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"DETECTING LIVE POTHOLES BY NAVIGATION SYSTEM"

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Abstract: Potholes are becoming a growing cause of concern, resulting in numerous road accidents across the country. To address this problem, a smart pothole reporting system has been developed that can report and address potholes as soon as they occur. The system ensures transparency and accountability between citizens and the government while being user-friendly. The smart system employs an image recognition-based method that uses machine learning techniques, such as the Classification Algorithm using TensorFlow, to identify potholes. The system collects data and uses it to represent areas with a higher density of potholes on a map. If the density of potholes in a certain area is high, the road appears red on the map. Conversely, if the potholes have been patched up or there are no potholes, the road appears green. Color codes are used to warn and alert drivers about the observed road conditions. The smart pothole reporting system enables prompt reporting and resolution of potholes by the appropriate authorities. The system allows the government to prioritize areas that require attention and repair, leading to a more efficient allocation of resources. Additionally, the system helps to eliminate the threat posed by potholes and ensures safer roads for everyone. In conclusion, the smart pothole reporting system is an easy- to-use solution that addresses the growing concern about potholes and provides a safer road network for citizens. The system ensures transparency and accountability between the government and citizens, using advanced technology to identify and report potholes promptly.

Keywords: Potholes, Smart Reporting, Classification Algorithm, TensorFlow, Colour code, Alert

I. INTRODUCTION

Maharashtra is currently the second most pothole-ridden state in India. Currently, road maintenance companies require several working hours to roughly estimate the damage on a road. It becomes difficult to spot potholes during the night due to reduced visibility. While there are systems available that allow users to report potholes by using their mobile phones, the current system has many limitations. It cannot guarantee the presence of potholes at the reported location, and it also lacks transparency in the repair process. Although users can upload pictures of potholes, there is no algorithm to verify the authenticity of the images, and no standard definition of what is considered a pothole. While Google Maps offers many advanced features, it does not provide real-time updates on road conditions. So, a smart pothole reporting system is designed to report problems to the authorities as soon as they arise and maintain transparency between the government and citizens. The system is user-friendly and efficient in resolving pothole-related threats throughout the nation. While potholes are being repaired, the system uses navigation to guide citizens about road conditions.

To address the problems related to potholes using an application where users can upload images of potholes along with their coordinates, which results in an indication of road conditions by using a color code on the Navigation system. The road with the highest intensity of potholes should appear as red on the map, while under- construction roads should be denoted by a yellow color, and roads with no flaws are shown in green. This system should improve road understanding, allowing drivers to analyze the road properly using the provided information.

II. LITERATURE SURVEY

1. Indian pothole detection based on CNN and anchor-based deep learning method.:

Mallikarjun Anandhalli., and Vishwanath Baligar, In Proc. in International Journal of Information Technology. A study from February 2022 demonstrates the application of deep learning techniques for pothole identification. For the purpose of spotting potholes on the road, a convolutional neural network is employed. With the use of this method, image flaws are found and extraneous images of other objects are avoided. The pothole in the image is detected using deep learning methods as well as the layers in the CNN algorithm. In Proc. in International Journal of Information Technology ·

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February 2022[1].

2. A Real-Time Pothole Detection Approach for Intelligent Transportation System:

Hsiu-WenWang, Chi-Hua Chen, Ding-Yuan Cheng, ChunHao Lin, and Chi-Chun. An intelligent transport system is a cutting-edge program that intends to offer cuttingedge services connected to various modes of transport and traffic management and to give users the information they need to use transport networks in a safer, more effective, and ”smarter” way. The intelligent transportation system needs to be able to detect potholes. Road accidents caused by potholes are less common since it detects them in real time and prevents accidents on the roadways. 2015 in the Proceedings of HsiuWen Wang et al., Taiwan, China.[2]]

3. Convolutional neural networks-based pothole detection using thermal imaging

Aparna, Yukti Bhatia, Rachna Rai, Varun Gupta, Naveen Aggarwal, and Aparna Akula. Convolutional neural networks are a kind of artificial neural network that are commonly used to analyze visual data. Deep learning is relevant to this. Thermal imaging is a type of infraredimaging that uses a camera to gather and create images of objects using infrared radiation that is emitted from the objects throughout a process. It helps in determining the potholes' width and depth as well as in evaluating the specifics of their structural design. Computer and Information Sciences 34 (2022) 578-588, King Saud
University Privacy Journal, February 2019. [3]

4. Real-Time Pothole Detection using Android Smartphones with Accelerometers

Artis Mednisy, Girts Strazdinsy, Reinholds Zviedris, Georgijs Kanonirs, and Leo Selavoy.An accelerometer is a piece of electromechanical equipment used to monitor acceleration forces. These forces may be static, like the gravitational pull that is always there, or dynamic, like those used by many mobile devices to sense motion or vibrations. Here, the user can utilize the camera and accelerometer on their smartphone to find potholes. In Proc. of Institute of Electronics and Computer Science 14 Dzerbenes Str., Riga, LV 1006, Latvia Faculty of Computing University of Latvia 19 Raina Blvd., Riga, LV 1586, Latvia. [4]

5. Road Pothole Detection using Deep Learning Classifiers :

Surekha Arjapure, D. R. Kalbande.A classifier is a particular kind of machine learning algorithm used to categorize data input. Machines can recognize and extract features from photographs thanks to deep learning. The photographs will be classified by classifiers, who will also assist in spotting any potholes. In Proc. International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878 (Online), Volume8
Issue6, March 2020.[5]

6. Webbased framework for smart parking system:

Alharbi A, Halikias G, Yamin. This study shows how parking on specific streets and in important metropolitan areas greatly increases traffic congestion. The proposed web application, introduces the idea of an intelligent system to address this issue by enabling users to pre- reserve arriving at the venue and then modifying

the process in response to the automatic detection of the composite plate. On pages 1495– 1502 of JJT Information Technology.[6]

III. PROPOSED SYSTEM

- **Problem Statement**

The problem statement revolves around the project is to address the growing concern of potholes causing road accidents. This is being achieved by developing a smart pothole reporting system that utilizes advanced technology for prompt detection and resolution. The system

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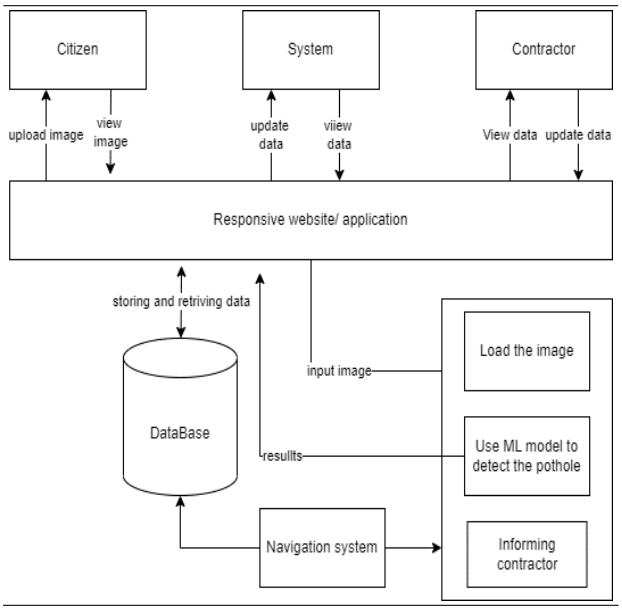

ensures transparency and accountability between citizens and the government by providing a user- friendly platform for reporting potholes and monitoring their resolution. It employs image recognition and machine learning techniques, such as the Classification Algorithm using TensorFlow, to accurately identify potholes. The system collects data and maps areas with a higher density of potholes on a color-coded map, alerting drivers to road conditions. Prompt reporting enables authorities to quickly address reported potholes, and the system assists the government in efficiently allocating resources for repairs. Ultimately, the goal is to eliminate the threat of potholes and create safer roads for everyone.

SYSTEM ARCHITECTURE CONTAINS MAIN COMPONENTS

1. Citizen:

View Image: Citizens can use an Android application or website to access a user interface and view images of road potholes. Upload Image: They can also capture and upload images of road potholes through the Android application.

2. Android Application:

Store and Retrieve Information: The Android application manages the storage and retrieval of information related to road potholes, including images and other relevant data.It communicates with the server and database for these operations.

3. Contractor:

View Image: Similar to citizens, contractors can view images of road potholes through the Android application or website's user interface. Upload Image: Contractors can alsocapture and upload images of road potholes using the Android application.

4. Website:

The website serves as a platform for administrators and contractors to maintain pothole data. Administrators can assign contractors to query and update the data. The website provides UI components for viewing and uploading images of road potholes.

5. Database:

All information related to road potholes, such as images and user details, is stored in thedatabase. The Android application and server interact with the database for storing and retrieving information.

6. Server:

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The server acts as a mediator between the Android application, website, and database. It receives and processes requests from the Android application and website, facilitating communication with the database. It also enables integration with other services like the map navigation system.

MATHEMATICAL MODEL

$E = a\ (KLOC)^b$

7. Map Navigation System (Integrated with Google Maps):

The map navigation system is integrated with Google Maps to provide navigation and mapping functionalities. It can display the locations of reported potholes on the map, assisting users in visualizing and identifying areas with road issues.

- **Requirements**

Hardware Requirements

1. Processor- Intel i5/i7
2. Speed- 3.1 GHz
3. RAM- 8 GB(min)
4. Hard Disk- 50 GB
5. Camera Interface

Software Requirements

1. Operating System- Windows
2. SQL Database
3. .NET Platform
4. Google Maps API

- **Algorithm**

1. START
2. Enter your credentials to login.
3. Verify the pothole image
4. Complaint details

5. Admin panel

1. User panel

2. Pothole image verification.

8 . END

where,

a = 11.32,b = 1.05, for an organic project. E = Efforts in person month

IV. RESULT DISCUSSION

A smart pothole navigation system has been developed, consisting of both a mobile application and a website. The mobile application is designed for use by the general public, allowing citizens to access and utilize the system. On the other hand, the website is specifically intended for administrative officers and contractors involved in the management and maintenance of the road infrastructure. The primary component of the smart pothole navigation system is the user application. Upon registration, users gain access to a dashboard that offers several key features. The dashboard includes options such as ”Create Case,” ”All Cases,” and ”View Map.”

V. FUTURE WORK

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The future scope for a navigation system depicting live potholes holds immense potential for leveraging technology to improve road safety, optimize maintenance efforts, and enhance the overall driving experience. Continued advancements in data collection, analysis, and communication technologies can lead to more effective and efficient management of pothole- related issues on road networks. Not only this but the system can further be in use for various purposes such as mentioned below:

The navigation system can establish partnerships with road maintenance agencies, enabling seamless communication between the system and these authorities. This collaboration can facilitate timely pothole repairs based on the reported data, ensuringa quicker response and improved road conditions.

The road can be surveyed using a vehicle with infrared sensors mounted on it, this will help in 3-dimensional mapping of the road and will help in detecting the depth and structure of the pothole.

A potential improvement to the current application is the addition of a feature that facilitates direct communication between citizens and contractors without the need for an intermediary, such as an admin. This would enable more straightforward and streamlined communication between citizens and contractors. This feature could be incorporated into applications that already have a direct communication channel between citizens and contractors.

In the future, the capabilities of this system could potentially be expanded to includethe detection of accidents and various disasters, along with assessing their severity.This could lead to a more comprehensive and advanced system that provides critical information to both citizens and concerned authorities.

VI. CONCLUSION

In conclusion, This system aims to tackle the challenges faced by citizens as a result of potholes by providing a platform for direct communication with the government. It offers several benefits to citizens in achieving three main objectives. Firstly, citizens can actively contribute by reporting the locations of newly formed potholes, enabling the government to swiftly identify and address them. Secondly, citizens can monitor the progress of pothole repairs, ensuring transparency andaccountability in the government's actions. Lastly, utilizing a navigation system, citizens can proactively check for potholes along their route, facilitating smoother and safer journeys. By effectively addressing potholerelated issues, this system has the potential to reduce accidents and improve road safety. Implementing smart city initiatives not only benefits the residents byenhancing their quality of life but also has positive implications for the overall development andprogress of city.

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