Addie Bush, Asa Hood, Mia Chavez, Nick Becker

Professor Fankell

MECH103

5 December 2022

Final Project: Turtle Feeder

Introduction:

Have you ever had to pay a pet-sitter ridiculous amounts of money just to feed your pet for a week? Well, most college students do not have the money to afford this type of care, so we decided to create an automatic turtle feeder for groupmate, Nick Becker, and his turtle named Fish while he's away for long weekends. We have designed and built a feeder that has the ability to automatically feed Nick's turtle for up to four days unsupervised. The design includes a motor and rotating wheel that functions based on the times the turtle needs to be fed using code from the Arduino. This will create ease for Nick while he is away knowing that his turtle is alive and happy, and he is not spending wasteful money.

Figure 1: Fish the turtle

Background:

Finding a pet sitter is a difficult process and can result in spending a lot of money to complete simple tasks for pets. American spend a ridiculous amount of money yearly on pets. An estimate puts this number at $109.6 billion spent on pets in 2021. This spending was spread over

around 90.5 million homes, meaning each household spent over $100 per month on pet care (Gray). When a significant portion of paychecks is put towards a pet as is, many owners dread spending even more to find a sitter when they are out of town and unable to care for their pets. Nick's pet is a turtle, and aside from the trouble of paying for care while away, it is nearly impossible to find a sitter. By mechanically engineering a system to automatically feed the turtle, Nick can save time trying to find a sitter and money to pay them.

We began with an idea of a conveyor belt composed of popsicle sticks but ran into problems with the ability of rotation for the amount of days that were required, so we switched to a "ferris wheel-like" structure that rotates on a pair of small wheels that are attached to the motor and Arduino. Additionally, we initially wanted to be able to automatically feed the turtle for a total of a month, but we discovered that our motor is unable to rotate a total of 360 degrees on a timed rotation. In order for it to work accurately, we needed to shorten the amount of time that the feeder has the ability to provide food for the turtle. Now, the feeder is able to spin for a total of four days without supervision.

Methodology:

Materials used:

- Popsicle sticks
- Hot glue
- Axel
- Paper

- Wheels
- Arduino Micro servo
- Arduino uno board
- Jumper wires

Build process

1. Build a frame out of Popsicle sticks. This included two triangles made out of popsicle sticks and spacers between the frames to strengthen the structure and keep the two supports the same distance apart. Secure all parts with hot glue.

2. Mount two wheels (or any object with a circular hole in the middle) to the top of the frame using hot glue, in which place a free spinning axle made of two halved popsicle sticks.

3. Build a half a Ferris wheel, containing four compartments, on top of the free spinning axle and in between the two wheels and secure using hot glue. Use a sheet of paper to enclose the sides of the compartments. Add a thin line of hot glue at the edge of each compartment to prevent premature dispensing of the food.

4. Build a support for the servo motor and attach it to the bottom of the frame, using hot glue, perpendicular to the axle. Attach the provided servo arm to the free spinning axle using hot glue.

5. Connect the servo motor to the Arduino and write the Arduino code to spin the servo a set amount per day using the delay function and 86400000 milliseconds to allow 24 hours in between each partial rotation.

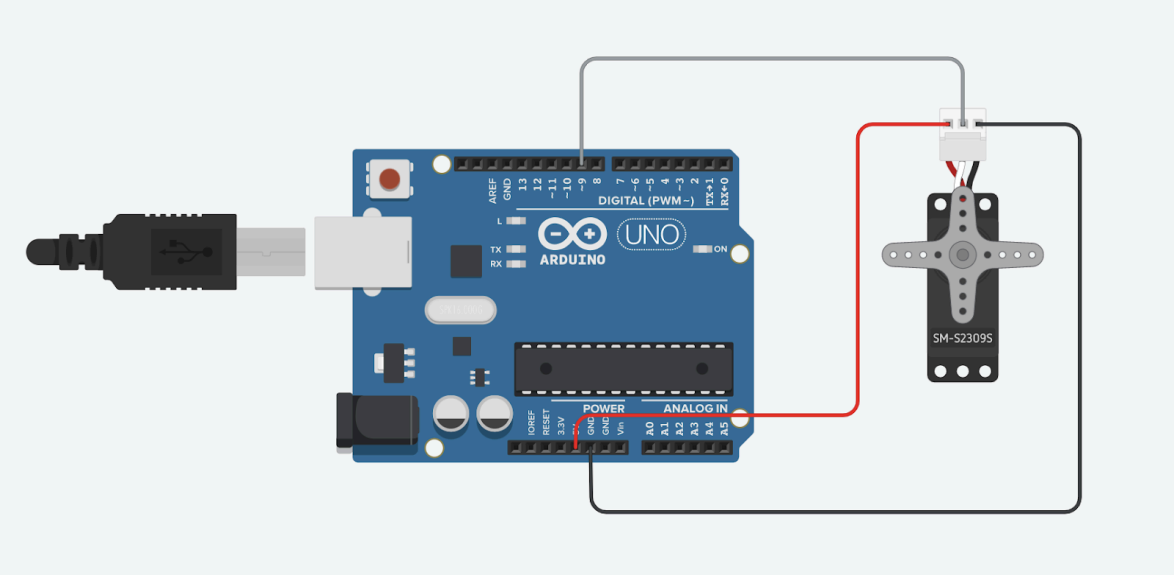

Figure 2 : Arduino and servo motor wiring diagram

```
// Include the servo library:
#include <Servo.h>

// Create a new servo object:
Servo myservo;

// Define the servo pin:
#define servoPin 9

// Create a variable to store the servo position:
int angle = 0;


void setup() {
  // Attach the Servo variable to a pin:
  myservo.attach(servoPin);
}
void loop() {

  myservo.write(0);   // Set servo angle to 0 degrees.
  delay(86400000);    // Wait 24 hours before next action.
  myservo.write(30);  // Set servo angle to 30 degrees to empty first compartment.
  delay(86400000);    // Wait 24 hours before next action.
  myservo.write(80);  // Set servo angle to 80 degrees to empty second compartment.
  delay(86400000);    // Wait 24 hours before next action.
  myservo.write(130); // Set servo angle to 130 degrees to empty third compartment.
  delay(86400000);    // Wait 24 hours before next action.
  myservo.write(180); // Set servo angle to 180 degrees to empty fourth compartment.
  delay(86400000);    // Wait 24 hours then motor will return to 0 degrees.
}
```

Figure 3: Arduino code to operate servo

6. Construct a small ramp out of popsicle sticks and attach it to the bottom of the frame following the slope of the supports. Place it on the side the food will dispense from.

7. Fill up the Ferris wheel and plug in the Arduino and forget about feeding your pet turtle for four days

The only problem we had with the construction of the feeder was the premature dispensing of food. We were able to solve this by adding a thin strip of hot glue along the edge of

the compartment. It kept the food from dispensing prematurely while also allowing the food to come out at the correct time.

Results:

When the feeder was plugged in it worked as planned, The feeder dispensed the correct amount of food four days in a row and once per day.

Figure 4: final product ready to go

Now Nick will be able to travel and spend a long weekend away from home because he has four days where he does not have to worry about making sure his turtle is fed. Fish the Turtle will also not have to worry about dying in those four days when Nick is gone, thanks to the new automatic turtle feeder, he will be fed on time and the correct amount four days in a row.

Conclusion:

While our project is focused specifically on one person, one turtle, and one problem, figuring out how to keep the turtle fed and alive while Nick is away is one problem solved through the simple use of mechanical engineering. From our Arduino kit, our main components include the arduino board and a motor. By simply connecting wires appropriately and coding the kit to rotate the motor, we are able to have the ferris wheel with food rotate, dropping the amount of pellets needed to feed the turtle for one day. In the future we could find a different motor that turns three hundred sixty degrees so we can add more compartments to extend the period of automatic feeding. Another future improvement would be different materials, Ideally this could be designed and 3D printed, That would make construction easier and it could possibly make the product look better. This was an important problem to solve because nobody likes to have a pet die. If we can reduce the amount of turtles and other aquatic creatures that die due to under feeding with our product, I would like to think this is an important product. Feel free to replicate

Works Cited

Gray, Elizabeth. “Top 20 Pet Spending Statistics to Know in 2022: Who's Spending the Most on Their Pets?” *Pet Keen*, 4 Aug. 2022, https://petkeen.com/pet-spending-statistics/.