

ECE 1000 Final Project Report:

Nerf Gun Turret

Eudik Garcia, Nathan Galloway, Jacob McMurray, George Vaporis

Tennessee Technological University
Department of Electrical and Computer Engineering
Cookeville, TN, USA

ejgarcia43@tntech.edu , gvaporis42@tntech.edu ,
ngalloway42@tntech.edu , jtmcmurray42@tntech.edu

GitHub: <https://github.com/geovapor/ECE-1000-Fall-2024-Turret-Group-Project>

Abstract – The Nerf Gun Turret is a project designed as a nerf gun mounted on a stand with two motors controlling its motion to aim on the x and y axes. The motivation for this project was that it would be unique and enjoyable to put together.

I. Introduction

The motivation for this project was that it was unique and fun to put together. Rather than doing one of the cookie cutters projects we wanted to do something that we would not only enjoy doing but would also be unique.

to help write the code for the color-based targeting system.

II. Background

As we developed the Nerf Gun Turret, we relied on online tutorials as resources. We referenced an Arduino stepper-motor guide to aid in the coding for the use of our stepper-motors. We also used online tutorials and templates

III. Project Description and Formulation

Materials:

1. Nerf Gun – To serve as the gun in the turret.
2. Breadboard – To make connections to communicate the stepper motors with the Arduino servo motor.

3. A wooden 2" x 4" – Serves as a stand for the turret to rest on.
4. Plywood – Creates a strong base for the turret stand.
5. Marbles – Used in between two plywood circles to reduce friction.
6. 2 Stepper motors – For motion of the turret in the x and y axes.
7. Wooden Rod – Used to hold the nerf gun in place, connected to a motor on the y axis to move it.
8. Jumper Wires – To make the necessary connections between the Arduino servo motor and the breadboard.
9. 2 Clear Plastic Panels – In use with screws to hold the stepper motors in place on the wood.
10. Colored Paper – Used as a target that the webcam can differentiate from other colors.
11. 3' x 4' Canvas – Served as a larger target in which the colored paper is placed; to demonstrate the nerf gun can differentiate the colored paper from.
12. Screws – Used in necessary places to hold the parts together.
13. Arduino Servo Motor – Used to control the movement of the stepper motors.

14. Webcam – Used so that the turret can “see” to choose its target.

15. Colored Flashlight/Laser Pointer

Functionality:

The Nerf Gun Turret has two main functions. The first function is the stepper-motors that control the movement of the gun itself. There is one motor situated on the base of the turret that controls its movement in the x-axis. The second motor is situated on the stand of the motor and that controls the turrets movement in the y-axis. Together, these motors allow the turret to accurately move itself in the direction of its target. The second main function of the turret is its targeting system. The targeting system is facilitated by a webcam. The webcam allows the turret to decipher its surroundings and pinpoint the location of the target. Once the target is within its sight, after a slight delay, the turret will fire.

IV. Discussion and Results

Our original design ran into some unforeseen problems that caused the project not to work. The largest problem that our original design faced was the amount of friction that the marbles caused, causing the motor rotating about

the x-axis to fail. To avoid this, part of the base was cut out, and the marbles were removed, causing less friction and allowing the motor to rotate about the x-axis as intended.

Individual Contributions:

Jacob McMurray: Responsible for putting together the C++ code for the stepper motors to function as intended. Put together the breadboard-circuit connecting the Arduino to the stepper motors, allowing for user input on a laptop. Also made the adjustment necessary for the motor on the x-axis to work correctly. Constructed the target and flashlight used in the targeting actuation. Modified the base to allow for the function of the two motors in tandem.

Nathan Galloway: Responsible for putting together the base and stand for the turret. Did most of the work over weekends using tools back at his parents' house.

Eudik Garcia: Responsible for the code and software required for the targeting system to recognize the color it is

supposed to fire at.

George Vaporis: Wrote the necessary reports and put together the GitHub page for the project. Also hosted group meetings at apartment.

V. Conclusion

Though we were unable to put the project together as a whole, the major individual parts of the project were completed and work. The stepper-motors are able to freely move accurately upon command, and the targeting system is able to distinguish the desired color for the target from its surroundings.

References

Project Design Inspiration:

<https://www.hackster.io/hackershack/raspberry-pi-motion-tracking-gun-turret-77fb0b>

Useful information used in writing the code for the motor function:

<https://www.makerguides.com/a4988-stepper-motor-driver-arduino-tutorial/>