

Pacific Garbage Patch

C3



Hardware Review 1

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Sponsor: Dr. Trevas

The Pacific garbage patch cleanup worked on collecting most of the parts needed to build the cleanup device that collects ping pong balls in the water autonomously. Dr Trevas and the team realize that there is a lot left to do to create the device. The team must finish ordering the remaining parts in order to construct the device.

Stephen worked on the grabber. He 3D printed an original prototype. The length was too short, the depth and the arm were too long. After the boat was shipped in, Stephen redrew the grabber to the proper dimensions He placed in the order on Wednesday before the hardware review. Unfortunately, the maker lab was down to one large 3D printer, and it was having malfunctioning. Stephen picked up the misprinted grabber to show the proper dimensions of the final product.

Mohammad worked on the motors. He used the information from the grabber to determine the torque needed for the motor. After Mohammad decided with the team and Dr. Trevas in the staff meeting, he researched for a motor that works in the boat to make the grabber collect the ping pong ball from the water. He found a motor (TETRIX W39530) which is good with torque and speed. He decided with the team to go with this motor. Dr. Trevas approved the order. Mohammad ordered the motor and he got it three days ago. Mohammad will work with the team, Stephen especially to make the motor work with the grabber. We decided to have a gear to make the motor carry the grabber.

Salman worked on the solar cells. Compared the values resulting from various configurations (how many in series/parallel) of the cells. He looked at the efficiency and the possible collection in order to calculate how many cells would be necessary given the boats electrical components. Given the calculations, a platform has been designed to be mounted above the boat in order to fit the necessary amount of cells. He ordered the panels, which will be mounted on the designed platform ensuring enough power is collected for the device to run continuously. The cells will be connected in series and some in parallel where necessary, then wire them to the boat's battery. To work towards the next hardware review, Salman will continue working with the cells to optimize the energy output and connect it to the boat's battery to run the boat as long as the battery is charged from the solar cells.

Jake attended Arduino club meetings to learn how to program all the components to work autonomously. He has also worked on multiple CAD parts including all of the original CAD assembly and assisted on both the original grabber prototype and the cell platform prototype. He assessed the updates to the grabber dimensions needed for Stephen to update the part including the height, width, and thickness of the grabber as well as the radius of arm to attach the piece to the boat. To meet the needs of the next hardware review, Jake will continue pursuit of Arduino to automate the device. He will also continue assisting the CAD designing of parts.

Nader worked on the camera. Originally he tried to use a thermal camera to sense the balls in the water. Yet, the thermal cameras were too expensive. Nader then decided to do many research to help the the team. Nader found a Ov7670 Arduino Camera. Its a visual camera which can help the team to figure out where is the location of the ping pong ball. The size of the camera is 1/6 inch and this good for the boat. Nader discussed with Dr. Trevas about the camera that he found. Dr. Trevas was happy about this type of camera, so he encouraged him to order it early. Ov7670 Camera works by connecting some wires in Arduino. In addition, this camera can more easily be coded to sense the balls in the water.

The Pacific garbage patch cleanup team must complete several action items before hardware review. The new action items must focus on completely building the final product with all its parts. There is extensive coding that must also be done in order to make the device fully autonomous. The team must order bevel gears and axles to connect the motor to the grabber in front of the boat. The grabber might need to be slightly modified to reduce the mass without sacrificing strength in order to reduce the torque.

The reduction in torque might be needed to allow less solar panels and a lower torque motor if necessary. The group must also build the platform for the solar panels and the collection bin below for the ping pong balls. The batteries for the motors must also be ordered. The solar panels must be connected to the components. The camera must recognize the plastic ping pong balls. The signal must then tell the boat to drive to the balls at defined speeds (speed over when far and then slowly approach once close). Then the grabber must scoop up the ball and drop it into the on-board collection bin.

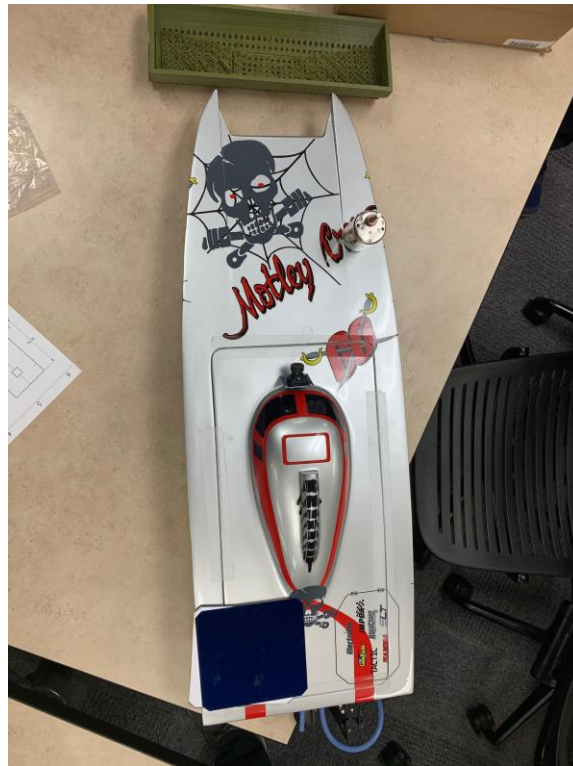


Figure 1: Pacific Garbage Patch Clean Up Device

The figure above contains the boat, grabber, motor, camera and, a solar panel. The pieces are placed for comparison in sizes along with their approximate locations, excluding the solar cell. The solar cell will be placed on top of a platform which is still to be printed and attached above the boat. Axels and bevel gears are awaiting design to connect the motor to the grabber.



Figure 2: Grabber V2

The picture above shows the grabber that is 30cm long and 10cm wide. The thickness is 0.5 cm. Each hole is also 0.5 cm. The edge thickness might be decreased in the future to save mass. In addition the hole diameter might increase up to 0.75cm in order to reduce mass. The reduction in mass will reduce the torque needed for the motor to generate in addition to the reduction in cost.

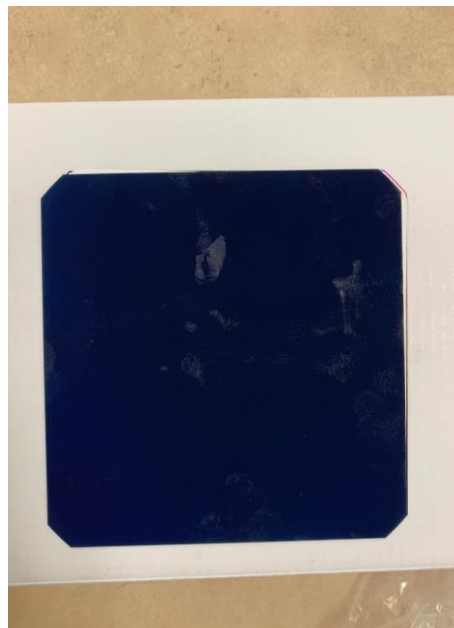


Figure 3: Solar Panel

The cells are very thin and light while being very fragile. Each cell is 5 in by 5 in with an approximate 25 cells needed to sufficiently power the device.

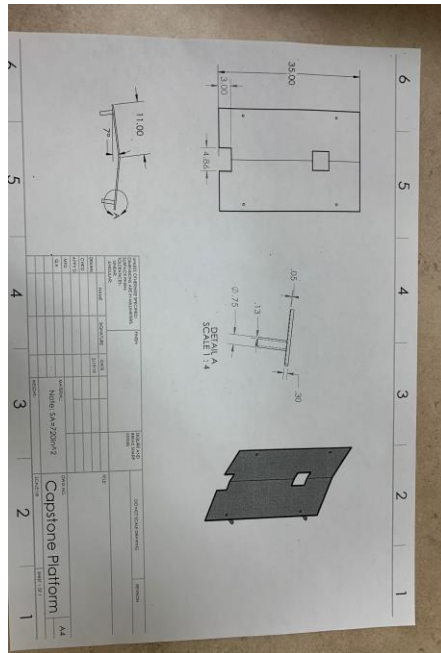


Figure 4: Solar Panel Platform

The initial design for the platform contains a projected 720 in² surface area which is enough for 28 cells. It contains slots for the collection of the ping pong balls as well as for a tower to hold the board and camera. Mounted above with hollow stilts, the cells can be mounts above the platform with wiring through the stilts to the main hull.