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AUTOMATIC OBSTACLE AVOIDANCE AND POTHOLE FILLING ROBOT

M.Saravanakumar M.E [1],I.Pavadharani [2],M.Sangeetha[3],V.Vishaal[4]

[1](Assistant professor ,in department of Electrical and Electronics Engineering ,Dr.Mahalingam College Of Engineering and Technology, Pollachi 642001)

[2,3,4](Department of Electrical and Electronics Engineering, Dr.Mahalingam college of Engineering and Technology, Pollachi 642001)

Email :Pavadharaniilangovan@gmail.com, Sangeetharuna10@gmail.com, vishaalvikram4041@gmail.com

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Abstract:

In this research, discovered that road upkeep is a serious issue in Indian towns and villages. It has caused damage on the road, causing potholes and damage to the surface. This technique aids drivers in avoiding collisions and damage to their vehicles. This research examines existing approaches and provides a cost-effective system for detecting potholes on roadways and taking prompt action to prevent accidents or vehicle damage. Ultrasonic sensors are used to detect potholes and other road hazards. The robot's power supply is turned on, allowing it to travel down the road. If an obstacle is detected on the road, the Ultrasonic sensor 1 emits a buzzer and the robot comes to a halt. The Ultrasonic sensor 2 on the robot's front allows it to sense the road's surface; if a pothole is detected, the sensor sends signals to the Arduino Controller, which suddenly stops the robot's movement near the pothole and sends the pothole location to the Highways Authority, as well as allowing robot to discharge the required Filling Element for the detected pothole..

Keywords **— Pothole, Arduino Uno,Gsm Module,Gps Module.**

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I. INTRODUCTION

Roads play a critical role in economic development and provide significant social benefits. They are critical to a country's growth and development. Roads connect more people and places, promoting economic and social development. As a result, road infrastructure is the most valuable of all public assets. However, due to repeated loading and weathering on roads, a pothole may form, posing a serious threat to human life. A pothole is a road surface structural failure produced by the failure of the asphalt pavement due to water in the underlying soil structure and traffic passing over the affected area..

So the goal of this project is to create a robot that aids society in promoting road safety by reducing the difficulty of identifying potholes, as well as reducing the need of human power and so saving time. So created a Semi-Automatic Robot that would identify a pothole on the road, discharge the necessary quantity of concrete to fill the pothole, and then use the slider to level the discharged concrete.

Figure 1.1 Pothole

As a result, the pothole on the road (Fig.1.1.Pothole) may be entirely filled, and the number of accidents caused by the pothole may be decreased.

II. BLOCK DIAGRAM

The block diagram of the proposed system consisting of Inverter, DC Supply, Ultrasonic Sensors, LCD, Gsm Module ,Gps Module, Servo, Relay, and Battery. Driver Circuit is shown below in figure 2.1

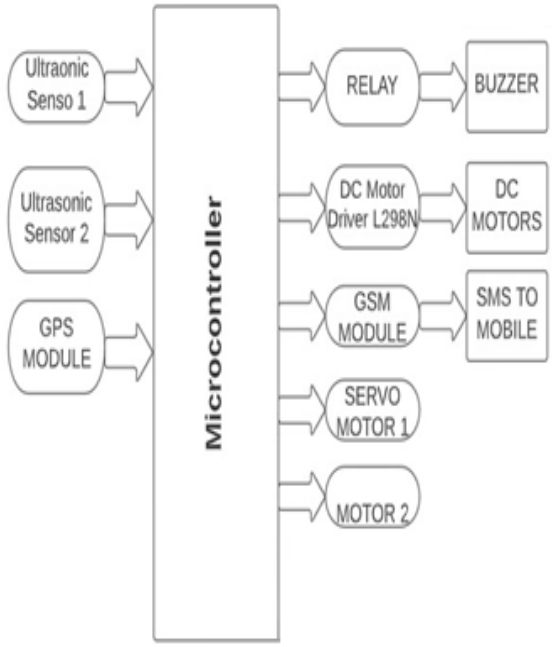

Figure 2.1 Block Diagram

This system includes two ultrasonic sensors, one GSM module, one GPS module, two servo motors, one motor driver, and a relay module. Ultrasonic 1 is used to find a path and detect any obstacles in the way of the robot. This turns 180 degrees with the help of servo motor 1 and when an obstacle is encountered, the buzzer is activated. If the ultrasonic 2 detects a pothole on the robot's route, it signals the microcontroller to stop the robot and the servo motor 2 to open the filing valve, as well as sending a message to the robot authority with the GPS position.

A. ARDUINO UNO :

The suggested system's main component is an Arduino Uno microcontroller that runs on an ATMega328P. It requires a 5 volt power supply, which may be constructed using a variety of components such as a step converter, rectifier, filter, and regulator. The key three elements of this suggested system are controlled by Arduino. There are GSM, GPS, and Ultrasonic sensor readings, and the Arduino turns on the relay switch and displays a message about the time slot on the LCD.

Figure 2.1.1 Arduino Uno

B. GSM MODULE:

The GSM (Global System for Mobile Communications; derived from Groupe Spécial Mobile) standard is the most widely used mobile phone standard in the world. According to the GSM Association, the standard is used by 82 percent of the global mobile market. Over 3 billion individuals in more than 212 nations and territories utilise GSM. Because of its widespread use, international roaming between mobile phone operators is fairly frequent, allowing customers to use their phones in many different locations throughout the world. GSM is a second generation (2G) mobile phone technology that varies from its predecessors in that both the signalling and speech channels are digital. It was also simple to integrate data communication into the system as a result of this.

Consumers (who profit from the ability to roam and transfer carriers without switching phones) and network operators (who can choose equipment from any of the numerous vendors implementing GSM) have benefited from the GSM standard's ubiquity. GSM also pioneered the Short Message Service (SMS, sometimes known as "text messaging"), a low-cost (to the network carrier) alternative to voice calls that is now supported by various mobile protocols. Another benefit of the standard is that it provides a single global emergency telephone number, making it easier for international travellers to contact emergency services without knowing the local emergency number.

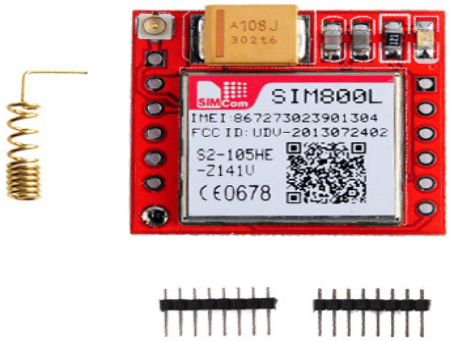

Figure 2.1.2 GSM Module

C. *GPS MODULE:*

The Global Positioning System (GPS) is satellite based navigation system that provides location and time information. The system is freely accessible to anyone with a GPS receiver and unobstructed line of sight to minimum this of GPS satellites. A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites. GPS is now days widely used and now also has become integral part of smart phones.

It operates over 3.2 to 5V supply range thus enabling interfacing with microcontrollers with 3.3V as well as 5V.The module outputs GPS data in NMEA0183 format. Each of message string starts with '$' and then the message identifier. Each parameter is separated using a comma. So that the message can be parsed with the help of the commas.

FEATURES

- Jammer detection and reduction
- Patch antenna
- High sensitivity
- Low power consumption
- UART as well as USB interface
- On-board battery is provided

Figure 2.1.3 GPS Module

SPECIFICATIONS

- Input power supply: 3.3 – 5V
- Update rate: 1 - 10Hz
- Velocity accuracy: 0.1 m/s
- Acceleration accuracy: 0.1 m/s2
- Timing accuracy: 100ns RMS
- Interface: TTL
- Power consumption: 100mW

D. *ULTRASONIC SENSOR*

Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception. Ultrasonic sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception. In a reflective model ultrasonic sensor, a single oscillator emits and receives ultrasonic waves alternately. This enables miniaturization of the sensor head

Distance Calculation.

Distance L = 1/2 × T × C where L is the distance, T is the time between the emission and reception, and C is the sonic speed. (The value is multiplied by 1/2 because T is the time for go-and-return distance.)

Figure 2.1.4 Ultrasonic Sensor

III. CIRCUIT DIAGRAM

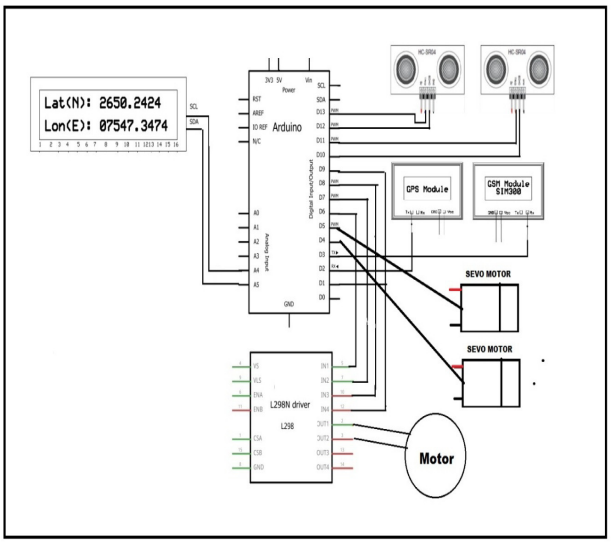

Figure 3.1 Circuit Diagram

In this *system* have two ultrasonic sensor, one GSM module, one GPS module, two servo motors, motor driver and relay module.

Ultrasonic 1 was linked to pins A1 and A2 of the microcontroller. It turns 180 degrees with the help of servo motor 1 to locate a path and deduct any obstacles in the robot's path, and every obstacle deducted activates the buzzer. Pin 11 was used to connect servo motor 1.

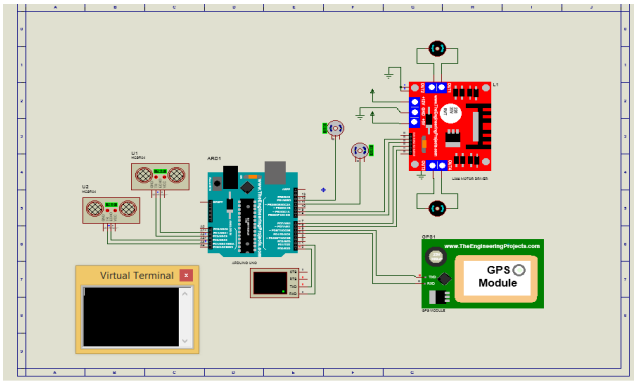

Figure 3.1.1 Simulation

Ultrasonic 2 was linked to pins A3, A4 on the microcontroller. On the robot-driven road, it's utilised to detect potholes. It sends a command to the microprocessor to stop the robot and a signal to the servo motor 2 to open the filing valve if it detects a pothole.

A communication containing location data was sent to the robot authority at the same moment. GSM and GPS are connected to pins 2,3 and 4,5, while servo motor 2 is attached to pin 12.

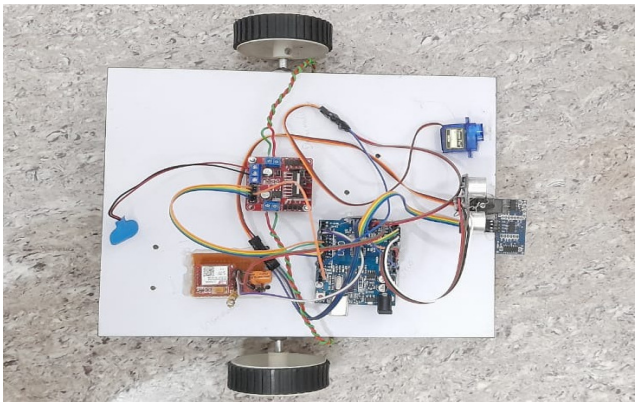

Figure 3.1.2 Pothole Finding Robot

IV. ADVANTAGE

- Initial investment is less
- Easy to maintain
- It reduces labour because of Automatic equipment.
- It's worked autonomously.
- Easy to operate.

V. CONCLUSIONS

Following the development and testing of the "Pothole Filling Machine," we were able to conclude that, based on the overall performance of the machine, we can confidently state that the project will have an impact on the municipalities and cities. Multiple operations, such as rolling and tar discharge, can be carried out at the same time. Reduces the amount of manpower as well as the amount of time spent on the process. Because the machine is compact, the problem of traffic disruptions while filling tar is eliminated. Because only one machine is used to perform the work, the number of pieces of equipment used is reduced, and thus the cost is reduced. This reduces the amount of time and money required to fill a pothole. Also this system automatically maintains the distance between two vehicles to avoid road accidents.

FUTURE SCOPE

An important aspect of this project is the maintenance of roads which will rapidly make this city a smart city and these developed roads will lead to the safety of human life & this system can be used to benefit the people by using some high level technologies and ideas for the increased development of the roads and prevention from pothole based accidents.

ACKNOWLEDGEMENT

One of the advantages of completing this project report is that it allows you to discuss and test ideas with both colleagues and teachers. We owe a debt of gratitude to every member of this team who contributed to the success of this project. We are grateful for the opportunity to express this heartfelt gratitude. Thanks to this department's project guide for their inspiration, invaluable suggestions. Appreciate the valuable advice provided by the HOD of Electrical and Electronics Engineering. Last but not least, we'd like to express this gratitude to everyone who contributed to the project's success, whether directly or indirectly. Every project is the result of meticulous planning, consistent, and well-organized efforts. This work is a synthesis of all of them.

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