Construction Tips

When you begin designing your solar car, a few ideas must be taken into consideration to maximize the speed of the vehicle, including the following:

1. Weight of the solar car
2. Direction of the sun
3. Addition of Reflectors
4. Setting up the Guide Wire

There will be tradeoffs when designing your vehicle. For example, a lighter car in weight will go faster than a heavier car. However, adding reflectors that increase the weight also can increase the power output (increases in the power may lead to an increase in rotation per minute (RPM)). It is **highly recommended** that you test your vehicle several times with a guide wire before the day of the race to ensure all components remain attached and your eyelet does not prevent the solar car from traveling the length of the course. One last note to remember is that mistakes are OK! Learning from our failures is part of the process to creating a successful solar car.

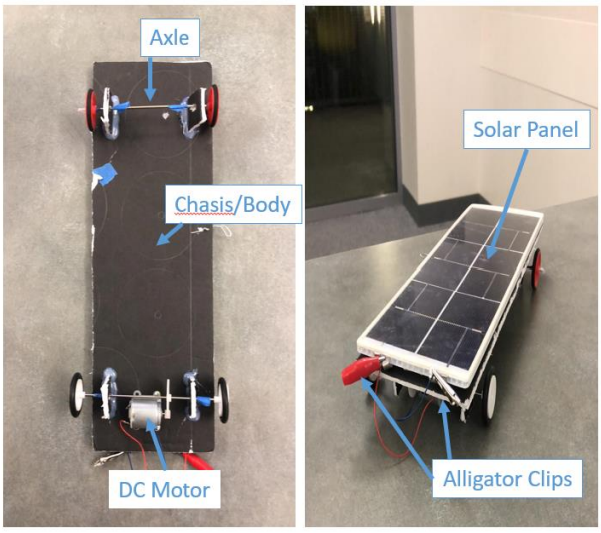
Weight of the solar car:

There is no limit to the weight of the vehicle in the regulations, however, a larger weight will cause more friction between the wheels and ground which will result in lower speeds and the larger weight results in a larger inertia to overcome, decreasing the acceleration. Think about the type of materials you would like to use to increase the speed as much as possible. Be as creative as possible and attempt to use recycled materials, they will earn you points during the holistic review of your solar vehicle.

On another note, if you decide to add reflectors on your vehicle, consider the minimum amount of weight that will lead to the highest power outputs.

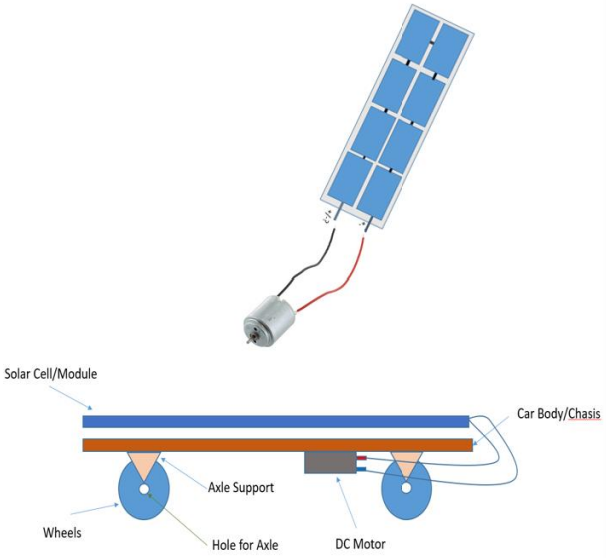
NOTE: If the motor breaks due to high solar panel power outputs, this will result in automatic disqualification from the race. The vehicle must be able to run with the motor that will be inspected the day of.

Assembly Component of Basic Solar Car



Note: Important to have axle aligned parallel otherwise car will deviate or prone to turn

Circuitry



Direction on Travel:

Solar energy comes from the sun, which takes different positions in the sky as the day progresses. Therefore, it is useful that your solar panel is directly facing the sun during the competition. Figure 1. below is a satellite map of UC Merced and a star is placed where the location of the race will occur. Online platforms and software applications allow you to determine where the sun will be during the time of the event. Figure 2. shows the location of the sun at four separate times for the month of March according to the location of the race.

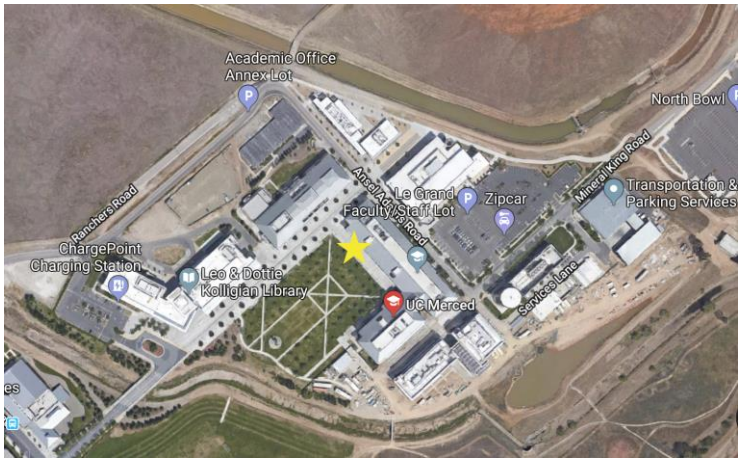


Figure 1

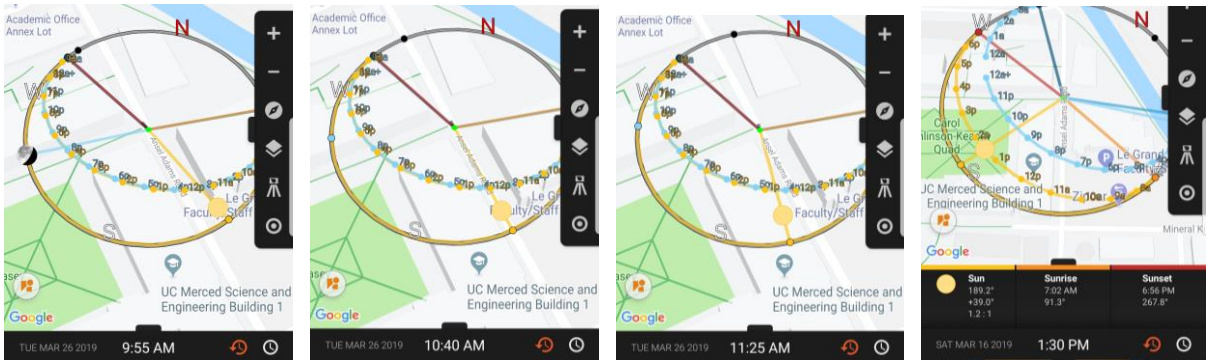
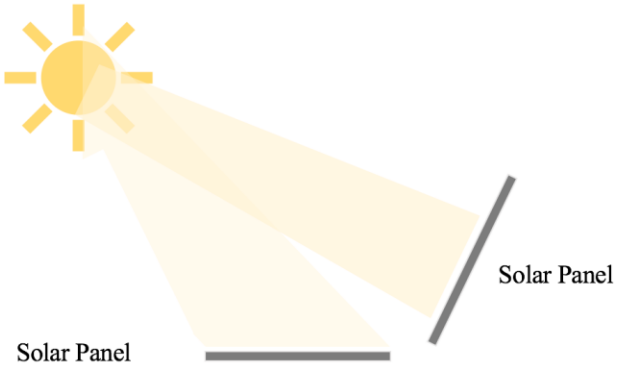


Figure 2*

As the morning progresses, the sun travels southwest and the direction of the sun's rays change. It is important to know which direction the car will be heading in order to ensure the solar panel receives as much direct sunlight as possible.

It is common to lay the panel flat on the vehicle, however, there is some benefit to setting the panel on the vehicle at an angle. Depending on the location of the sun in the sky, a specific angle will lead to the highest solar panel power output. For example, in Figure 3, part a) shows how the sun's rays at an angle will lead to a higher illuminated area which leads to not as many rays hitting the solar panel surface compared to sunlight that is perpendicular to the surface.

a) Time: 9 am



The solar panel on the right receives direct sunlight. The rays of the sun hit the left solar panel at an angle and therefore, receives rays that are spread over a larger area and produce smaller power outputs.

b) Time: 12 pm

At 12 pm, a flat solar panel will receive direct sunlight and obtain the maximum amount of solar power output given no clouds in the sky.

Figure 3

*Images provided by Sun Locator application

Reflectors:

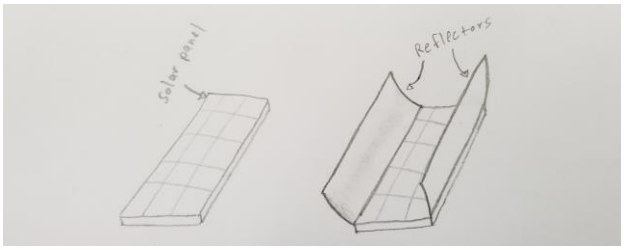


Figure 3

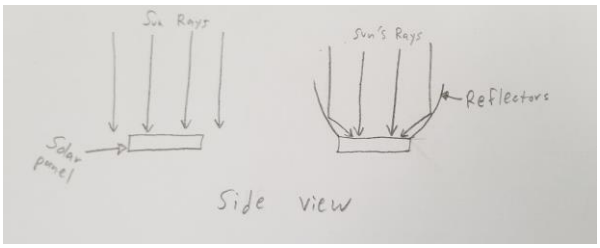


Figure 4

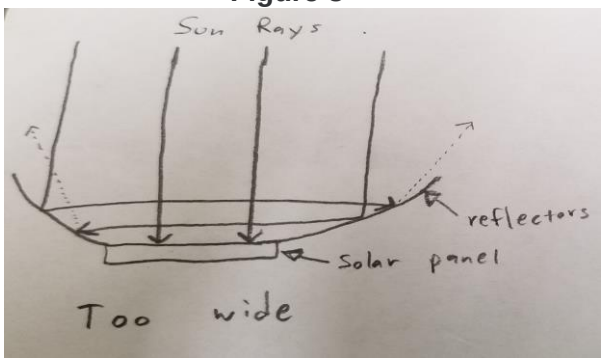


Figure 5

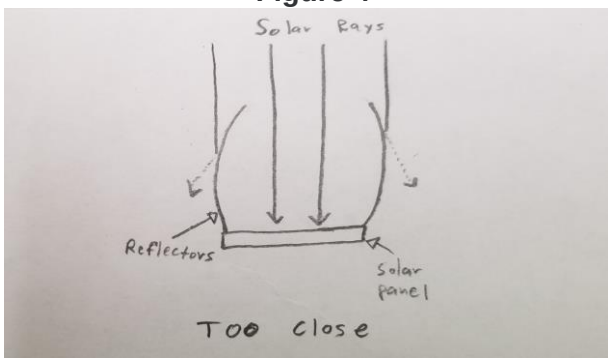


Figure 6

A Reflector can be used as an additional component to increase the speed of your solar car. How the Reflector works is by having two parabola shaped curves extend from the sides of the solar panel to gather more solar rays which will then increase the current delivered to the motor, as shown in **Figure 3 & 4**. An important hint to note when creating the reflectors is that when making the curves, you should be careful to not have the curves extend too wide like in **Figure 5** which will not allow all of the solar rays to bounce off into the solar panel but instead out of the solar panel. In addition, if the curves are made too close to each other like in **Figure 6**, they will block off solar rays from entering the sides or center of the solar panel. Therefore, you will have to do some decision making on how far the reflectors would have to extend to gather as much solar rays as possible. UC Merced has some of the world's experts on the best shape for your reflector! The Materials used for reflectors could be aluminum foil, mirrors, Silver Mylar, white plastic or any other shiny materials that can be used for reflective sheeting. Although the reflectors will give your solar cars a boost, one thing to consider is that the car will have some added weight. Reflectors are optional, and you may wish to omit them if this is the first time you are building a car.

Setting up the Guide Wire:

It is required that all vehicles have a detachable guide wire holder. There is no requirement to the location of this part or any exclusion of certain materials. The objective will be to find a guide wire holder that will not slow down your vehicle. It is recommended that you test your guide wire holder before the day of the race. The racetrack will consist of a string or wire to guide the solar vehicles straight. You can test your vehicle by having one person hold a 30-meter-long string at each end and inserting the string through the detachable guide wire holder.

Examples of eyelets:

Figure 5. Wire curved with pliers and inserted into wood

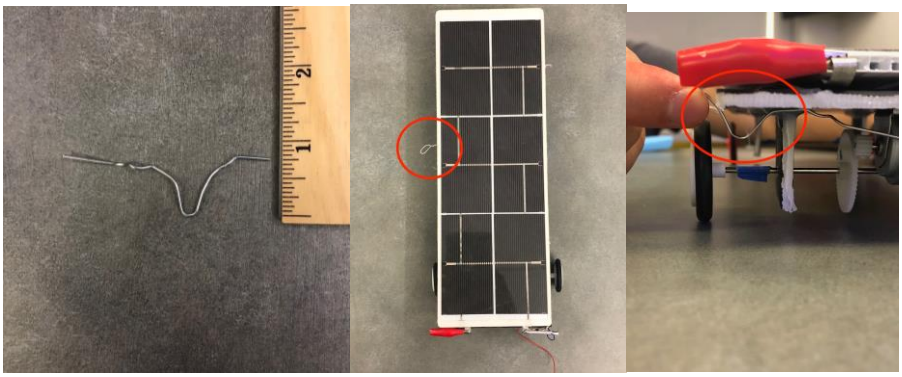


Figure 6. Paper clip refolded and inserted into foam board (base of car)

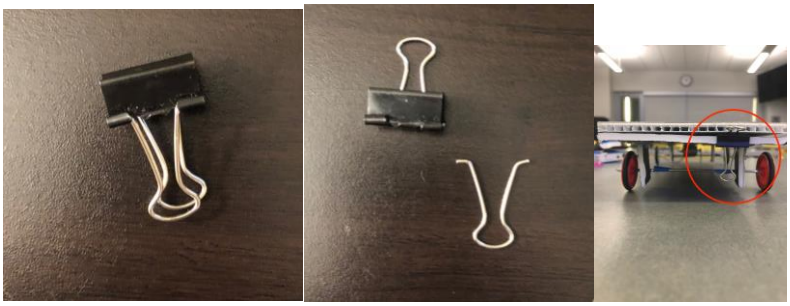


Figure 7. Binder clip attached to foam board with hot glue gun and wire is removed to place guide wire