Automatic gate closing for heavy vehicles detection

Introduction

The project features an automatic gate that identifies and closes for large vehicles, prompting them to divert. Upon detecting a heavy or tall vehicle approaching the gate, the system initiates a sequence of actions. Firstly, it promptly closes the gate, creating a barrier for the identified vehicle. Simultaneously, the system displays a message on an LCD screen, instructing the driver to take an alternative route ahead ensuring the smooth flow of regular-sized vehicles, such as cars.

This project includes key components like an Arduino Uno, a servo motor responsible for gate movement, an LCD display for communication, and an ultrasonic sensor for precise measurement of vehicle height. The ultrasonic sensor plays a crucial role in the decision-making process, assessing whether a vehicle meets the specified height criteria.

The real-world applications of this system extend to areas with specific height restrictions such as underpasses, express highways, railway crossings,and tunnels

COMPONENTS REQUIRED

1) Arduino Uno x 1

2) Ultrasonic Sensor x 1

3) Servo Motor x 1

4)I2C LCD Display x 1

5) Breadboard

ARDUINO UNO

Arduino Uno is an open-source microcontroller board based on the processor ATmega328P. There are 14 digital I/O pins, 6 analog inputs, a USB connection, a power jack, an ICSP header, and a reset button. It contains all the necessary modules needed to support the microcontroller. Just plug it into a computer with a USB cable or power it with an adapter to get started.

ULTRASONIC SENSOR

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target).

In order to calculate the distance between the sensor and the object, the sensor measures the time it takes between the emission of the sound by the transmitter to its contact with the receiver. The formula for this calculation is D = ½ T x C (where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second)

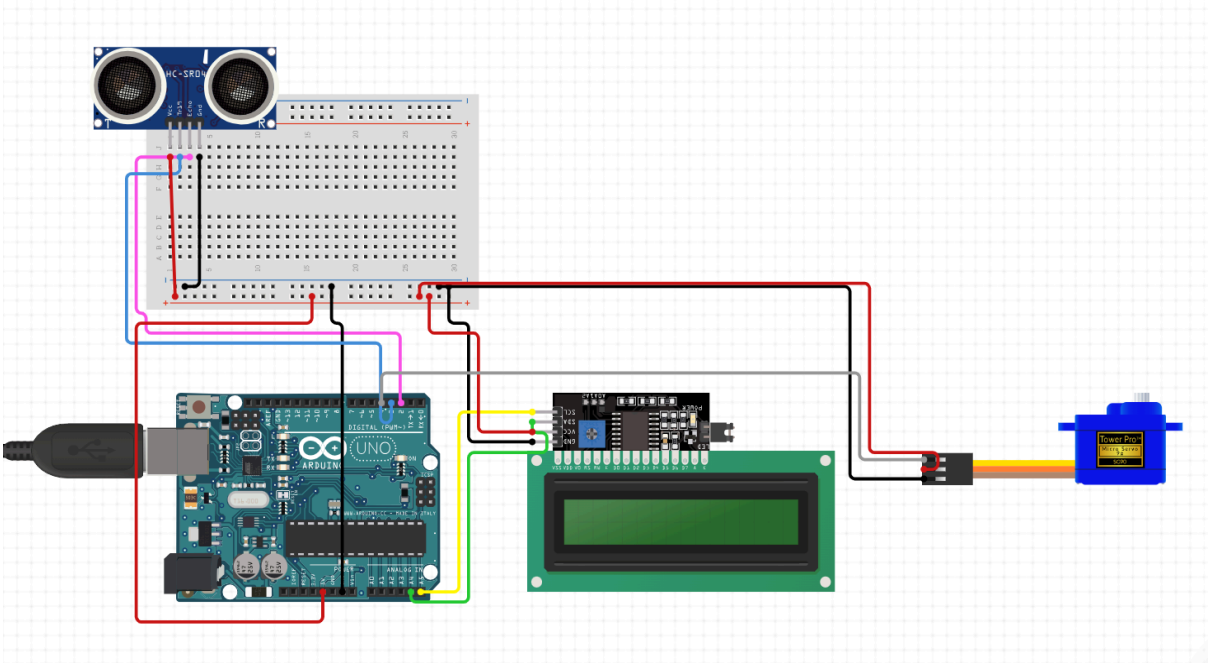
SERVO MOTOR

A servo motor is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft, this feedback allows the servo motors to rotate with great precision. If you want to rotate an object at some specific angles or distance, then you use a servo motor. It is just made up of a simple motor which runs through a servo mechanism.

I2C LCD DISPLAY

I2C interface 16x2 LCD display module, a high-quality 2 line 16 character LCD module with on-board contrast control adjustment, backlight and I2C communication interface. For Arduino beginners, no more cumbersome and complex LCD driver circuit connection. The real significance advantages of this I2C Serial LCD module will simplify the circuit connection, save some I/O pins on Arduino board, simplified firmware development with widely available Arduino library.

CIRCUIT DIAGRAM



PROGRAM

```
#include <Servo.h>
#include <LiquidCrystal_I2C.h>

#define trigPin 3

#define echoPin 2

Servo servo;

int sound = 250;
LiquidCrystal_I2C lcd(0x27,16,2);
```

```
void setup() {
lcd.init();
lcd.backlight();
lcd.setCursor(0,0);
lcd.clear();

Serial.begin (9600);

pinMode(trigPin, OUTPUT);

pinMode(echoPin, INPUT);

servo.attach(4);

}

void loop() {

long duration, distance;

digitalWrite(trigPin, LOW);

delayMicroseconds(2);

digitalWrite(trigPin, HIGH);

delayMicroseconds(10);

digitalWrite(trigPin, LOW);

duration = pulseIn(echoPin, HIGH);

distance = (duration/2) / 29.1;
if (distance < 16) {

Serial.print(distance);

Serial.println(" cm");
```

```
Serial.println("DON'T GO FORWARD!");
lcd.print("DON'T GO FORWARD! ");


lcd.setCursor(1,1);
lcd.print("TURN LEFT");




delay(500);
lcd.clear();


servo.write(35);

}

else if (distance<71) {

Serial.print(distance);

Serial.println(" cm");
Serial.println("Happy Journey!");
lcd.print("Happy Journey!!!");

lcd.setCursor(2,1);
lcd.print("Wear Seat Belt");
delay(500);


lcd.clear();


servo.write(140); }

else {

Serial.println("The distance is more than 180cm");
```

```
}

delay(500);

}
```

WORKING

When heavy vehicle pass under the ultrasonic sensor it detects the height between the top of the vehicle and the sensor. If it less than the particular distance servo motor works and it turns to zero degree angle otherwise 90 degree. Servo motor act as gate. Display gives the instructions to the driver .

OUTPUT