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Design and Development of Pothole Detection and Cement Dispensing Robot

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Abstract: *A road network is a way of transporting, sharing and transporting goods and services locally to the community. Road networks are also the means of communication in some parts of the world. Therefore, access to good roads improves the quality of life and work of the people living in the community. But the poor condition of the design and development of the road network coupled with natural disasters such as heavy rains have caused many unwanted potholes and abrasions on the roads which are very dangerous for commuters and other road users and for road users. In addition, the lack of a proper road maintenance program has resulted in a steady increase in the number of potholes that endanger transport and road safety. Meanwhile road maintenance works are heavily dependent on actual acquisition and reporting.*

Keywords: Pothole Detection, Cement Dispensing, Road Maintenance, Transportation.

I. INTRODUCTION

Roads contribute significantly to the growth of the economy as a whole. Road conditions include various types of injuries such as pits, pothole imbalances, crack skid resistance, etc. One type of pressure, the pothole is defined as a plate-shaped depression in a paved area. The minimum layout is 150 mm. Potholes can cause damage to car tires and tires Impact on the lower part of the car, And the presence of potholes leads to emergency braking and steering wheel Operation leads to car crashes and serious accidents. Since 2011, for the next five years, motorists have spent more than $ 3 billion on vehicles to repair damage caused by potholes. This costs about $ 300 on average per driver. A report by the India Economic Times in 2018 states that 3597 people have died as a result of potholes, according to the Supreme Court. Also, road quality measurements such as acquisition of Cracks, holes, etc. most handmade is hard work and time consuming. To address this problem, much research is being done in many countries to develop such technologies Can detect and identify sensory-based holes Which may improve research results Effectively with regard to road quality through preliminary investigation and prompt action can be taken. In this paper, we have explored the various holes and drawing methods that have been developed so far. Proposing a discovery plan and mapping the pothole accurately and effectively. The discovery of clever holes and mapping is done by combining information from multiple vehicles and users using Crowd sourcing are used to access environmental data with improved accuracy.

II. PROBLEM STATEMENT

A pothole is a structural failure in a road surface, mostly resulting from failure in asphalt pavement because of the presence of water in the underlying soil shape and the presence of visitors passing over the affected vicinity. As soon as a pothole bureaucracy, it may develop to several feet, with rain water accelerating the technique and developing a entice for vehicles, making one of the top causes of vehicle injuries. The pressure can cause a misalignment inside the steerage components in addition to in the engine, both of that can motive ability control problems and boom coincidence risks. So, our challenge is to make a robotic which facilitates the society in selling the road protection and to reduce the problems in detecting the pothole and also reduce the usage of human power, and as a result saves the time.

III.OBJECTIVES

The main objective of this project is to design and manufacture the Semi-Automated Robot, which will detect the Pothole on the road and will produce the required amount of concrete, required for the hole obtained and to perform the measurement process on the output. concrete and that is why the pothole on the road is completely filled. All paragraphs must be indented.

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IV. PROPOSED METHODOLOGY

When the Robot is on, it will start moving in a straight line. The Ultrasonic sensor is mounted upside down and will always detect the location from the height of the Robot. If there is a change in the wavelength of the Transmission wave and the received ultrasonic wave, then automatically calculate the depth of the Pothole. The Microcontroller sends a command to the servo server to OPEN for some time as the Pothole dies. After removing the cement, the Robot will move forward and then the cement removed from the road will be equal to the robot attached to the back of the Robot.

A. Ultrasonic Sensor

HC-SR04 is an active ultrasonic sensor and contains a transmitter and receiver. It is used to measure the distance at which humps. They are not present before it. The ultrasonic sensor transmits high frequency sound and waits for the reflected wave to strike the recipient ULTRASONIC SENSOR- Ultrasonic sensor is basically used to measure distances between the front object area. Its and the sensor. The ultrasonic sensor operates on the Doppler Effect. The distance is calculated based on the time taken by the ultrasonic pulse to move a certain distance. HC-SR04 is active at 40 kHz frequency and can measure objects distance of 2-400cm at a 15o angle of discovery.

Figure 1: Ultrasonic Sensor

B. Microcontroller

Small Module to fit intelligently within your IoT projects The NodeMCU ESP8266 development board comes with an ESP-12E module containing an ESP8266 chip with a Tensilica Xtensa32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB Flash memory for data storage and programming. Its advanced processing capabilities have built-in Wi-Fi / Bluetooth and Deep Sleep Operating features that make it ideal for IoT projects. NodeMCU can be enabled using a Micro USB jack and VIN (External Provider PIN). Supports UART, SPI, and I2C interface

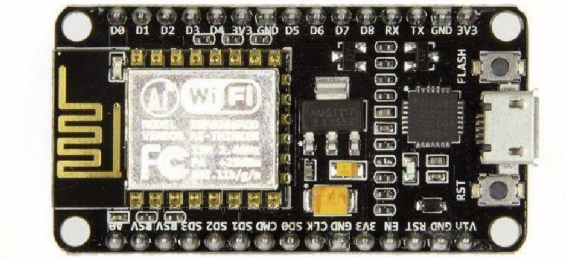

Figure 2: Microcontroller

C. Servo Motor

There are many servo motors available in the market and each has its own technology and applications. The following two sections will help you identify the right type of servo motor for your project / plan. Most Servo motors operate from 4.8V to 6.5V, where the voltage rises above the torque we can get, but usually operates at +5V. Almost all recreational servo motors can only rotate from 0° to 180° due to their gear arrangement so make sure your project can live with half a circle if not, you can choose a 0° to 360° engine or change the engine to make full circle. Car gears change easily, so if your application requires sturdy and long-lasting motors you can either carry metal gears or simply stick to regular plastic. Next comes the most important parameter, which is the torque in which the engine operates. Again, there are many options here but the most common torque is 2.5kg / cm which comes with the Tower pro SG90 Motor. This torque of 2.5kg / cm means that the engine can pull 2.5kg if it hangs at a distance of 1cm. So, if you stop the load at 0.5cm then the engine can pull 5kg

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the same way if you stop the load at 2cm then you can only pull 1.25. Based on the load you use on the project you can choose the engine with the appropriate torque. The image below will show the same.

Figure 3: Servomotor

V. FLOWCHART

The implementation section consists of the flowcharts for sensing pothole as well as dispensing cement are as shown below:

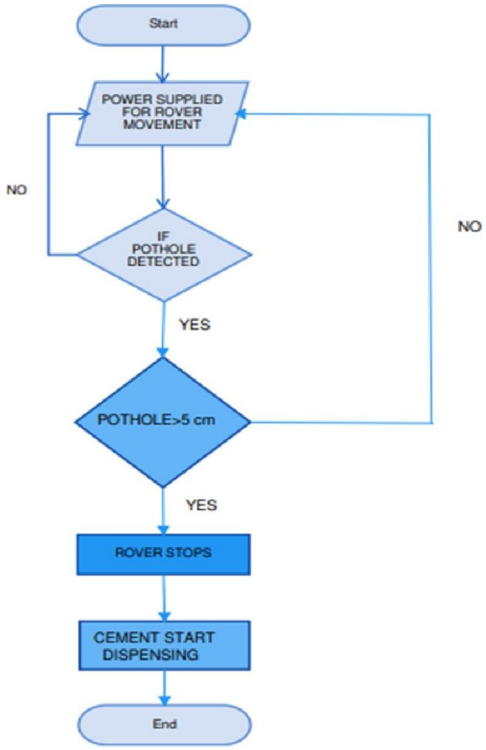

Figure 4: Flowchart of Implementation

VI. ALGORITHM

1. Start
2. Initialize the system peripherals
3. Start the robot
4. Check the distance measured from Ultrasonic sensor
5. If distance goes high above reference level, then pothole is detected
6. Stop the robot
7. Servo motor starts
8. Cement starts dispensing
9. Robot moves forward and cement is rolled by roller attached to robot

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10. Go to step 4
11. End

VII. Proposed Demo Model

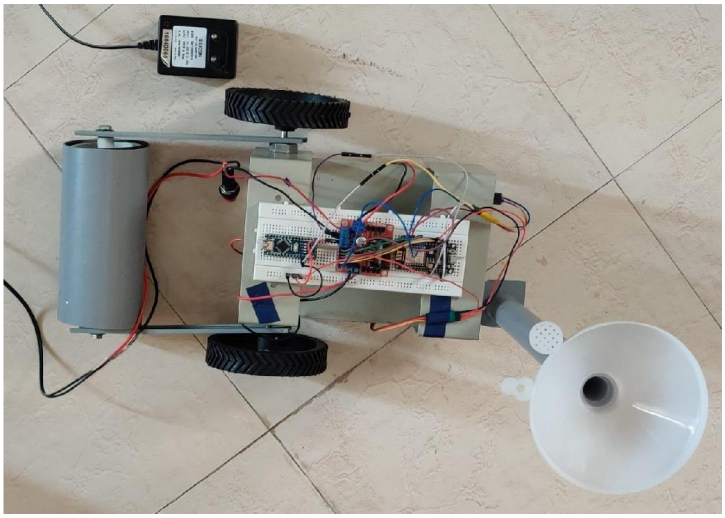

Figure 5: Photos of actual Robot

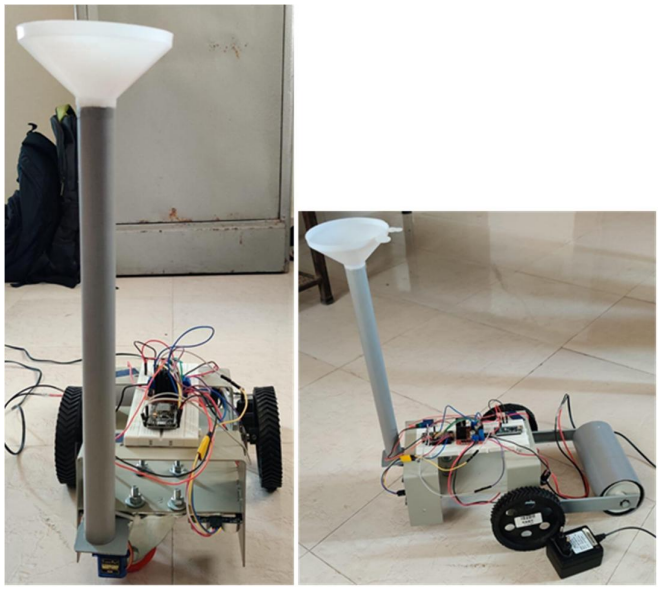

Figure 6: Photos of actual Robot

VIII. Conclusion

The proposed system basically serves the following purposes:

1. The proposed system will detect potholes and hubs on the road.
2. And save the information to a server. The holes are also found and their height and depth are measured using ultrasonic.
3. Sensors and accelerometer. Therefore, our self-propelled robot, helps the community in promoting road safety and reducing potholes and reducing human energy consumption, and that saves time.
4. Therefore, by filling the hole, accidents on the road can be reduced.

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