Conor Ball, David Hingeveld 6/4/2014
Final Project Engr 12 Lab

Solar Chariot

For our project, David and I decided to build the BEAM Solar Chariot. As Mechanical Engineers, any opportunity to build a moving robot peaked our interest. We both had never worked with any kinds of solar panels as well, so we were eager to play around with some relatively modern technology. This final project also coincided with our Engineering 2 (Auto-CAD) class, and allowed us to make use of the 3-D printers, another relatively new technology that only recently became available to the mass market. Having the schematic and parts list predetermined as well as the instructions for building the device all were vary attractive to us. The core components we used are as follows:

1 Flashing (red) LED
3 4700×10^-6 F Capacitors
1 3906 Transistor
1 3904 Transistor
1 2200 Ohm Resistor
1 Motor from a micro cassette player
Wires

The guide to this device describes finding one of the essential pieces, the motor, as “fun to hunt down in thrift stores or via online auction”. After spending hours upon hours scrounging every local pawn shop, second hand store, electronics store, and even the dump I soon learned that the micro cassette players this piece is taken from have quickly become a rare antique. Aside from the motor however, all the other pieces were readily available for purchase.

The essence of our device and schematic, as seen in figure 1, come from the 4.5V solar panel charging the set of capacitors. When the circuit has charged enough energy to flash the LED, it acts as a conductor and allows electricity to flow through it and into the motor. When we were initially building this circuit, we weren't using a flashing LED, which proved to be troublesome. After a little bit of research we learned why the LED must be flashing, and we quickly replaced the part.

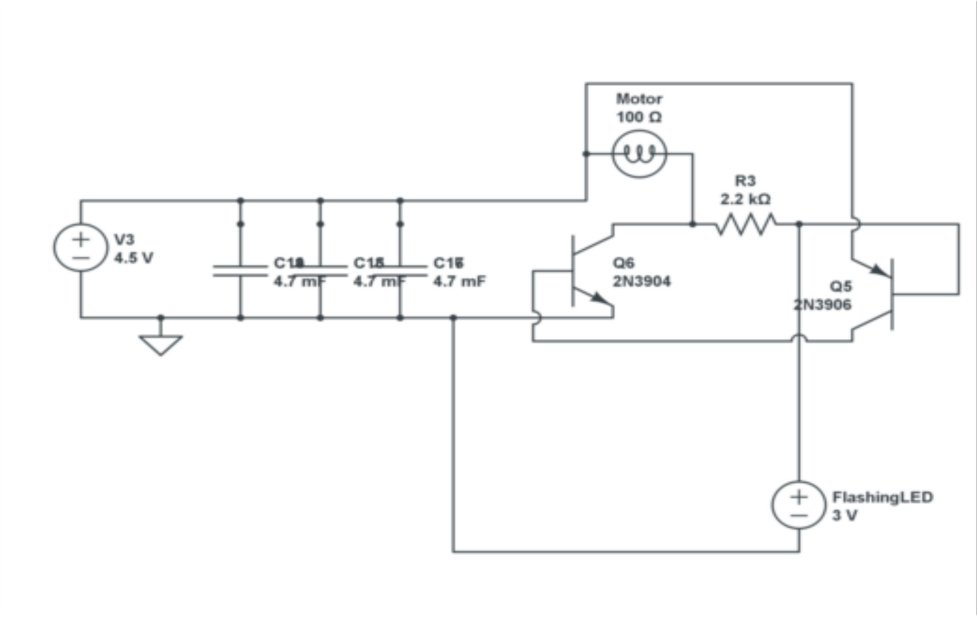

Figure 1: The schematic for our Solar Chariot

Once our circuit was complete, we found the next step to be extremely difficult, if not impossible. When creating our wheels and chassis for the chariot, we had to predetermine the dimensions of our circuit and motor, with the end result being the pieces in Figure 2.

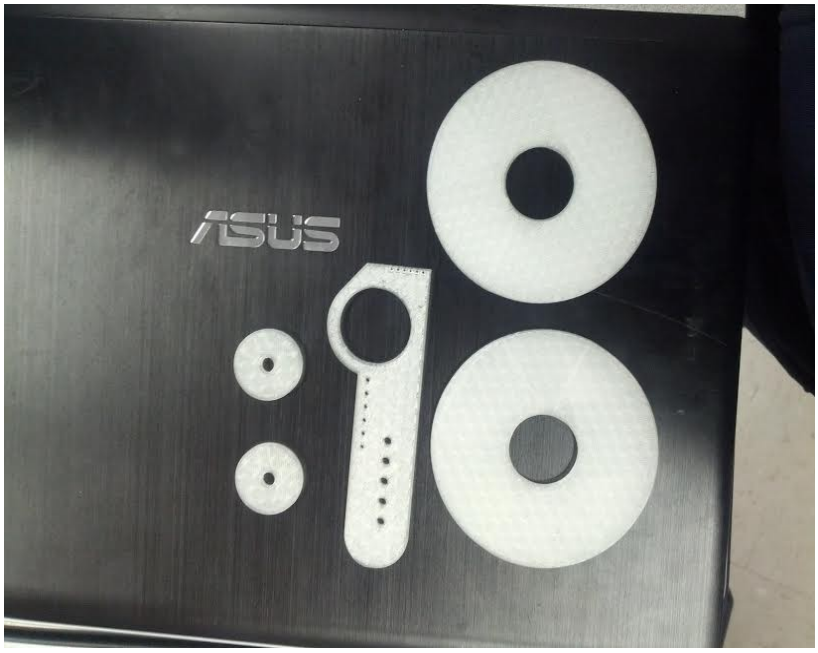

Figure 2: The chassis and wheels after coming out of the 3-D printer.
The tolerance for the printer was.. .10", while a lot of the dimensions of our pieces fell in the .125" range, so we were very nervous about the tolerances of the pieces when the combined.

The motor were using was extremely heavy compared to the lightweight and small pancake style motor that was recommended, so even if everything could be properly mounted on the chassis, it

wouldn't have enough torque to get any sort of momentum or movement. After a little deliberations with our instructor, we came to the conclusion that it would be better to keep the circuit mounted on a breadboard, figure 3, and turn our chariot into a spinning fan.

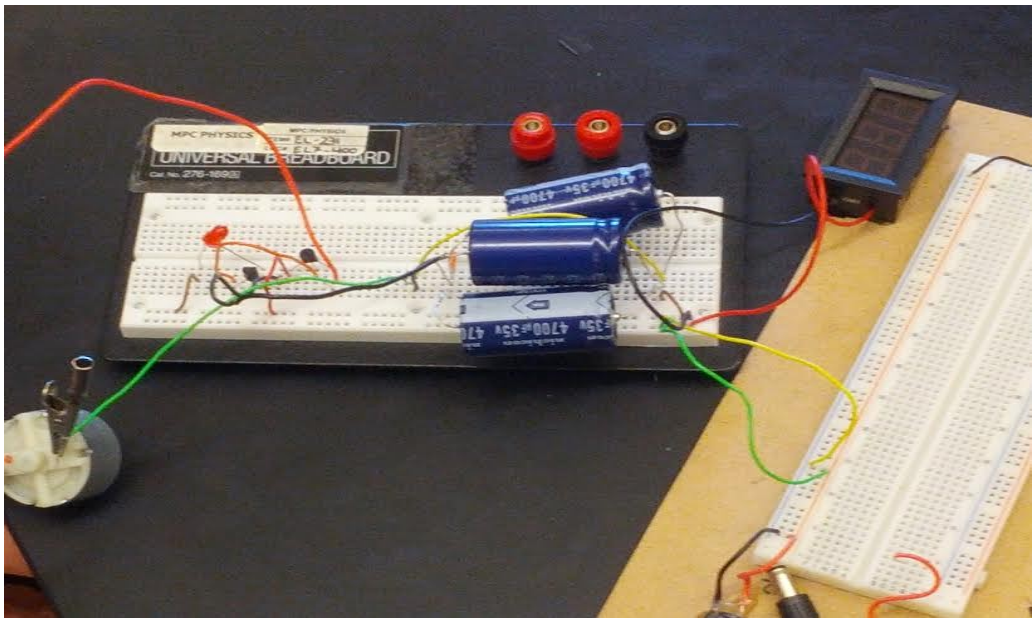

Figure 3: Our circuit mounted on a breadboard

One of the major lessons learned from this project is to properly account for dimensions and required space necessary to build ones device. After building the device numerous times, with slightly difference variations in the location of components, it became clear that the circuit was too big and immobile to ever be put onto the predetermined chariot. Even the 4700*10^-6 F Capacitors the project shows as an example were half the size of the capacitors we were able to purchase. Our breadboard became extremely cluttered making troubleshooting any issues an overwhelming challenge.

Our circuit ended up being much more complicated than we expected, and it took us numerous tries to get the correct wiring combinations that we liked. In the end, out circuited was as follows in figure 4.

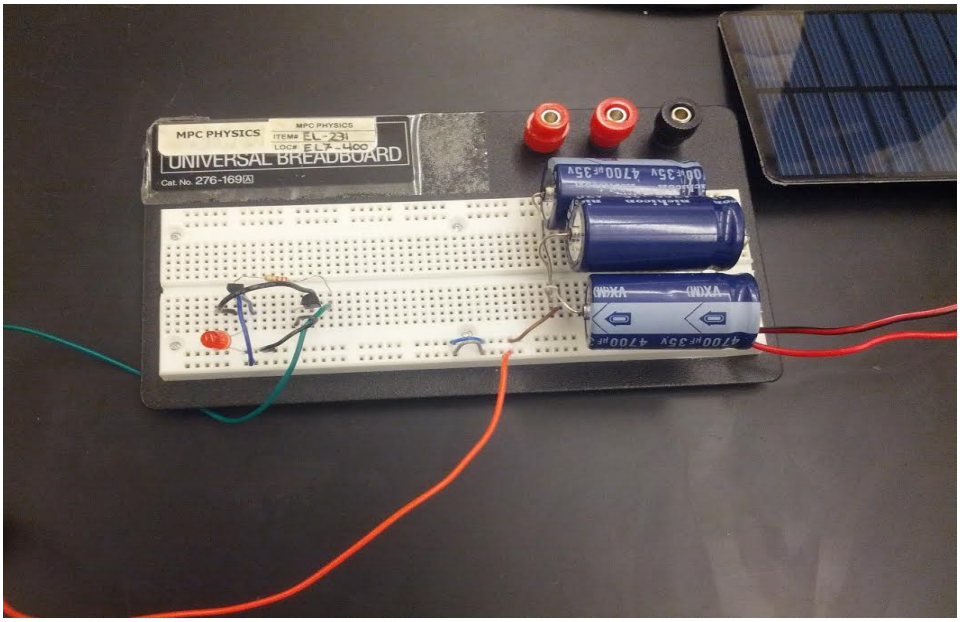

Figure 4: Our final circuit, with the motor off to the left and the solar panel on the right.

https://www.youtube.com/watch?v=bms9qxa0iR8&feature=youtu.be is a video of our project, with solar panel attached as well as motor. Seeing everything together and working was a very rewarding experience, especially after such frustrations with the schematic.

In the future, if we were to retry this project, I might recommended holding off on building and buying the wheels and chassis until the very end to allow for proper dimensioning. I would have also like to try various combinations of resistors, capacitors, and difference color LED's to experiment with the amount of torque the motor could produce.