JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

# Pothole Detection and Cement Dispensing Robot

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***Abstract:*** **The main objective of the project is to design and fabricate a Semi- Automated Robot, which will detect the Pothole on the road and will discharge the required amount on concrete quantity, which is needed for the detected pothole and to do the levelling process on the discharged concrete and hence the pothole on the road filled completely.**

**The power source for the robot is switched ON and allows the robot to move on the road. The Ultrasonic sensor on the front of the robot is allowed to sense the surface of the road, if the pothole will be detected the sensor send the signals to the Arduino Controller, and the controller suddenly stops the movement of robot near the pothole, and allows to discharge the required concrete needed for the detected pothole. Then after filling the pothole the slider crank mechanism is used for levelling process.**

**KEYWORDS: Pothole, Ultrasonic sensor, Slider crank mechanism, Levelling, semi-automated robot.**

## I. INTRODUCTION

Roads make a crucial contribution to economic development and bring important social benefits. They are of vital importance in order to make a nation grow and develop. Roads open up more areas and stimulate economic and social development. For those reasons, road infrastructure is the most important of all public assets. But due to repeated loading and weathering on roads, a pothole may be caused which may affect the human life very badly.

A pothole is a structural failure in a road surface, caused by failure primarily in asphalt pavement due to the presence of water in the underlying soil structure and the presence of traffic passing over the affected area.

So, our project is to make a robot which helps the society in promoting the road safety and to reduce the difficulties in detecting the pothole and also reduce the usage of human power, and hence saves the time.

## II. PROBLEM STATEMENT

Roads make a crucial contribution to economic development and bring important social benefits. They are of vital importance in order to make a nation grow and develop. Roads open up more areas and stimulate economic and social development. For those reasons, road infrastructure is the most important of all public assets. But due to repeated loading and weathering on roads, a pothole may be caused which may affect the human life very badly.

A pothole is a structural failure in a road surface, caused by failure primarily in asphalt pavement due to the presence of water in the underlying soil structure and the presence of traffic passing over the affected area.

So, our project is to make a robot which helps the society in promoting the road safety and to reduce the difficulties in detecting the pothole and also reduce the usage of human power, and hence saves the time. We designed a Semi-Automatic Robot which will detect the pothole on the road, and will discharge the required amount of concrete to fill the pothole and to do a levelling process on the discharged concrete using the Roller. Therefore, the pothole on the road may be filled completely and hence the accidents occur due to the pothole may be reduced.

## III. OBJECTIVES

The main objective of the project is to design and fabricate a Semi Automated Robot, which will detect the Pothole on the road and will discharge the required amount on concrete quantity, which is needed for the detected pothole and to do the levelling process on the discharged concrete and hence the pothole on the road filled completely. The power source for the robot is switched ON and allows the robot to move on the road. The Ultrasonic sensor on the front of the robot is allowed to sense the surface of the road, if the pothole will be detected the sensor send the signals to the Arduino Controller, and the controller suddenly stops the movement of robot near the pothole, and allows to discharge the required concrete needed for the detected pothole. Then after filling the pothole the Passive Roller will level up the road.

## IV. PROPOSED METHODOLOGY

When the Robot is Powered ON, it will start travelling in the straight direction. The Ultrasonic Sensor is fitted facing the ground and will constantly detect the area from the Robot height. When there is a change in height of the Transmitted wave and the received ultrasonic wave, then it automatically calculates the amount of depth of the Pothole. The Microcontroller sends the command to the servo feeder to turn ON for a specific time as per the depth of the Pothole. After dispensing the Cement, the Robot will move ahead in the forward direction and the Cement dispensed on the road will be levelled up by the passive Roller which is attached at the backside of the Robot.

### A. Ultrasonic sensor

Fig. 1 Ultrasonic Sensor

This ultrasonic sensor module can be used for measuring distance, object sensor, motion sensors etc. Highly sensitive module can be used with microcontroller to integrate with motion circuits to make robotic projects and other distance, position & motion sensitive products.

The module sends eight 40Khz square wave pulses and automatically detects whether it receives the returning signal. If there is a signal returning, a high-level pulse is sent on the echo pin. The length of this pulse is the time it took the signal from first triggering to the return echo.

### B. ESP8266

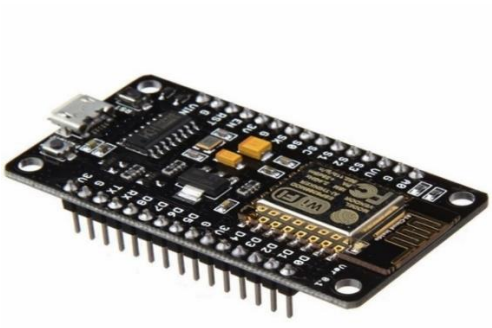


Fig. 2 ESP8266 Chip

ESP8266 is a computer on a chip. It is an integrated chip that is usually a part of an embedded system. It is a self-contained, independent and yet function as a tiny, dedicated computer m. It also supports IOT Applications due to built-in WIFI.

### C. Servo Motor

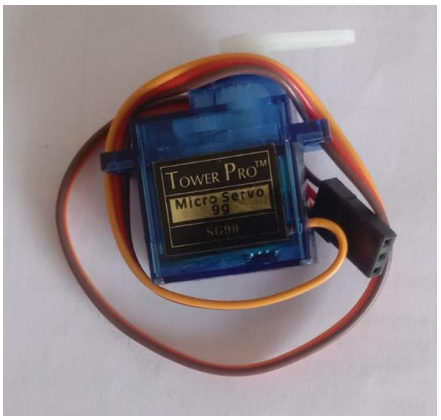



Fig. 3 Servo Motor

Tiny and lightweight with high output power. Servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kinds but smaller. You can use any servo code, hardware or library to control these servos. Good for beginners who want to make stuff move without building a motor controller with feedback & gear box, especially since it will fit in small places. It comes with 3 horns (arms) and hardware.

### D. Motor Controller

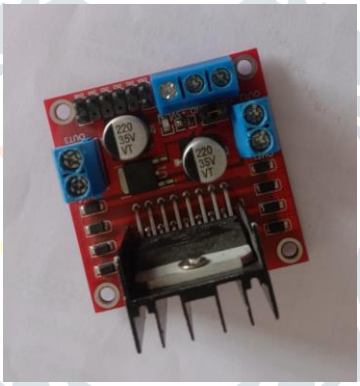


Fig. 4 Motor Controller

Motor controllers are devices which regulate the operation of an electric motor. In artificial lift applications, motor controllers generally refer to those devices used in conjunction with switchboards or VFDs to control the operation of the prime mover.

Without control of the DC motor torque/current, the motor is allowed to pull large currents that can often result in torques delivered in excess of what is mechanically viable for the system, leading to imminent failure

### E. PCB busboard

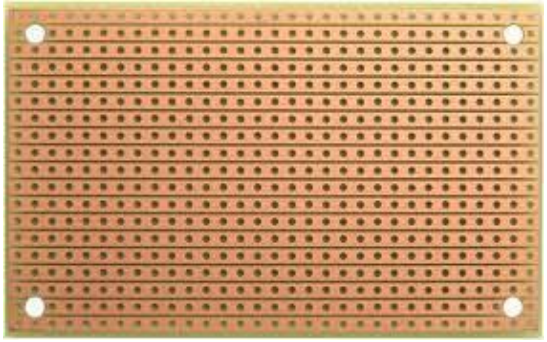


Fig. 5 PCB busboard

Prototyping boards have holes to which you affix electronic components to build your desired circuit. These components can be attached with or without solder depending on the type of board. It is always recommended to test your circuit diagram first. There are many electronics prototyping boards available in the market.

### F. Power Supply


Fig. 6 Power Supply

12v Battery Accuplus brand lead-acid battery is used to power the control circuit of the Project. Controller supports from 7-12 V DC Supply.

### G. Storage Tank

Fig. 7 storage tank

A watch box is used as a storage tank. One part of box is used as a column and other part as a tank as shown in fig.

## V. Software Coding

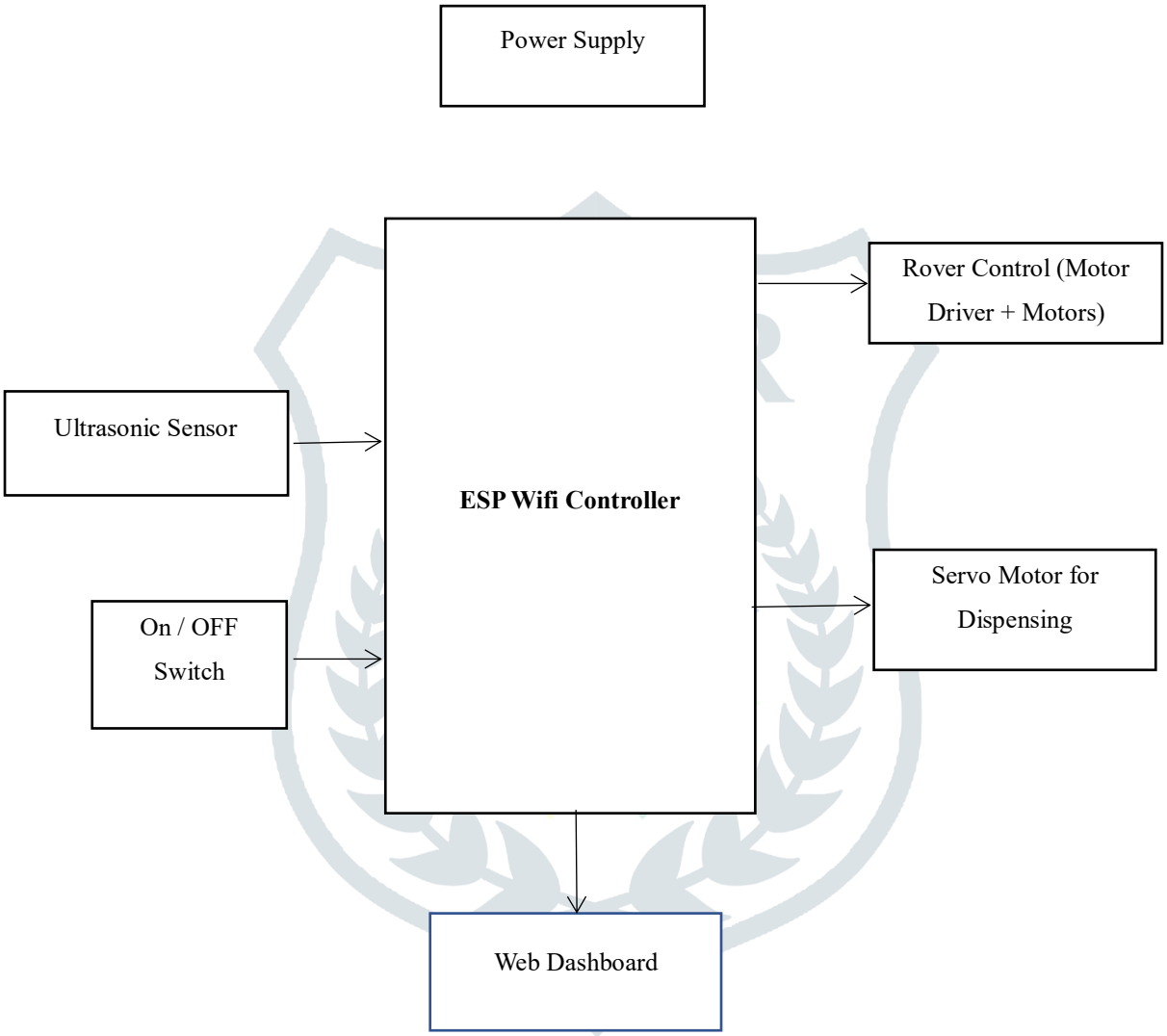
```
#include<Servo.h>
#define echoPin 14 // attach pin GPIO 14 of esp8266 to pin Echo of HC-SR04
#define trigPin 12 //attach pin GPIO 12 of esp8266 to pin Trig of HC-SR04

// defines variables
long duration; // variable for the duration of sound wave travel
int distance; // variable for the distance measurement

// define servo motor
Servo servo1;

int timer1;
float Time;
```

```
int pole1 = 0;
int pole2 = 0;

float Distance = 5.0;
float speed;

int sensor1 = A0;



int buzzer = 13;

void setup() {
  pinMode(trigPin, OUTPUT); // Sets the trigPin as an OUTPUT
  pinMode(echoPin, INPUT); // Sets the echoPin as an INPUT
  pinMode(sensor1, INPUT);
  servo1.attach(0);

  Serial.begin(9600);
  Serial.println("Ultrasonic Sensor HC-SR04 Test"); // print some text in Serial Monitor
  Serial.println("with Arduino UNO R3");

}

void loop()
{
  // Clears the trigPin condition
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  // Sets the trigPin HIGH (ACTIVE) for 10 microseconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  // Reads the echoPin, returns the sound wave travel time in microseconds
  duration = pulseIn(echoPin, HIGH);
  // Calculating the distance
  distance = duration * 0.034 / 2; // Speed of sound wave divided by 2 (go and back)
  // Displays the distance on the Serial Monitor
  Serial.print("Distance of the pothole: ");
  Serial.print(distance);
  Serial.println(" cm");
  if (distance > 5 && distance < 20)
  {
    Serial.println ("");
    Serial.println("Incoming pothole");
    servo1.write(90);
  }
```

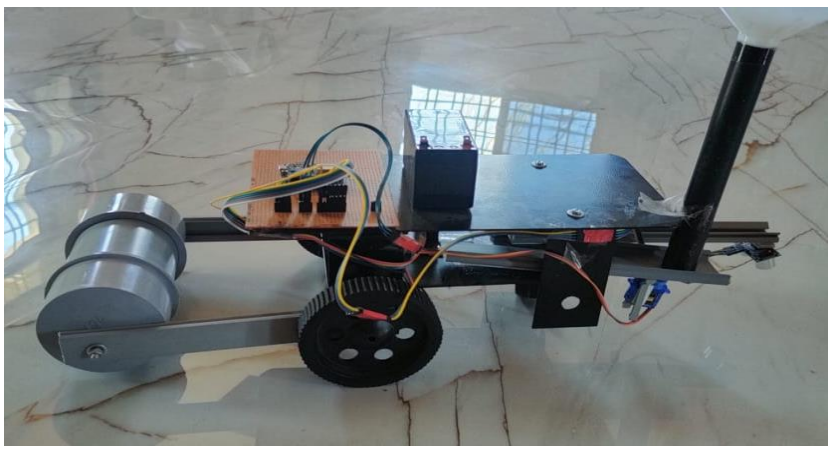
```
else {
  Serial.println ("");
  Serial.println("No pothole incoming");
  servo1.write(0);
}


if (digitalRead (sensor1) == LOW && pole1 == 0) {
  timer1 = millis();
  pole1 = 1;
}



if (pole1 == 1)
{
  Time = Time / 1000; //convert millisecond to second
  speed = (Distance / Time); //v=d/t
  speed = speed * 3600; //multiply by seconds per hr
  speed = speed / 1000; //division by meters per Km
}
if (speed == 0)
{

  if (pole1 == 0) {
    Serial.println("No vehicle  detected");
  }
  else {
    Serial.println("Searching vehicle...    ");
  }
}
else {

  Serial.print("Speed:");
  Serial.print(speed, 1);
  Serial.println("Km/Hr  ");

  if (speed > 50) {
    Serial.println("  Over Speeding  ");

  }
  else {
    Serial.println("  Normal Speed   ");
  }
  delay(3000);
```

```
    speed = 0;
    pole1 = 0;

  }
}
```

## VI. BLOCK DIAGRAM




## VII. PROPOSED DEMO MODEL



## VIII. CONCLUSION

Therefore, our Automated Robot, helps the society in promoting the road safety and to reduce the difficulties in detecting the pothole and also reduce the usage of human power, and hence saves the time. Therefore, by filling the pothole accidents which occur on the road may be reduced.

## ACKNOWLEDGMENT

I take this opportunity to thank all those who have contributed in successful completion of work. I would like to express my sincere thanks to my guide **Prof R. S. Sewane** who have encouraged me to work on this topic and provided valuable guidance wherever required. I also extend my gratitude to **Prof. T. S. Sargar (H.O.D Mechanical Department)** who has provided facilities to explore the subject with more enthusiasm.

I express my immense pleasure and thankfulness to all the teachers and staff of the **Department of Mechanical Engineering of Smt. Kashibai Navale College of Engineering** for their co-operation and support.

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