Report

on

Implementation of Smart Transportation

Interaction Technology
(DA619A)

Submitted

by

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I. Introduction

With ever growing volume of vehicles on road, safety of the passengers has become an issue paramount importance. New technologies are being developed by public and private sector players to not only improve the wholesome experience of travelling by road, but also reduce chances of accidents by equipping vehicles with newer safety equipments. One of the leading directions in ensuring safe usage of roads is a new paradigm called Intelligent Transportation Systems (ITS), which strives to put together the top notch technologies advacements in information and communication with transportation and traffic management systems.

In this assgnment, we need to implement a smart transporation which will help us to reduce accidents. Below figure 1 shows the types of sensors is used to implement this project. The details of each sensors are explained in the following subsections. The assisgnment was divided into two parts. Part A was to use the ultrasonic sensor. Part B was the IR sensor. The details of the sensors and implementation are explained in the following sections.

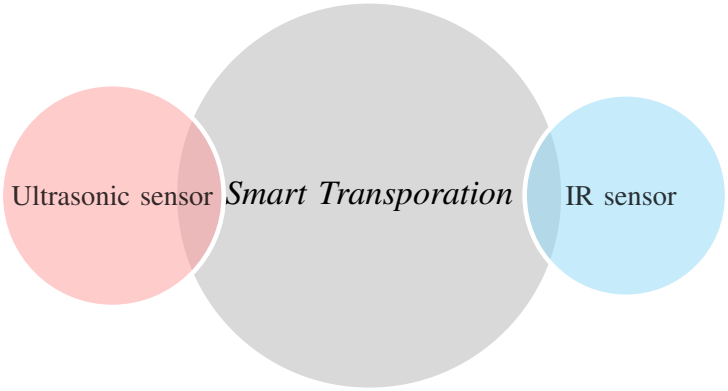

Fig. 1: Types of sensors used

II. Sensors

Sensors are devices which sense from the environment and act upon that environment through actuators. We used two different types of sensor to implement an smart transporation. The different types of sensors are enumerated as:

A. *Ultrasonic Sensor*

Ultrasonic sensor [1] [2] uses Sonar to determine the distance of n object. The range of this sensor is from 2 cm to 400 cm. The sensor consists of four pins. The four pins are ground (GND), VCC (5 volt supply), trigger (Trig), and echo (Echo). The internal structure consists transmitter and receiver module. The transmitter transmits an ultrasonic wave. It travels in air and when detects any objects it gets reflected back toward the receiver module of ultrasonic sensor. The sensor calculates the distance from the object by using: Distance = (Duration X Speed of the sound)/2.

We used ultrasonic sensor to detect object if the distance of the object and the car is 20 cm, the car stops. We used HC-SR04 model of ultrasonic sensor.

Fig. 2: Ultrasonic Sensor

B. *IR Sensor*

An infrared sensors are electronic devices used to sense certain aspects of its neighbourhood by emitting infrared radiations. These types of radiations are invisible to our eyes, but can be detected by an infrared sensor. The infrared specturm is usually

associated with some or other form of thermal radiation, thus making IR sensors a natural choice for detecting/sensing heat. As an application IR sensors are also used to detect motion as well.

An IR sensor works on a very simple principle: that of emitting infrared radiation through a source, typically an IR LED (ligh emitting diode), and then measuring the reflected radiation via an IR photodiode. The IR photodiode responds only to the infrdared radiation as it is sensitive to IR light of the same wavelength as that emitted by the IR LED. The precise measurements of the reflected infrared radiation are made by way of a proxy which is the change in the resistance and the output voltage in the photodiode. This change in resistance and output voltage is proportional to the maginitude of the infrared radiation received by the photodiode. We used IR sensor to follow the path. We used two IR sensor.

Fig. 3: IR Sensor

III. Methodology

The car utilizes 2-Layer Round Robot Chassis Kit, which will assist it with moving forward, left or right. It utilizes two motors and wheel in the both side and one freewheeling ball is put at the front which causes it to free movement. The sensors are put so that they can cover the greatest territory before the car and can be skilled to distinguish an obstruction. The ultrasonic sensor is used to detects an object. Upon detection of object ultrasonic sensor sends an automatic signal to Arduino which stop the motors of the car which helps to stop the movement of the car. The IR sensors are used to follow the path.

A. Requirements

1) Hardware Components:

- Ultrasonic sensor
- IR sensor -2
- Chassis kit 2x2
- Diode - 2
- NPN Transistor -2
- Bread board
- Arduino UNO
- 270 ohm resistor -2
- Jumper wires
- USB cable
- Green LED

2) Software Components:

- Arduino IDE

B. Design

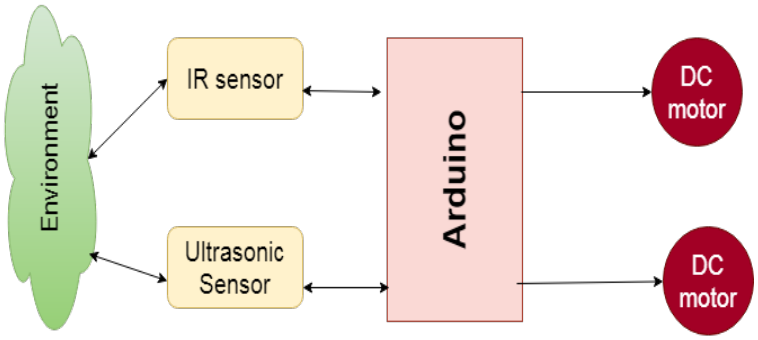

Fig. 4: Block diagram of the model

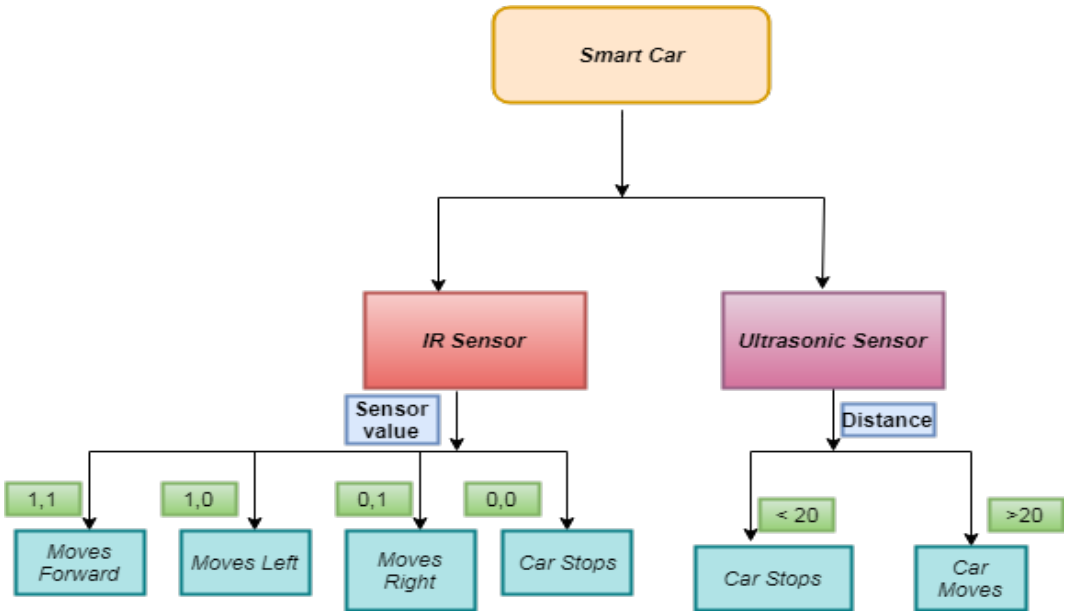

Fig. 5: Flowchart of the model

IV. Algorithms

A. Ultrasonic sensor

1) Initialize duration and distance.
2) Digital write trigger to high and delayed for 5 seconds.
3) Digital write trigger to low and delayed for 10 seconds.
4) Using pulseIn keep the echopin high and store in duration.
5) Calculate distance using the formula: (duration/2)/29.1
6) After calculating the distance, check if the distance is less than 20 cm or not. If the distance is less than 20 cm stop the car and LED turns on. Otherwise move the car forward and LED turns off.

B. IR sensor

1) Reading sensor value from both the IR sensor.
2) If both the IR sensor readings are 1, then the car moves forward.
3) If one IR sensor is 1 and other is 0, it moves left.
4) If one IR sensor is 0 and other is 1, it moves right.
5) If both IR sesnor readings are 0, the car stops moving.

V. Interesting and Challenges

The project is very interesting. We had a chance to work with different sensors. The challening part was to work with IR sensors. We faced few challenges in the begining with the IR, it was not following the complete path. We found that the IR sensor was not placed properly. After we re-circuited our car it worked fine.

VI. Conclusion

The developed project is an intelligent transportation system that accomplished the expressed destinations had been created. This prototype was created utilizing two gear motors. We built the prototype with an exceptionally decent insight which is effectively fit to detect the obstruction and by preparing the flag originating from the sensor. It is flawlessly maintaining a strategic distance from the obstacles that are coming in the middle of the way. The car takes left or right or the forward movement which indicates detecting signal with the assistance of the two IR sensor.

In the future, the detecting of an object or following a path can be expanded by using more sensors. The prototype can also be exapanded using three IR sesnor.

References

[1] Geddes,M., Arduino project handbook Vol2
[2] https://www.tutorialspoint.com/arduino/arduino_ultrasonic_sensor.htm

APPENDIX

A. Source Code

```
   int motorPin1 = 11; //motor connected to pin 11
int motorPin2 = 10; //motor connected to pin 10
int IRsensorPin1 = 4; // IR sensor 1 is connected to the 2 pin of the arduino
int IRsensorPin2 = 2; // IR sensor 2 is connected to the 4 pin of the arduino
const int trigPin =12; //Trigger pin of the ultrasonic is connected to 12 pin of the arduino
const int echoPin =8; //Echo pin of the ultrasonic is connected to 8 pin of the arduino

   int ledRpin =13; // Led is connected to 13 pin of the arduino

   int IRsensorValue1;
int IRsensorValue2;
long duration, distancecm;

   void setup() {
   /*initialize serial communications at 9600 bps: */
Serial.begin(9600);
// pinMode(out, OUTPUT);
pinMode(motorPin1, OUTPUT);
pinMode(motorPin2, OUTPUT);
pinMode(ledRpin, OUTPUT);
pinMode(trigPin, OUTPUT);
pinMode(echoPin, INPUT);

   }
   void loop() { digitalWrite(trigPin, LOW);

   delayMicroseconds(5);
digitalWrite(trigPin,HIGH);
delayMicroseconds(10);
digitalWrite(trigPin,LOW);
duration = pulseIn(echoPin, HIGH);
distancecm =(duration/2)/29.1;
Serial.print(distancecm);
Serial.println("cm");
delay(500);

   IRsensorValue1 = digitalRead(IRsensorPin1); //reads the digital value of IR sensor 1
IRsensorValue2 = digitalRead(IRsensorPin2); //reads the digital value of IR sensor 2

   Serial.print(" IR sensor 1 = " );
Serial.println(IRsensorValue1); // prints the IR sensor 1 value
Serial.print("IR sensor 2 = " );
Serial.println(IRsensorValue2); // prints the IR sensor 2 value
/* Ultrasonic sensor code starts */

   //https://www.instructables.com/id/Simple-Arduino-and-HC-SR04-Example/
//https://www.tutorialspoint.com/arduino/arduino_ultrasonic_sensor.htm

   if(distancecm <=20){
   digitalWrite(ledRpin,HIGH);
//robo car stops
analogWrite(motorPin1, 0);
analogWrite(motorPin2, 0);

   }
```

```
  /* Ultrasonic sensor code ends */

  /* IR sensor code starts */

  /* IR sensor 1 and IR sensor 2*/
if((IRsensorValue1 == 1) && (IRsensorValue2 == 1)){
  //robo car moves forward
analogWrite(motorPin1, 100); //rotate motor 1
analogWrite(motorPin2, 100); //rotate motor 2

  } if ((IRsensorValue1 == 1) && (IRsensorValue2 == 0)){
  // robo car turns left

  analogWrite(motorPin1, 0); // stops motor 1
analogWrite(motorPin2, 60); // rotate the motor 2

  delay(30);
analogWrite(motorPin1, 100); //rotate motor 1
analogWrite(motorPin2, 100); //rotate motor 2

  } if ((IRsensorValue1 == 0) && (IRsensorValue2 == 1)){
  //robo car turns right
analogWrite(motorPin2, 0); //stopsmotor 2
analogWrite(motorPin1, 60); //rotate the motor 1
delay(30);
analogWrite(motorPin1, 100); //rotate motor 1
analogWrite(motorPin2, 100); //rotate motor 2

  }
  if((IRsensorValue1 == 0) && (IRsensorValue2 == 0)){ //robo car stops
analogWrite(motorPin1, 0);
analogWrite(motorPin2, 0);
}
  } /* IR sensor code ends */

  }
```

B. Tasks Allocated

Name of the team members	Task Assigned
Manaswini Kolluru	Car Assembling, IR sensor, DC motor, Report
Prakriti Dhang	Car Assembling, IR sensor, Ultrasonic sensor, Report
Monica Handa	Car Assembling, DC motor, Report