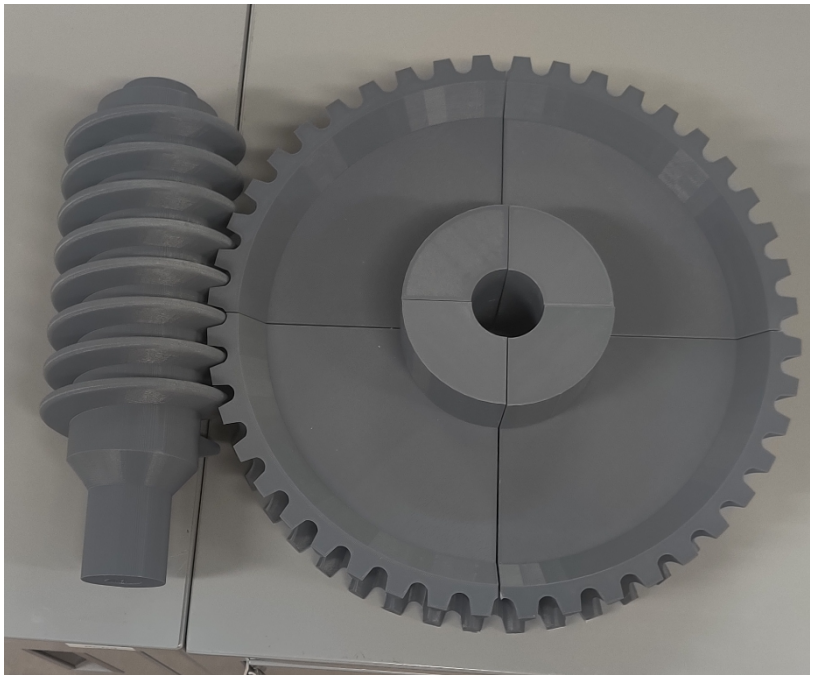
Figure 1: Talha's Gear Designs



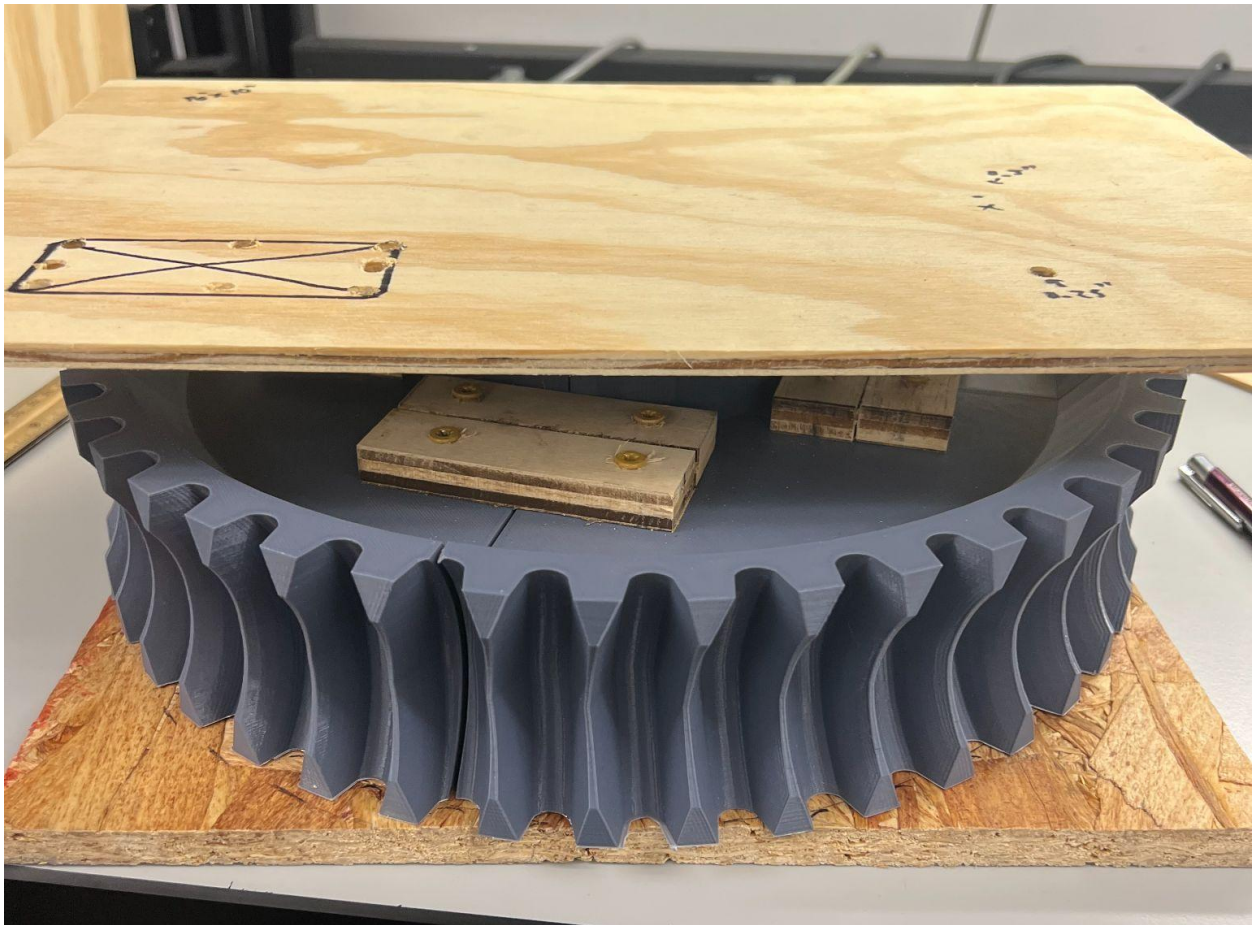
Talha worked incredibly hard to design his gear configuration we would need for the project. Cooper assisted with the design by helping to determine dimensions needed as well as helping to plan how the gears would be used for the project.

Figure 2: Worm Gear Holding Construction

In order to get a clean contact point of the worm gear to the main gear a holding block was used to keep the stepper motor elevated and would tightly hold the stepper motor in place. This is shown as the left block on our platform. The worm gear was far too heavy to be held up and reliably turned by the stepper motor so a second support

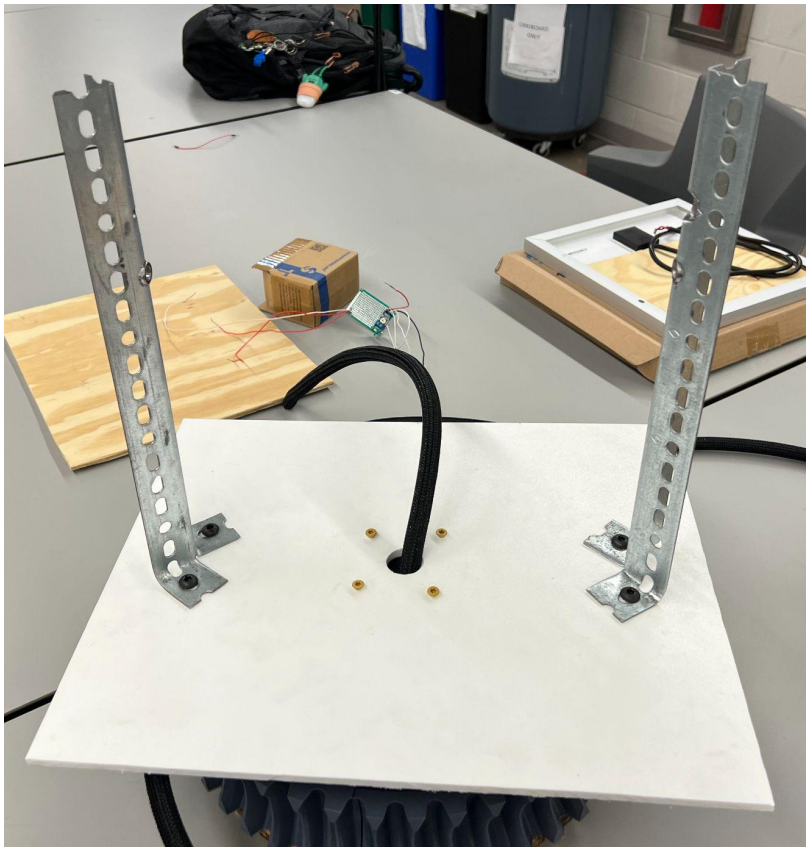
block was designed to hold the end of the worm gear. Using 3d printed parts and a ball bearing to reduce friction the worm gear was able to reliably rotate.

Figure 3: Securing the Worm Gear and Support Beam Platform



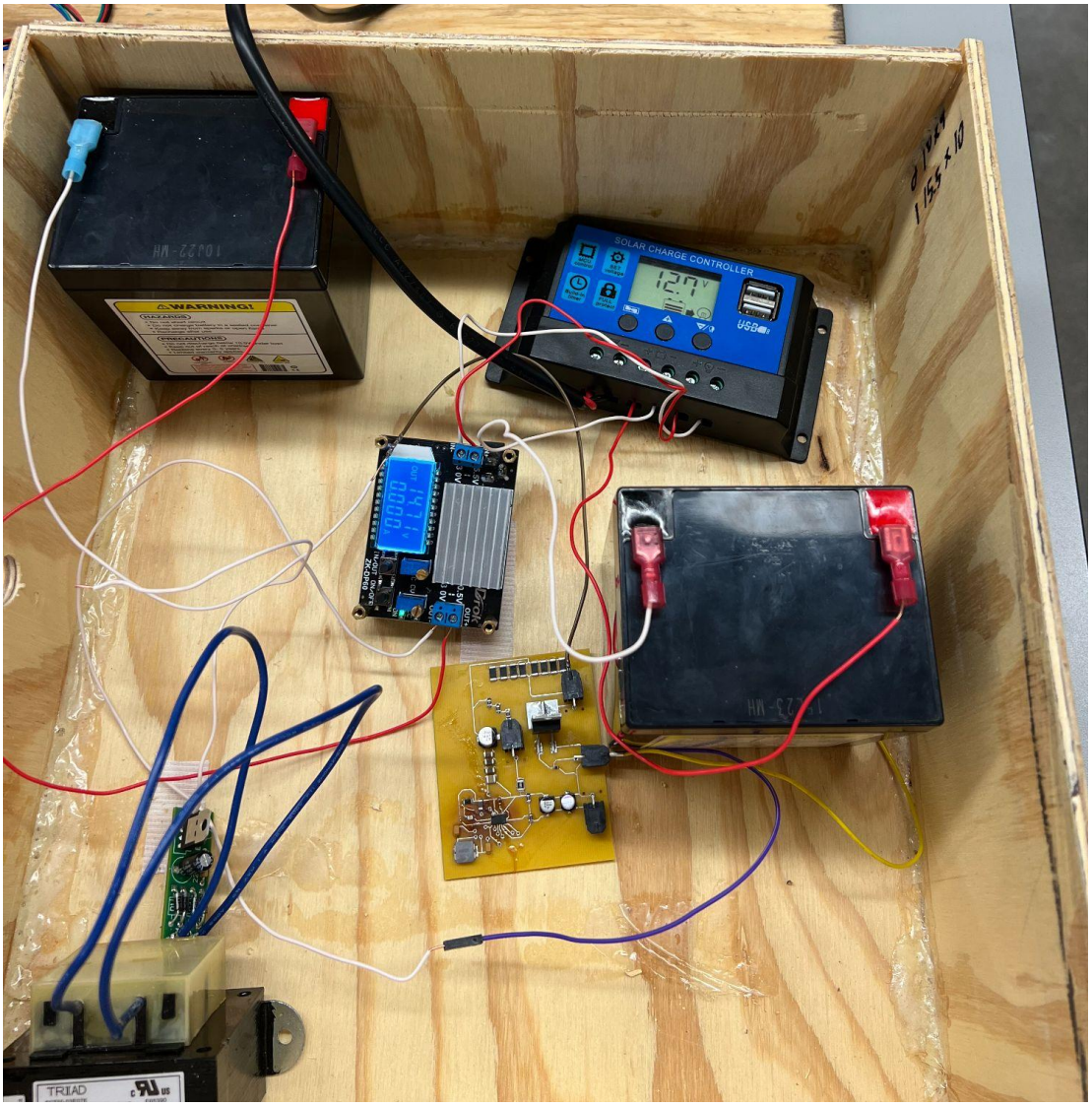
The Main gear was too large for the 3d printers we had available for this project as the extra large 3d printer was too expensive. To accommodate this issue, Talha and Cooper decided to print the main gear in 4 equal parts. This solved the printing problem but now the pieces had to be fastened together. The gear pieces were connected using small pieces of wood that had to be cut and fastened to the gear system using screws. Additionally in order to spin the main gear without friction with the ground a lazy susan was used and needed a smooth connection point. This was resolved using an additional piece of wood placed at the bottom of the contraption that was then cut to the proper circular shape as well fastened to the main gear. Lastly a platform was needed to connect the support beams of the solar panel to the main gear system. This was originally designed using wood but was later switched to a plastic board.

Figure 4: Solar Panel Support Beams



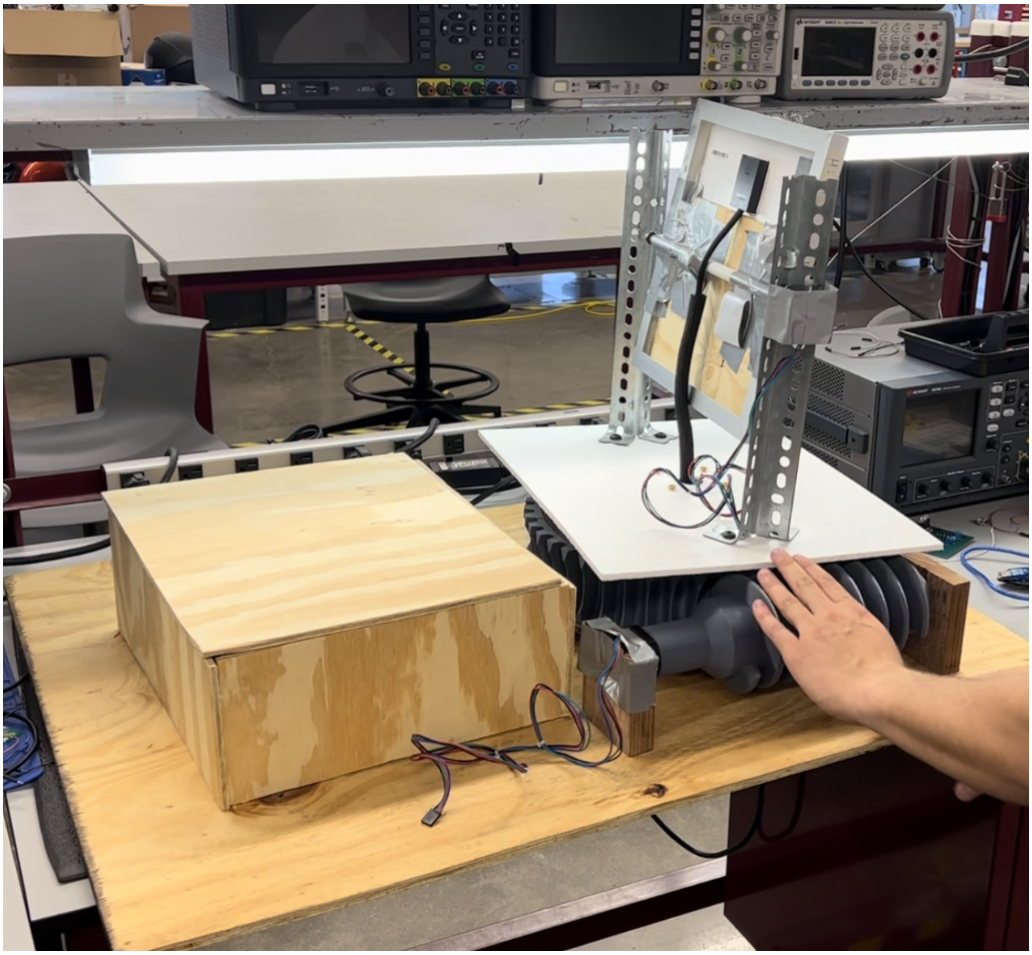
In order to connect the main gear system to the solar panel, two support beams were constructed to accomplish this. These beams were originally two long steel beams that needed to be cut to length. After the proper length was obtained, a slit was cut to fan out at the bottom so that the beam could be fastened to main gear. A hole was needed to be drilled into the vertex of the beams to allow for a ball bearing to be placed within the cut out. It was important not to drill the hole too big as well as to not drill the hole all the way through so the ball bearing can be secured without falling through the beam. This ball bearing setup was replicated on the other support beam as well.

Figure 4: Control Box Construction



Many of our electrical equipment pieces took up a large amount of space on our ground platform. To house these components a large piece of wood was sawed into the six components that were needed to form a cube that would contain all of our components and keep them out of the way from the gear system. However, a way to access these components was still necessary so two small holes were drilled into the walls of the control box that would allow for a wire casing to neatly store all of the wires that would travel out of the control box.

Figure 4: Control Box Construction



Our final built structure is presented here. It consists of the gear system, worm gear holds, main gear connecting platforms, solar panel support beams, axial rod that holds the solar panel, and the control box. The axial rod was the final part of our construction to be fabricated. It consisted of a cylindrical beam with holes drilled into the ends to allow for 3d printed components to attach to the ball bearings embedded into the support beams.

Full Construction Movement Video: https://www.youtube.com/watch?v=pweY3_f5rAo