

Aidan Henderson dates below Daily log

Day 1 12/8/21 9:12 - 10:01

Aidan tested to make sure that all of the 3D printed parts would fit together correctly, but they did not so he edited the models and uploaded them to the 3D printer to print later. He also started to try and figure out how the servo motors work. Aidan was able to get one working by itself and started to work on getting two of them to work together.

Day 2 12/10/21 9:12 - 9:54

Aidan started what is hopefully the last 3D print that he needs and was notified of an issue with the printer. After a few minutes of trying to figure out what was wrong, he found that some of the filament had come off of the spool and wrapped itself around the pole that holds the filament and would not move off of it. He quickly fixed this issue and continued working on the rest of his project. For the rest of the time, Aidan tried to figure out how to use the nerf gun motors. Aidan found a circuit that will hopefully allow him to use the motors, and spent some time looking for the pieces needed. After finding the necessary pieces he tested out the code and the new circuit. Once it did not work he tried looking for a reason why. Aidan eventually looked at the micro switches that the motors are soldered to and saw that one of the wires on one of the switches had been snapped off before he started working on this project, so now he plans to try and remove the switches and try to get it to work without them.

Day 3 12/13/21 9:12 - 9:54

Aidan collected and cleaned up his 3D print as well as made sure that all of the pieces fit and worked together. Then he started to try and use the motors on the nerf gun before remembering that he plans to desolder the microswitches and decided to try and figure out motion sensors instead.

Day 4 12/14/21 9:12 - 9:54

Aidan researched nerf gun motors/micro switches and found programs that should be able to control them. After those programs did not work, he believes that there is something wrong with the motors or the wiring on the nerf gun.

Day 5 12/15/21 9:12 - 9:54

Aidan decided to cut the wires from the motors to the switches and solder them to different wires so they can be plugged into the breadboard. The wires were tested with a battery before soldering and they were able to spin. After lugging the wires into the breadboard, Aidan found out that they were using too much power and turning off the Arduino.

Day 6 12/16/21 9:12 - 9:54

Aidan switched from the motion sensor to an ultrasonic sensor for the "eyes" of the turret and started to try and work on using that. He also was able to set up the nerf gun to a battery snap which will power the motors instead of the Arduino.

Day 7 12/20/21 9:12 - 9:54

Aidan wired up the servo that will be used as the trigger for the nerf gun and got everything to work with the ultrasonic sensor, so if something gets closer or comes in between the sensor and whatever it was previously looking at, then all of the motors will turn on. He also switched out the motors he was previously using for the ones on the previously assembled turning mechanism.

Day 8 12/21/21 9:12 - 9:54

Aidan hooked up 2 more ultrasonic sensors so that the turret will know its left and right and where to turn when it senses something. He then wrote code to tell the turret to turn towards the sensor, fire, and then return to facing forward.

Day 9 1/3/22 9:12 - 9:54

Aidan re-familiarize himself with the turret and its circuit, then he started to figure out how he is going to assemble the turret.

Day 10 1/4/22 9:12 - 9:54

Aidan started to assemble the turret and realized that with the ammo and the magazine inserted into the gun, it is off balanced and leans back. Aidan plans to fix this by moving the breadboard and the Arduino to the front of the gun and tape the front down to hopefully counteract the balance issue.

Day 11 1/5/22 9:12 - 9:54

Aidan fully assembled the turret and started testing to make sure that the turret works. During testing he noticed that the connection to the motor at the bottom gets unplugged if it turns to the right.

At Home

12/8/21 9:12-9:54

Aidan was able to get 2 motors to work at the same time. He then started trying to get the Nerf gun motors working.

1/6/22 5:30 - 8:23

Aidan tested the turret and fixed some issues that occurred like the sensors being too sensitive. Aidan also found out about a glitch where the sensors will randomly detect a change in the distance.

Resources

<https://learn.adafruit.com/adafruit-arduino-lesson-13-dc-motors>

<https://lastminuteengineers.com/pir-sensor-arduino-tutorial/>

<https://github.com/kchutskoff/nerfgun/blob/master/NerfGun.ino>

<https://www.elprocus.com/electronic-speed-control-esc-working-applications/>

<https://howtomechatronics.com/tutorials/arduino/ultrasonic-sensor-hc-sr04/>

Final Write-Up

1/6/22

Goals

My original goal was to create a motion sensor nerf turret. It would have three motion sensors, one on the front and one on either side of the turret. When the motion sensor on the left or the right would detect motion the turret would turn towards that sensor until the front of the turret would be facing where the motion was and then it would fire. The way that it would find out where to point would be it would turn a little towards the motion sensors and then check for motion on all of the sensors again until only the front sensor would detect the motion, and then it would fire a shot. The turret was originally going to use a base that was entirely 3D printed. The base had two points where it would be able to swivel, one horizontally and one vertically. The base consisted of five 3D printed parts, all of which I had modeled in Fusion360. There was the bottom most portion which is where the motor for the horizontal motion would be held, the middle portion which sat on top of the bottom motor and held the arm and the motor that controlled the vertical motion, the arm which would hold the pivoting part and allow for the pivoting to happen, the pivoting point which would be held up by the arm and the vertical motion motor and connect to the gun connector, and the gun connector which would hold the gun so it could be put onto the base. But after I found a metal base that did the same thing as my 3D printed base (besides the specialized connector), but it allowed for a greater range of vertical motion, I decided to use that.

Problems/Solutions

The first problem I encountered was that the PIR motion sensors that I was using would not work reliably. No matter what settings I used for the sensors, the sensor would only work about half the time. So in order for me to be able to get this project to work, I decided to switch the PIR motion sensors out for some ultrasonic sensors. These sensors won't allow the turret to be as accurate as I wanted it to be, but they would be much easier to work with and allow me to be able to finish the project.

The next issue I had was that the motors on the nerf gun would not work. I started to do a lot of research on each of the parts which did not help. Then I decided to examine the wires on the nerf gun and found out that one of the wires were snapped. I did not know where I would solder the replacement wire to so I decided to cut the wires that lead directly into the motors and plug them directly into the circuit. I then found out that the motors consumed too much power for the arduino to handle, so I attached them to a battery snap. The motors being plugged into the battery allowed them to fire as long as they were powered.

Another problem that Aidan had was placing the sensors and arduino on the turret as well as balancing issues. Aidan was able to tape all of the components on top of the turret and he decided to not use the servo on the y-axis so that the turret will not fall over,

The final problem that I ran into was the ultrasonic sensors would randomly change the distance that they would detect even if there was no actual change in the real world. This issue caused the turret to activate when it should not have. I could not completely fix this issue, but I was able to minimize the amount of times the gun would randomly trigger by changing the code to make the sensors less sensitive.

Accomplishments

By the end of the learning module Aidan was able to get the ultrasonic sensor, motors, servo motors, and the arduino to all work together to get the turret to turn and fire when it senses something around it. Although he did not use them he was still able to 3D print and

model out parts that could be used as the base of the turret instead of the metal one that he found.

Learned

Aidan learned how to use the ultrasonic sensors, PIR motion sensors, and servo motors.

Additional things

If Aidan had the time to, he would have made the turret be able to judge the distance and fire at a specific angle that would be best to shoot and hit the target. He would have also tried to implement facial recognition software so that the turret would be able to precisely turn and point at any target that it would detect.

Suggestions

If anyone plans on doing this project Aidan would recommend that you pre plan how you are going to place all of the components on the turret and maybe even 3D model and print something that will hold all of the pieces on the turret.