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Automatic Pothole Repairing Robot

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ABSTRACT: In secondary Indian roads, one often encounters potholes, which can be either dry or water-filled. Accordingly, to ensure safe driving, it is imperative to detect potholes and estimate their depths in either condition. In this paper, we develop a physics-based geometric framework, where such detection and depth-estimation can be accomplished using suitable. Here we consider diminishing resolution with increasing distance from the camera. Moreover, we design and fabricate a Semi-Automated Robot, which will discharge the required amount on concrete quantity, which is needed for the detected pothole, and to do the leveling process on the discharged concrete, and hence the pothole on the road filled completely. In this experiment, we are also providing manual control of the robot; if the user does not want to use the automatic, then he can monitor using an android application which has all control of robot applications, like forwarding, backward, left, right, roll, fill.

KEYWORDS: (Pothole Detection, Manual & automate Control System, Remote controlled, Secure)

I. INRODUCTION

Potholes on roads are a major problem, and they can cause significant damage to vehicles and injury to drivers and pedestrians. Potholes are formed due to several factors, including weather, heavy traffic, and poor road maintenance. Detecting potholes on roads is a challenging task, and it requires a reliable and accurate system to provide early warning to drivers. The proposed pothole detection system uses ultrasonic sensors to detect the presence of potholes on roads. The system is designed to provide an early warning to drivers, allowing them to take appropriate action. Traditional methods of pothole detection involve manual inspections by trained personnel, which are time consuming, labor-intensive, and prone to human errors. Moreover, they often fail to identify potholes in real-time, leading to delayed maintenance and potential accidents. To address these limitations, advanced technological solutions have been explored, and among them, ultrasonic sensor-based systems have gained significant attention due to their accuracy, versatility, and cost-effectiveness.

II. LITERATURE SURVEY

DESINGNER	YEAR	DESCRIPTION	METHODOLOGY
Aniket Kulkarni, Nitish Mhalgi, Sagar Gurnani, Dr. Nupur Giri	2002	Proposed a system investigates an application of mobile sensing detection of pothole on roads. But this system does not have a centralized database. System also provides less GPS accuracy.	Mobile sensing detection of pothole on roads.
Yuzhong Yan, Lei Huang	2007	Published a paper which gives a brief idea about how images, videos which are being produced on large scale are processed with the help of image processing algorithm. In this paper the use of Hadoop hampers the data distribution. Hadoop is also not good at handling low- latency requirement	How images, videos which are being produced on large scale are processed with the help of image processing algorithm.
Karmel. A, Adhithiyan. M, Senthil Kumar	2015	Proposed a pothole detection technique which is carried out	Pothole detection technique which is

		using two techniques namely image processing and machine learning. This system is distracted by sense which has heavy shadows, lighting problem, etc.	carried out using two techniques namely image processing and machine learning.
E Sai Tarun Kumar Reddy; Rajaram V	2022	Pothole detection with CNN and YOLO utilizes a smartphone's camera and current location to categorize the potholes and determine the pothole count. The YOLO v7 algorithm is utilized for pothole categorization, and the Google API and Accelerometer are utilized for pothole counting.	Pothole detection with CNN and YOLO utilizes a smartphone's camera and current location to categorize the potholes and determine the pothole count
Y. Pan, X. Zhang, G. Cervone and L. Yang	2023	Multispectral imagery presenting spatial and spectral features of objects has been widely used in remote sensing application	Application is made by using the remote sensing technology.
Emir Buza Samir Omanovic Alvin Huseinovic	2022	Spectral Clustering for Image segmentation	Spectral Clustering is used.
A. Basavaraju, J. Du, F. Zhou and J. Ji	2020	This approach enables the detection of road anomalies such as potholes and irregularities in real-time, offering a cost-effective and accessible solution for assessing road infrastructure health and safety.	The detection of road anomalies such as potholes and irregularities in real-time, offering a cost-effective and accessible solution for assessing road infrastructure health and safety.
Asst.Prof. Rashmi Deshpande, Siddhant Patil, Arti Gagare, Rajshree Sanap, Renuka Suryabanshi.	2021	Detect and locate potholes on the map road using Arduino uno, ultrasonic sensor, GPS.	Detect and locate potholes on the map road using Arduino uno, ultrasonic sensor, GPS.
S.Jothi, S.Priyanka, P. Yuvaraj, S.Kalaivani	2014	Send message to driver using GSM when ever pothole is detected. The pothole is detected using Arduino, GSM, SIM900, GPS, Ultrasonic sensor	Send message to driver using GSM whenever pothole is detected. Using GSM, Arduino, etc.
Tushar D. Patil, Prof. Archana B. Kanwade	2018	Gather information incorporates pothole, hump, and geographic location, which is stored in the Google spread sheet	Gather information incorporates pothole, hump, and geographic location, which is stored in the Google.

III. PROPOSED METHOD

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.

3.1 Components Requirement:

ESP 32 & Cam Module:



Fig: ESP 32 & cam module

The ESP32-CAM is a small size, low power consumption camera module based on ESP32. It comes with an OV2640 camera and an ESP32-CAM-MB micro-USB to serial port adapter. The ESP32-CAM can be widely used in intelligent IoT applications such as wireless video monitoring, Wi-Fi image upload, QR identification, and so on.

L293 Motor Driver IC:

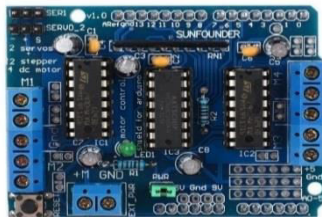


Fig: L293 Motor Driver IC

The L293D is a popular motor driver IC (Integrated Circuit) that is widely used in robotics and other electronic projects. It is designed to drive small DC motors, typically in the range of low to moderate power applications. The L293D IC is known for its simplicity and ease of use in controlling the direction and speed of DC motors.

Ultrasonic Sensor:



Fig: Ultrasonic Sensor

This ultrasonic sensor module can be used for measuring distance, object sensor, motion sensors etc. Highly sensitive modules 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.

IV. COMPONENTS

Hardware Component:

- Ultrasonic Sensor
- Motor Diver L293D
- Car chassis
- Motor with wheels
- ESP32



- Camera
- Battery
- Jumper wire
- Pump
- Arduino UNO

Software Component:

- Arduino IDE
- Blynk IOT

V. SOFTWARE

5.1 Arduino IDE

The Arduino Software (IDE) makes it easy to write code and upload it to the board offline. We recommend it for users with poor or no internet connection. This software can be used with any Arduino board. Arduino Software (IDE) - connects to the Arduino boards to upload programs and communicate with them. Programs written using Arduino Software (IDE) are called **sketches**. These sketches are written in the text editor and are saved with the file extension. ino.

5.2 Blynk IOT

Blynk is an IoT platform for iOS or Android smartphones that is used to control Arduino, Raspberry Pi and NodeMCU via the Internet. This application is used to create a graphical interface or human machine interface (HMI) by compiling and providing the appropriate address on the available widgets.

VI. SYSTEM DESIGN

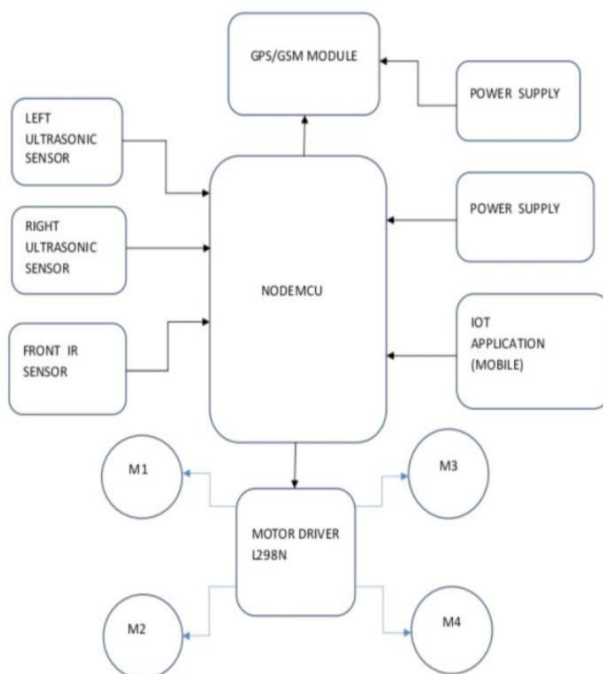


Fig. System Design

VII. FLOWCHART

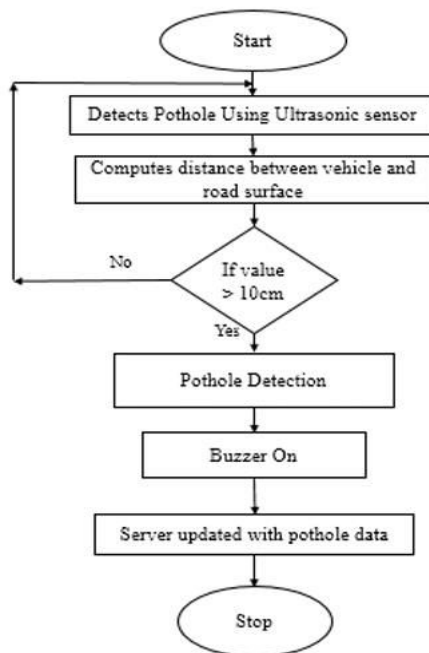


Fig. Flowchart

VII. WORKING


It's installed inside the frontal cushion of a machine and another camera is used to record the images of the road. The data is continuously collected while the vehicle is on its route. If the pothole is detected, then it will pop up the msg and fill it by its own. We can use this rover manually as well as it works automatically. In addition to the ultrasonic sensor detects the pothole and alerts us by popping message on pc/mobile screen. It acts according to how we control it. It will go forward, backward, right, left.

IX. RESULT

The utilization of pothole detection systems has resulted in improved accuracy compared to traditional methods. It can effectively learn complex features and patterns in pothole images, leading to more precise and reliable detection outcomes. This increased accuracy is crucial for identifying and prioritizing road maintenance needs. Real-Time Detection based pothole detection systems have the potential to operate in real-time, allowing for immediate identification of potholes. This capability enables prompt response from maintenance crews or automated systems, facilitating timely repairs and reducing the risk of accidents and vehicle damage.

9.1 OUTPUT

NO.	COMMAND	
1	Forward	
2	Left	
3	Right	
4	Backward	

5	Stop	
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X. ACKNOWLEDGEMENT

We would like to express our sincere gratitude to all those who have contributed to the completion of this research paper on " Automatic Pothole Repairing Robot". First and foremost, we extend our deepest appreciation to our supervisor Mrs.S.B.Gaikwad, whose guidance, expertise, and encouragement have been invaluable throughout this research endeavour. Their insightful feedback and unwavering support have greatly enriched the quality of this work. We are also grateful to the members of our research team for their dedication and collaboration. Each member has played a crucial role in conducting experiments, analysing data, and refining the algorithms, thereby contributing significantly to the success of this project.

Furthermore, we would like to thank the participants who generously volunteered their time and efforts for data collection and testing. Their participation has been essential in validating the effectiveness of the sign language translation system developed in this research. Our appreciation also goes to the academic and technical staff at [Sinhgad Institute of Technology and Science, Pune], whose resources and facilities have facilitated the execution of this research project.

Thank you all for your invaluable contributions.

XI. CONCLUSIONS

Therefore, our Automated Robot helps 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.

Our Semi Automated Robot helps society in promoting the road safety and reduce the difficulties in detecting the pothole and also reduce the usage of human power and hence saves time.

REFERENCES

- [1] Proposed a system investigates an application of mobile sensing detection of pothole on roads By. Aniket Kulkarni, Nitish Mhalgi, Sagar Gurnani, Dr. Nupur Giri(2002).
- [2] Published a paper which gives a brief idea about how images, videos which are being produced on large scale are processed with the help of image processing algorithm By. Yuzhong Yan,Lei Huang (2007).
- [3] Proposed a pothole detection technique which is carried out using two techniques namely image processing and machine learning By. A. Karmel, M. Adhithiyan, Senthil Kumar. (2015)
- [4] Pothole detection with CNN and YOLO utilizes a smartphone's camera and current location to categorize the potholes and determine the pothole count By. E Sai Tarun Kumar Reddy. Rajaram V. (2022).
- [5] Multispectral imagery presenting spatial and spectral features of objects has been widely used in remote sensing application By. Y. Pan, X. Zhang, G. Cervone and L. Yang. (2023).
- [6] Spectral Clustering for Image segmentation by Emir Buza. Samir Omanovic. (2022).
- [7] This approach enables the detection of road anomalies such as potholes and irregularities in real-time By. A. Basavaraju, J. Du (2020).



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