OBSTACLE AVOIDANCE USING IOT

A Mini Project Report submitted to

Jawaharlal Nehru Technological University, Hyderabad

In partial fulfillment for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

INFORMATION TECHNOLOGY

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CERTIFICATE

This is to certify that the mini project entitled "**OBSTACLE AVOIDANCE USING IOT**

" is a bonafide work done by **Mergoju Usha Rani** bearing Roll No. **18N31A1298**, **Sathvika Kurella** bearing Roll No. **18N31A1282**, **Moyya Gnan Akshith** bearing Roll No. **18N31A12A6** under my guidance and supervision is submitted to **Jawaharlal Nehru Technological University, Hyderabad** in partial fulfillment of the requirements for the award of **Bachelor of Technology** in **Information Technology**, during the academic year 2020-2021.

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INTERNAL GUIDE HEAD OF THE DEPARTMENT

EXTERNAL EXAMINER

DECLARATION

We hereby declare that the mini project entitled "**OBSTACLE AVOIDANCE USING IOT**" submitted to **Malla Reddy College of Engineering and Technology**, affiliated to **Jawaharlal Nehru Technological University, Hyderabad**, for the award of the degree of **Bachelor of Technology** in **Information Technology** is a result of the research and work done by us.

It is further declared that the project report or any thereof has not been previously submitted by any university or Institute for the award of degree or diploma.

~ MERGOJU USHA RANI
SATHVIKA KURELLA
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~MERGOJU USHA RANI
SATHVIKA KURELLA
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ABSTRACT

Obstacle detection and avoidance can be considered as the central issue in designing mobile robots. This technology provides the robots with senses which it can use to traverse in unfamiliar environments without damaging itself. In this paper an Obstacle Avoiding Robot is designed which can detect obstacles in its path and maneuver around them without making any collision. It is a robot vehicle that works on Arduino Microcontroller and employs three ultrasonic distance sensors to detect obstacles. The Arduino board was selected as the microcontroller platform and its software counterpart, Arduino Software, was used to carry out the programming. The integration of three ultrasonic distance sensors provides higher accuracy in detecting surrounding obstacles. Being a fully autonomous robot, it successfully maneuvered in unknown environments without any collision. The hardware used in this project is widely available and inexpensive which makes the robot easily replicable.

Key-Words:

- obstacle avoidance
- ultrasonic sensor
- arduino microcontroller
- autonomous robot
- arduino software.

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CHAPTER 1

INTRODUCTION

From its initiation in the 1950s, modern robots have come a long way and rooted itself as an immutable aid in the advancement of humankind. In the course of time, robots took many forms, based on its application, and its size varied from a giant 51 feet to microscopic level. In the course of technological developments of robots, one aspect remained instrumental to their function, and that is mobility. The term “obstacle avoidance” is now used in modern robotics to denote the capability of robot to navigate over an unknown environment without having any collision with surrounding objects (Duino-Robotics, 2013). Obstacle avoidance in robots can bring more flexibility in maneuvering in varying environments and would be much more efficient as continuous human monitoring is not required.

This project developed an obstacle avoiding robot which can move without any collision by sensing obstacles on its course with the help of three ultrasonic distance sensors. Robots guided with this technology can be put into diversified uses, e.g., surveying landscapes, driverless vehicles, autonomous cleaning, automated lawn mower and supervising robot in industries. The robot developed in this project is expected to fulfill the following objectives:

- The robot would have the capacity to detect obstacles in its path based on a predetermined threshold distance.
- After obstacle detection, the robot would change its course to a relatively open path by making autonomous decision.
- It would require no external control during its operation.
- It can measure the distance between itself and the surrounding objects in real-time.
- It would be able to operate effectively in unknown environment.

CHAPTER 2

PROBLEM DEFINITION

1. Problem Statement :

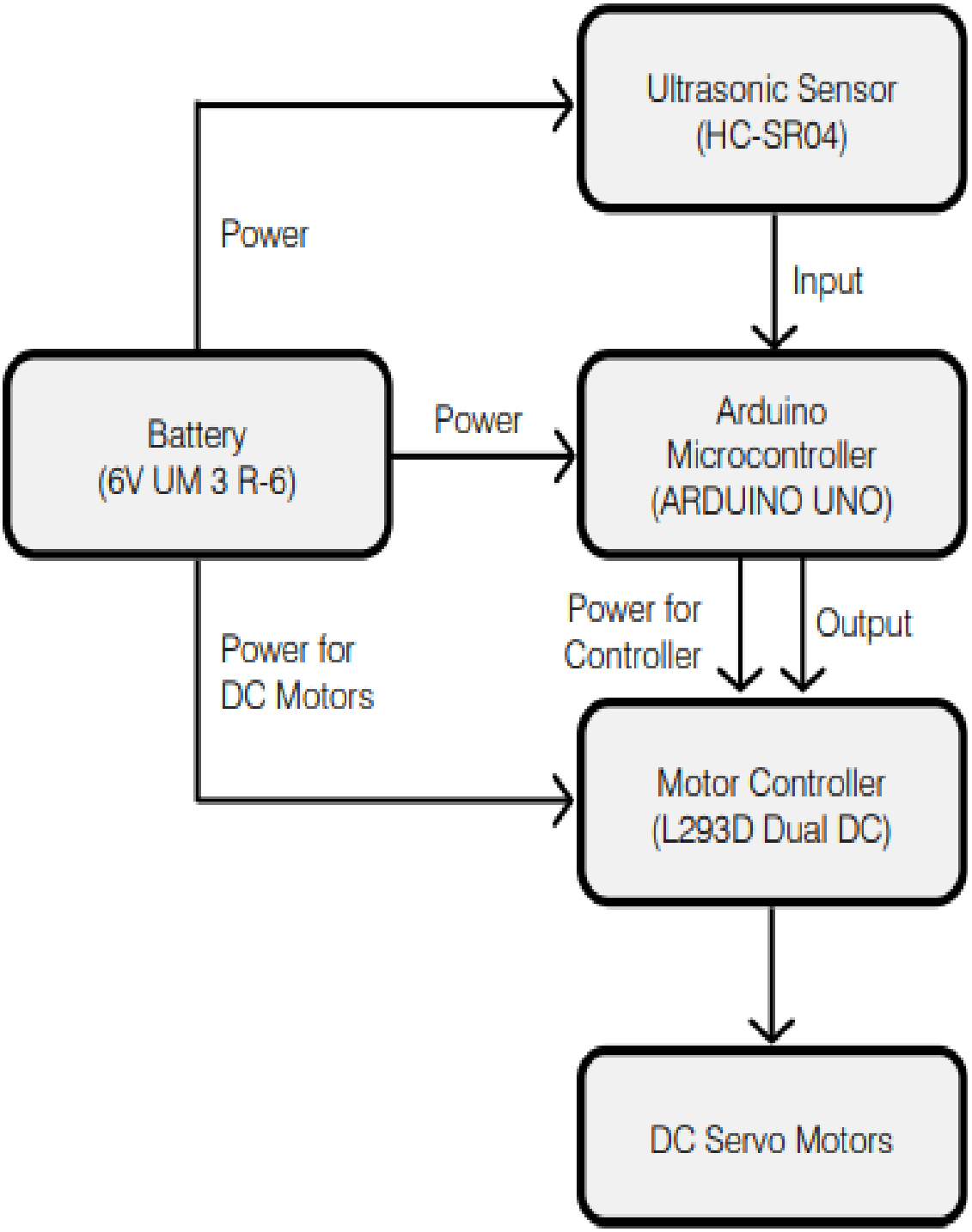
Obstacle avoidance system provides safety for both mobile robot and obstacles around. This would prevent any costing for repair and without increase the cost of maintenance or repair of the mobile robot. Mobile robot without obstacle avoidance will be unsafe for both obstacles and mobile robot.

CHAPTER 3

LITERATURE SURVEY

We reviewed different obstacle detecting robot mechanisms that have been built by a lot of students and other practitioners that are in existance. For an autonomous mobile robot performing a navigation-based task in a vague environment, to detect and to avoid encountered obstacles is an important issue and a key function for the robot body safety as well as for the task continuity. Obstacle detection and avoidance in a real world environment that appears so easy to humans is a rather difficult task for autonomous mobile robots and is still a well researched topic in robotics. In many previous works, a wide range of sensors and various methods for detecting and avoiding obstacles for mobile robot purpose have been proposed. Good references related to the developed sensor systems and proposed detection and avoidance algorithms can be found. Based on these developed sensor systems, various approaches related to this work can be grouped.

3.1 Algorithm:



CHAPTER 4

SYSTEM ANALYSIS AND DESIGN

4.1 System Architecture and Module Description:

How does an ultrasonic sensor works?

How does a bat sense distance. Bats sense distance using sound. They emit sound waves and receive back reflected waves. The time it takes to receive the waves back provides them with a very good estimate of the distance. This is exactly how ultrasonic sensors estimate distance.

An ultrasonic sensor has two parts:

- A transmitter that sends out a signal that humans cannot hear
- A receiver that receives the signal after it has bounced off nearby objects

- If the object is very close to the sensor, the signal comes back quickly.
- If the object is far away from the sensor, the signal takes longer to come back.
- If objects are too far away from the sensor, the signal takes so long to come back (or is very weak when it comes back) that the receiver cannot detect it.

4.2 Hardware Requirements

The development and deployment of the application requires the following general and specific minimum requirements for hardware:

- Ardino uno
- Ultra sonic sensor
- LCD 16 by 2
- DC Motors
- Battery.

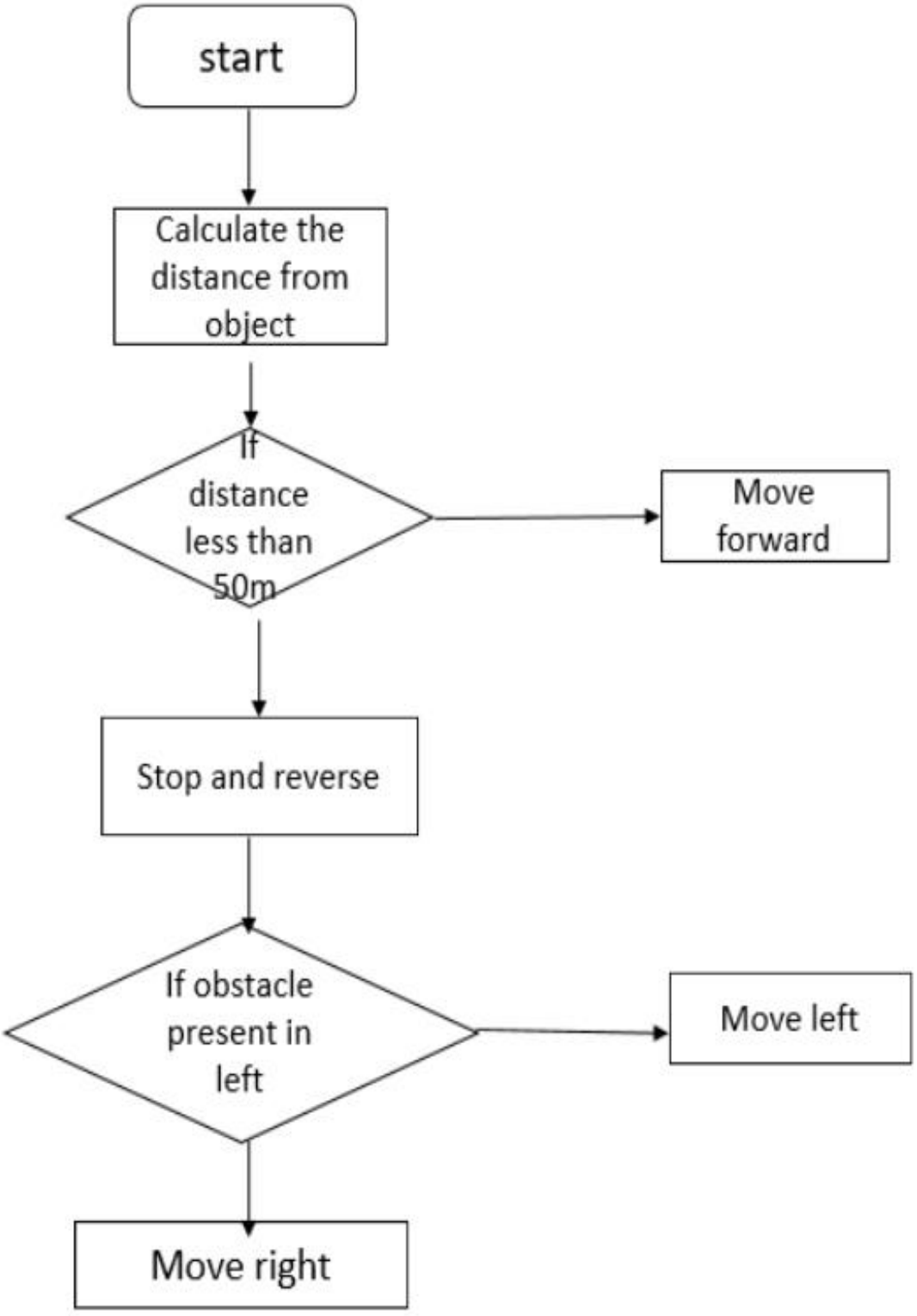
4.3 Software Requirements

The development and deployment of the application requires the following general and specific minimum requirements for software:

- IDE :- Arduino
- Programming :- C & C++
- Arduino Libraries
- Arduino LCD Libraries.

4.4 Flowchart/ DFDs / Object Modelling Diagram

1. Activity Diagram:



4.4.2 Use Case Diagram:

CHAPTER 5

IMPLEMENTATIONS

- Automobile industries.
- It can be used for army applications.
- It can be used in mines.

5.1 CODE IMPLEMENTATION:

```
// This code is for a OBSTACLE AVOIDING ROBOT
#include <LiquidCrystal.h>
LiquidCrystal lcd(8, 9, 10, 11, 12, 13);

long cm, duration;
const int echoPin = 7;
const int trigPin = 6;

const int lm1 = 2;
const int lm2 = 3;
const int rm1 = 4;
const int rm2 = 5;
// Above is the motor driver pin connection. lm1, lm2, rm1 and//rm2 are
the digital input pins from arduino to the motor driver.
void setup()
{
  pinMode(lm1, OUTPUT);
  pinMode(lm2, OUTPUT);
  pinMode(rm1, OUTPUT);
  pinMode(rm2, OUTPUT);

  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);

  Serial.begin(9600);
  lcd.begin(16, 2);
}
void loop()
{
  // the distance ahead using an ultrasonic sensor
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(5);
```

```
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH);
// converting the time into a distance in Centimetre
     cm = duration*0.034/2;
   if(cm < 20)
   {
    stop_bot();
    delay(2000);
       go_back();
    delay(2000);
        stop_again();
    delay(1000);
       go_left();
    delay(1000);
   }
    else
   {
    go_straight();
    delay(1000);
   }
  // For Serial Monitor
Serial.print("Distance:CM ");
  Serial.println(cm);
   }

//  Here are the functions that are used in the program

void go_straight()
{
lcd.setCursor(0,0);
lcd.print("NOTHINGAHEAD");
lcd.setCursor(0,1);
lcd.print("MOVING FORWARD");

digitalWrite(lm1,HIGH);
digitalWrite(lm2,LOW);
```

```
digitalWrite(rm1,HIGH);
digitalWrite(rm2,LOW);
}

void go_back()
{
lcd.clear();
lcd.setCursor(0,0);
lcd.print("TAKING REVERSE");
lcd.setCursor(0,1);
lcd.print(cm);

digitalWrite(lm2,HIGH);
digitalWrite(lm1,LOW);
digitalWrite(rm2,HIGH);
digitalWrite(rm1,LOW);
}
 void stop_bot()
{
lcd.clear();
lcd.setCursor(0,0);
lcd.print("SOMETHING AHEAD");
lcd.setCursor(0,1);
lcd.print("STOP!!");

digitalWrite(lm1,LOW);
digitalWrite(lm2,LOW);
digitalWrite(rm1,LOW);
digitalWrite(rm2,LOW);
}
void stop_again()
{
lcd.clear();
lcd.setCursor(0,0);
lcd.print("BREAK FOR TURN");
```

```
digitalWrite(lm1,LOW);
digitalWrite(lm2,LOW);
digitalWrite(rm1,LOW);
digitalWrite(rm2,LOW);
}
void go_left()
{
lcd.clear();
lcd.setCursor(0,0);
lcd.print("TURNING LEFT");
lcd.setCursor(0,1);
lcd.print(cm);

digitalWrite(lm1,LOW);
digitalWrite(lm2,LOW);
digitalWrite(rm1,HIGH);
digitalWrite(rm2,LOW);
}

void go_right()
{
lcd.clear();
lcd.setCursor(0,0);
lcd.print("TURNING RIGHT");
lcd.setCursor(0,1);
lcd.print(cm);

digitalWrite(lm1,HIGH);
digitalWrite(lm2,LOW);
digitalWrite(rm1,LOW);
digitalWrite(rm2,LOW);
}
```

CHAPTER 7

CONCLUSION

This project developed an obstacle avoiding robot to detect and avoid obstacles in its path. The robot is built on the Arduino platform for data processing and its software counterpart helped to communicate with the robot to send parameters for guiding movement. For obstacle detection, three ultrasonic distance sensors were used that provided a wider field of detection. The robot is fully autonomous and after the initial loading of the code, it requires no user intervention during its operation. When placed in unknown environment with obstacles, it moved while avoiding all obstacles with considerable accuracy. The work done in this project can act as a base for further improvements to increase accuracy and adaptability of obstacle detection in diverse environments. In future, the authors of this project intend to test the feasibility of integrating different types of sensors to complement each other's disadvantages. For instance, imaging sensor can be beneficial when ultrasonic sensor may not correctly identify obstacles in environment subjected to ambient noise and varying temperature or air pressure. The accuracy of determining the distance to the obstacles can be increased by the inclusion of an electronic barometer for automatic adjustment of the speed of sound in air. Also the addition of a Bluetooth device can offer the flexibility of remotely changing control parameters in the code.

CHAPTER 8

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