

Muhammad Somaan

2528404

**Aim:** To run a stepper motor and also control its direction using an IR sensor.

**Equipment:** Breadboard, Arduino Uno, Unipolar stepper motor, ULN2003A transistor package, CNY70 sensor, 20 k $\Omega$  and 220  $\Omega$  resistor, DC power supply, Connecting wires.

### Schematic:

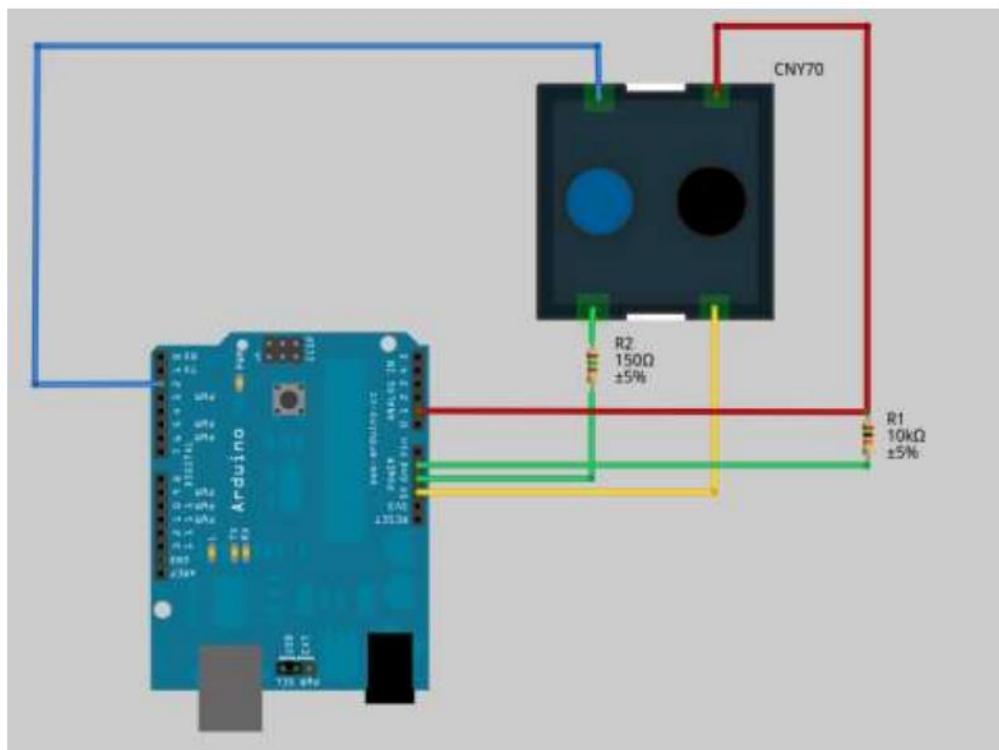
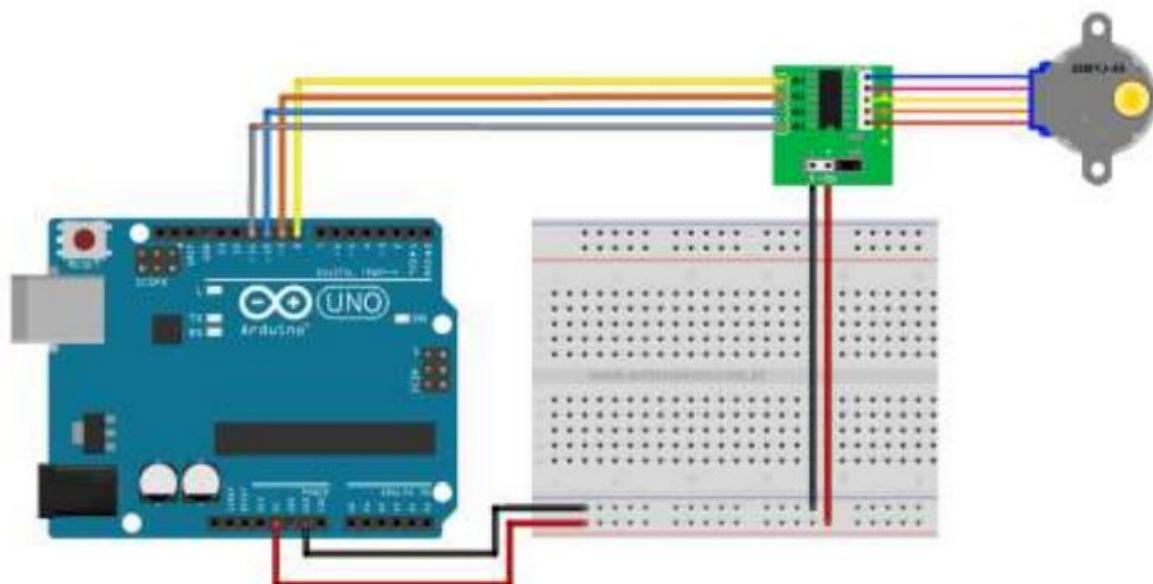


Figure 1



*Figure 2*

## Setup:

The infrared sensor is set up according to the schematic in figure 1 and then the ULN2003A is set up according to the schematic in figure 2. The ULN2003A motor driver inputs are connected to the arduino on pin 6,7,8,9, whereas the outputs go directly to the stepper motor. The fifth input of the stepper motor is Vcc which is supplied through a breadboard. The IR sensor is connected to pin A0, since it provides an analog output.

## Working:

The arduino code is written to perform simple functionality. I'm using an external library for controlling the LCD and the stepper motor. On the start-up of the arduino board, the Stepper motor is initialized, after which it initializes all the input and output pins. Following this it starts to take the input from the IR sensor to determine whether there is something present in front of the sensor, if there is then the readings are high otherwise the readings are low. After identifying if an object is present or not, the stepper motor is turned 360 degrees clockwise, and by using additional checks I make sure that the motor stays in that position until the object in front of the IR sensor is removed. Once the object is removed in front of the IR sensor, the stepper motor now goes 360 degrees anti-clockwise coming to rest on its original position.

## Code:

```
#include <LiquidCrystal.h>
#include <AccelStepper.h>

#define HALFSTEP 8

// Motor pin definitions
#define motorPin1 6      // IN1 on the ULN2003 driver 1
#define motorPin2 7      // IN2 on the ULN2003 driver 1
#define motorPin3 8      // IN3 on the ULN2003 driver 1
#define motorPin4 9      // IN4 on the ULN2003 driver 1

// Initialize with pin sequence IN1-IN3-IN2-IN4 for using the AccelStepper with
// 28BYJ-48
AccelStepper stepper1(AccelStepper::FULL4WIRE, motorPin1, motorPin3, motorPin2,
motorPin4);

const int rs = 12, en = 11, d4 = 5, d5 = 4, d6 = 3, d7 = 2;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);

const int sensorPin = A0;
const int background = 35;
```

```
int isDetected = 0;

int direction = 0;

int isMoving = 0;

const int turnSteps360 = 2100*4;

void setup() {

    // put your setup code here, to run once:

    lcd.begin(16, 2);

    pinMode(sensorPin, INPUT);

    stepper1.setMaxSpeed(1000.0);

    stepper1.setAcceleration(500.0);

    stepper1.setSpeed(1000);

}

void loop() {

    lcd.clear();

    lcd.setCursor(0, 0);

    // put your main code here, to run repeatedly:

    int thisReading = analogRead(sensorPin);      // Take a reading

    if(thisReading > background)

        isDetected = 1;

    else

        isDetected = 0;

    lcd.print("Reading: ");

    lcd.print(thisReading);

    lcd.setCursor(0, 1);

    if (isDetected == HIGH)

    {

        lcd.print("Detected");

        direction = 1;
}
```

```
if (!isMoving)
{
    stepper1.setSpeed(1000);

    stepper1.moveTo(turnSteps360);

    isMoving = 1;
}

else
{
    if (stepper1.distanceToGo() == 0)

        isMoving = 0;

    }
}

else
{
    lcd.print("Not Detected");

    direction = -1;

    if (!isMoving)

    {
        stepper1.setSpeed(1000);

        stepper1.moveTo(-stepper1.currentPosition());

        isMoving = 1;
    }

    else
    {
        if (stepper1.distanceToGo() == 0)

            isMoving = 0;

        }
    }

    delay(200);
}
```