

Ultrasonic Targeting Sentry Turret

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Abstract

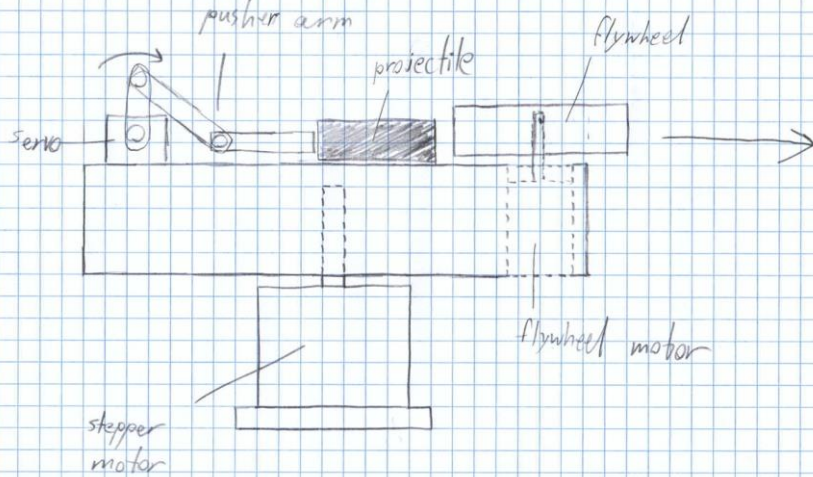
The sentry turret is an autonomous system used to “Defend” a certain area. It takes the form of a projectile launcher mounted on a stepper motor, rotating back and forth, scanning a designated span. It uses the ultrasonic sensor to detect objects within a certain range, at which point the turret will stop rotating, and begin to launch projectiles at the “target”.

Use-Case

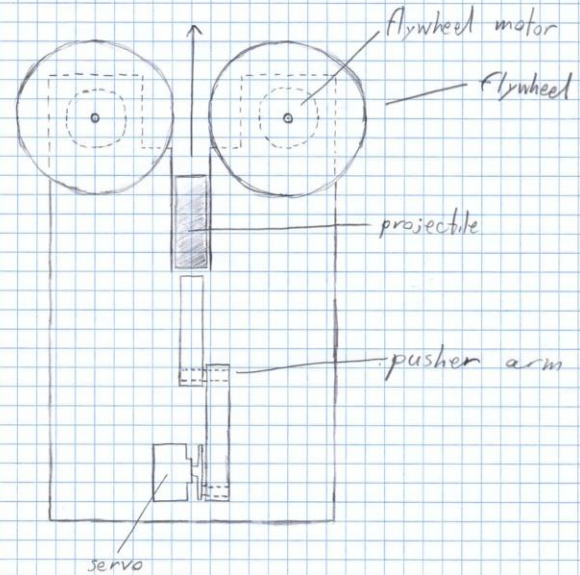
While the sentry turret is more of a gimmick or fun toy, the principles of ultrasonic sensing and response can be widely applied to the field of autonomous robotics. For example, ultrasonic ranging would be useful in collision avoidance systems of self-driving cars.

Mechanical Concept Design

Side View



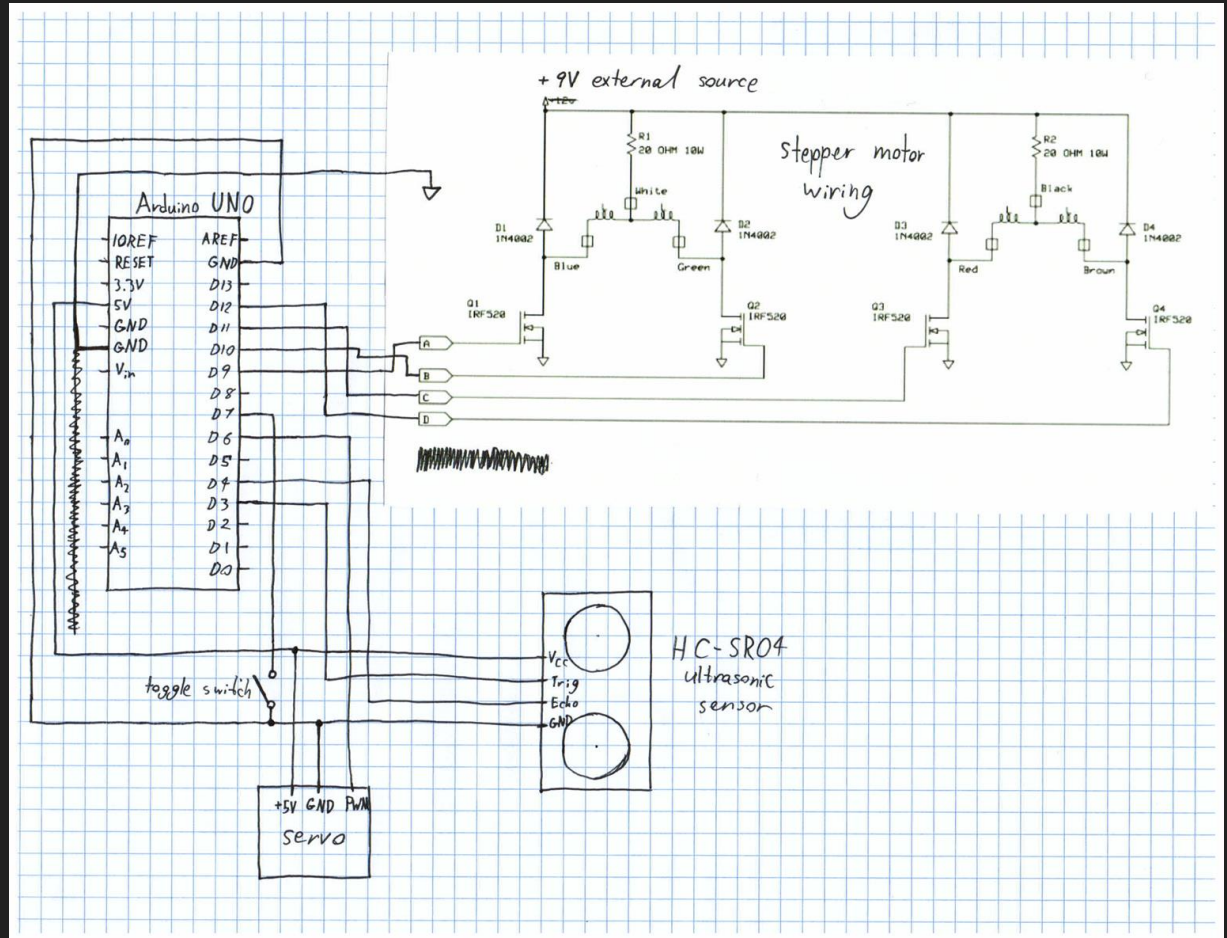
Top View



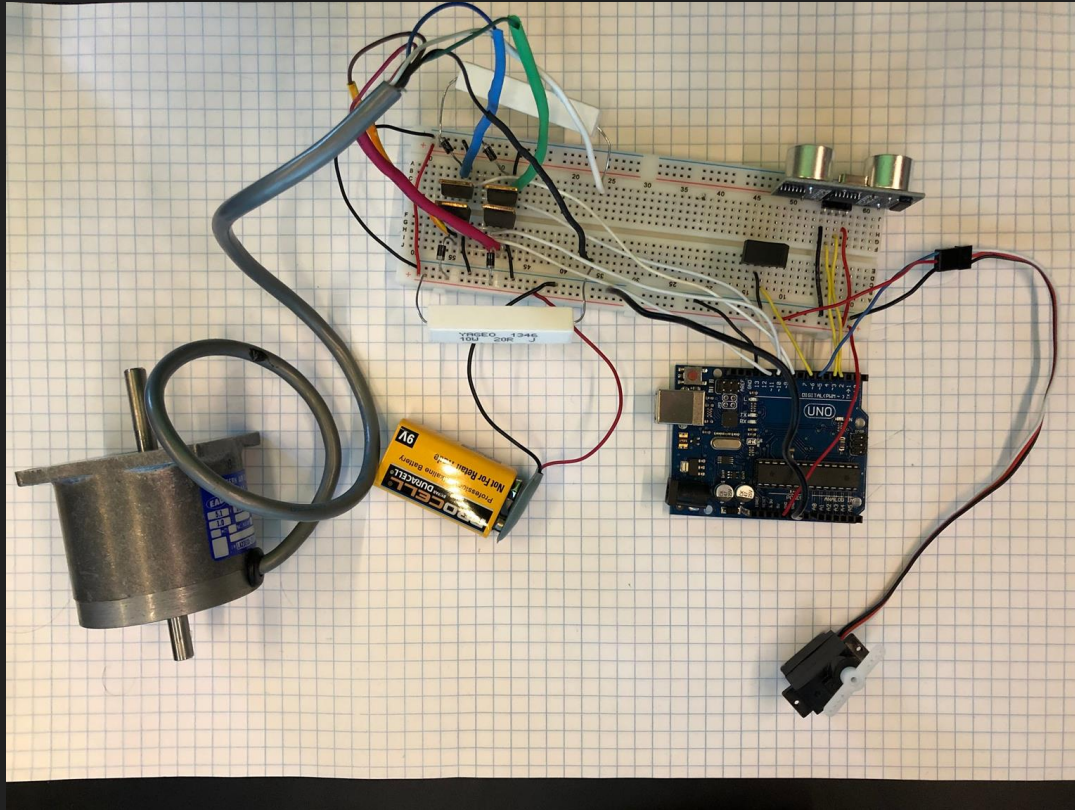
Circuit Diagram

Note that the stepper motor circuit was not connected to the GND rail used by the ultrasonic sensor and servo, instead being grounded directly to the Arduino. This was done to protect the ultrasonic sensor from the 9V battery.

(Credit for the stepper motor wiring diagram goes to Microcontroller Lab 3, Authors: Professor Larry Sulak, Yaokun Situ)



Breadboard prototype circuit



Arduino Code (Left page is setup and pre-setup code, right page is loop code)

```
#include "Servo.h"
#include "Stepper.h"

const int trig = 3;
const int echo = 4;
const int toggle = 7;

Servo myservo;
Stepper mystepper(200,9,10,11,12);

long duration;
int distance;

void setup() {

  pinMode(toggle, INPUT_PULLUP);
  pinMode(trig, OUTPUT);
  pinMode(echo, INPUT);
  myservo.attach(6,800,2400);
  mystepper.setSpeed(30);
  Serial.begin(9600);
}
```

```
void loop() {

  int Toggle = digitalRead(toggle);

  if(Toggle == HIGH){
    digitalWrite(trig,LOW);
    delay(2);
    digitalWrite(trig, HIGH);
    delay(10);
    digitalWrite(trig,LOW);

    duration = pulseIn(echo, HIGH);
    distance = duration*.034/2;
    Serial.println(distance);

    while(distance > 20){
      mystepper.step(50);
      delay(500);
      mystepper.step(-50);
      delay(250);
    }
    while(distance < 20){
      mystepper.step(0);
      myservo.write(90);
      delay(250);
      myservo.write(0);
      delay(250);
    }
  }
}
```

Conclusion

Unfortunately, there is an issue with the code. It likely has to do with the Arduino serial reading interfering in some way, but its exact nature is unidentified.

Debugging will continue until it is fixed and the prototype circuit is operational.

Overall, I learned a lot about the function of the ultrasonic sensor, and how to use the raw data it sends to the Arduino.