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ETECH 100

Project Paper

Background

The idea of this project came from Megan Donahue. She came to us with client that she had and wanted us to come up with something to help her client feed his animals on the ground. Her client cannot walk, he can barely move his arms. At most he moves his hands. He is mobile in a wheelchair but needs assistance when moving around.

We knew as a group this was a hard task to attain, but we decided to create a mobile dog feeder that will connect to his wheelchair. This way he can move around and not have to worry about bending down, trying to reach food in a bag and risk harming himself from falling out of his wheelchair. He would now be able to connect with his pets in a whole new aspect and will also create a happier environment for him. This part does not cost much to make at all and would be super easy to make in a high/fast production plant.

We had background with the arduino board and some of the coding/programming that goes along with it. We figured we could easily incorporate what we learned in the first few weeks of class to our project now. We wanted to design something simple enough that the concept is easy to understand and is super easy to fix. Megan Donahue is our personal source, we used her for most questions and roadblocks that we attained during the weeks of designing.

Design

We decided to use some left over sheet metal to create a cube with a lid that is about 12x12x12 inches. Garrett had come up with this design to create a big top for the lid so it is easily accessible. The sheet metal is a little heavy, but it gets the job done. The lid was mounted on with hinges on the side of the box. There is also a hole in the middle of the lid to be able to see how much food is left and if some needs to be added.

On the bottom of the box, we lofted sheets of wood to create a rectangular box about 2x6 inches on the bottom. If we had more materials and a bit more time, this all would have been 3D printed to create a lighter, more mobile box. The plywood we used was about a half inch thick. All sheets start at 12 inches on the top and are cut down to either 2 inches on the bottom, or 6 inches. You will need two of each to create this opening. Creating this will allow the food to fall to a center point on the part, which is where the wheel is mounted.

We 3D printed a wheel. The wheel is $1\frac{7}{8}$ inches wide and $5\frac{7}{8}$ inches in diameter. The center needed to be created and shaped to hold the stepper motor we are using to turn the wheel. The other side was designed to hold a shaft which will be $\frac{1}{4}$ inch in diameter. The wheel has 7 different slots in it to be able to scoop the dog food from the top and rotate it around to the bottom to fall out of the lofted 2x6 inch rectangle. We mounted the wheel to the bottom by cutting out a slot to hold the stepper motor on one side. We then cut around a $\frac{3}{8}$ inch hole and slid a $\frac{1}{4}$

inch bolt in to hold the other side of the wheel. The arduino board is mounted to the side of the lofted pieces of wood.

The arduino was programmed with a switch. Every time you turn on the switch it will rotate the servo 51 degrees. Allowing 1/7 rotation of the wheel. This way you cannot overfeed the dog and not have the wheel continuously rotating and creating a mess. The switch is right on the arduino board. It is mounted right to the wood that is lofted and is also run off a 9V battery.

Design Analysis

The design we came up with was something simple. We decided it would be best to use the materials we have, but if we had the correct lab and machines, this part would all be 3D printed to be made cost efficiently and also lighter.

Using the arduino was a more difficult aspect of the project. The coding was more difficult because of the servo only being able to rotate 180 degrees. We wanted to make it rotate the wheel 1/7 of a rotation at a time. We glued the servo motor right to the wheel allowing the servo to control the wheel. One problem we ran into was when the motor wants to reset itself back to the starting position. We decided to leave it, allowing the wheel to rotate backwards as well.

Creating the loft was an easy design to come up with because the food needs to come to a point for a wheel to be able to dispose of it. A square body for the base was a perfect design to make it simple to mount onto anything. You could put this on stilts as well to hover above a bowl in order to feed a dog. You can create different purposes for the same design.

The wheel was created to have 7 different divots in order to dispose of enough dog food at once, but not too much at the same time. With the speed that the motor runs, it is not being thrown out at a rapid pace, but just slowly enough to be able to drop.