 6 V + 6 V = 12 V \]

Configuring the 14 panel pairs in parallel also gives us a total current of 0.98 A. Using Kirchoff’s Current Law, the total current was determined. The following calculations show the computation for the total current.

\[ I_{SP_{parallel}} = 7(0.07 A) = 0.49 A \]
\[ I_{total} = 0.49 A + 0.49 A = 0.98 A \]

The maximum voltage and current produced by our array of solar panels is 12 V and 0.98 A. This means that with a battery that has a capacity of 6600 mAh, the following calculation determines long it would take to charge the battery fully.

\[ 6600 \text{ mAh} \times \frac{1 A}{1000 mA} \times \frac{1}{0.98 A} = 6.73 \text{ hours} \]

So it would take just less than 7 hours to fully charge the battery, which would allow for some leeway since there are more than 8 hours of sunlight during the day on average. [2]
3.0 Safety Statement

3.1 Safety Statement

The most dangerous part of our project would be the rechargeable battery, with which we are planning on having at least 11.1 V and 5.7 A. The deadly part of the battery would be the current, which is around 5.5 A above the required amount of Amperes to kill a person, (0.1 to 0.2 A). [1] Most of the electrical components will be housed in the top of the blinds, and we plan on the blinds being made out of wood or faux wood, so there will be much less conductive material for the user to interact with. The only parts further down on the blinds for the user to make contact with would be the solar panels and switches.
4.0 Citations

4.1 Citations

