

# Smart Pothole Detector on Road

Uma Maheshwari.P<sup>1</sup>, Dhanya.U<sup>2</sup>, Gurutheep.M<sup>3</sup>,  
Dharaneshwaran.S<sup>4</sup>, Ranjith.R<sup>5</sup>

<sup>1</sup> Ug Students, Department of Electronics and Communication Engineering  
SNS College of Technology

Date of Submission: 01-05-2023

Date of Acceptance: 10-05-2023

## ABSTRACT

This project aims to develop a system for automatic detection and notification of potholes and humps on roads to aid drivers, LCD display, image processing, camera, Open CV, ESP8266 module, motor and IoT technology. Potholes and humps on roads can cause damage to vehicles and pose a danger to drivers. Therefore, it is crucial to detect and notify drivers about these road hazards. The proposed system uses a camera mounted on a vehicle to capture images of the road. These images are then processed using Open CV to identify potholes and humps on the road. The microcontroller is used to interface with the camera and the ESP8266 module for wireless communication with the driver's device. The LCD display is used to display real-time information about road hazards detected. The system utilizes IoT technology to send notifications to the driver's device about detected road hazards, including the location and severity of the potholes and humps. This information can be used by drivers to take precautionary measures and avoid road damage and accidents. The proposed system provides an efficient and reliable solution for detecting and notifying drivers about potholes and humps on roads. It can help reduce the risks associated with driving on damaged roads and improve road safety for drivers.

## I. INTRODUCTION

The quality of roads is essential for safe and efficient transportation. Potholes and humps on roads can cause significant damage to vehicles and pose a hazard to drivers, leading to accidents and injuries. Therefore, there is a need to detect and notify drivers of road hazards, including potholes and humps, to avoid potential accidents and damage to vehicles. In this project, we propose an automatic detection and notification system for potholes and humps on roads to aid drivers, LCD display, image processing, camera, Open CV, ESP8266 module, and IoT technology. The system

uses a camera mounted on a vehicle to capture images of the road, which are processed using Open CV to detect potholes and humps. The detected hazards are then displayed in real-time on an LCD display and sent to the driver's device via the ESP8266 module using IoT technology. The system's proposed solution can help drivers to take necessary precautions, such as slowing down or changing lanes, to avoid road hazards and reduce the risks of accidents and damage to their vehicles. Moreover, the system's notifications can also alert authorities to repair damaged roads, improving overall road quality and safety for all drivers. In summary, the proposed system provides an efficient and reliable solution for detecting and notifying drivers about potholes and humps on roads, contributing to a safer and more efficient transportation system

## II. EXISTING TECHNIQUE

The existing systems for automatic detection and notification of potholes and humps on roads to aid drivers use a variety of technologies and techniques. One approach is to use sensors mounted on vehicles to detect changes in road surface elevation, such as accelerometers and gyroscopes. These sensors can detect humps and potholes based on changes in the vehicle's motion and send notifications to drivers. Another approach is to use computer vision techniques and image processing to detect potholes and humps. Cameras mounted on vehicles capture images of the road surface, and image processing algorithms analyze these images to detect changes in the road's surface. These systems can also use machine learning algorithms to classify potholes and humps, providing more detailed information to drivers. Some existing systems also use crowdsourcing to collect data on road conditions from drivers. Smartphone applications enable drivers to report potholes and humps they encounter on the road, providing real-time data to authorities and other drivers. This data can be used to prioritize road

repairs and provide more accurate notifications to drivers. The existing systems for automatic detection and notification of potholes and humps on roads to aid drivers use a variety of technologies and techniques to improve road safety and efficient transportation systems. These systems can help reduce the risk of accidents and damage to vehicles, and provide valuable information to authorities to repair damaged roads and improve overall road quality.

### III. SYSTEM HARDWARE

#### 3.1. ESP8266 NODE MCU

Allows There are open source prototyping board designs for the NodeMCU open source firmware. Combining "node" with "MCU" (micro-controller unit), the name "NodeMCU" is formed. In actuality, the firmware rather than the related development kits is what is meant by "NodeMCU" in this context. The designs for the prototyping boards and firmware are also open source. It makes extensive use of open source programmes like SPIFFS and lua-cjson. Users must choose the components necessary for their project and create a firmware specific to their requirements due to resource limitations.

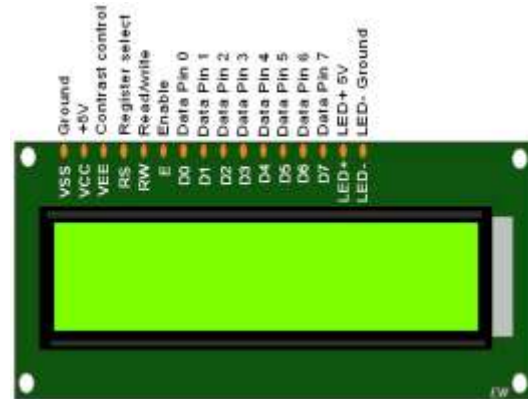
Typically, a circuit board acting as a dual in-line package (DIP) that incorporates a USB controller with a smaller surface-mounted board containing the prototype is used.



#### 3.2. LCD :

A type of flat panel display known as an LCD (Liquid Crystal Display) operates primarily using liquid crystals. LCD derives its meaning directly from its name. It is a mixture of the solid and liquid phases of matter. A liquid crystal is used by LCDs to create viewable images. Comparing LCD technology to cathode ray tube (CRT)

technology, displays may be made significantly thinner.



In an LCD television, polarised light is rotated by liquid crystals, which electronically turn on and off the pixels. There are many different applications for LCDs, such as LCD televisions, computer monitors, instrument panels, cockpit displays for aeroplanes, and interior and outdoor signs.

For showing various system parameters and the state of the system, LCDs (Liquid Crystal Displays) are utilised in embedded system applications. A 16-pin gadget called an LCD 16x2 has two rows with room for 16 characters apiece. You can use the LCD 16x2 in either 4-bit or 8-bit mode. Additionally, it is possible to make original characters. It features 3 control lines that can be utilised for control as well as 8 data lines. Refer to for more details on LCD 16x2 and how to use it..

#### 3.3. CAMERA :



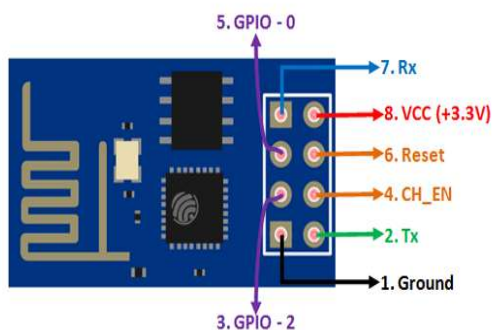
An IA webcam is a type of video camera designed for recording or streaming video to a

computer or computer network. They are mostly used in security, social networking, live streaming, and video telephony. Webcams often use USB or wireless protocols to connect to a device. They could be external devices or internal computer hardware.

Webcams have been used online since 1993, but the first extensively used commercial camera was released in 1994. Early webcam streaming to websites mainly consisted of still photos. In the late 1990s and early 2000s, webcam functionality was made available via instant messaging clients, which enhanced the use of webcams in video conferencing. The hardware of laptops now includes webcams as well, thanks to computer makers.

### 3.4. ESP8266 Module

The ESP8266 is a relatively affordable and user-friendly tool for connecting your creations to the internet. The module may function as a station (connect to Wi-Fi) and an access point (create hotspots), allowing it to simply retrieve data and post it to the internet, making the Internet of Things as simple as feasible. Your project could access any information that is available on the internet because it can also fetch data from the internet via APIs, making it smarter. This module's ability to be programmed using the Arduino IDE, which makes it much more user-friendly, is another intriguing feature. However, this particular module only has 2 GPIO pins (although you can modify it to use more).



### 3.5. OPEN CV :

Computer vision is a method that enables us to comprehend how images and videos are stored, how to change them, and how to extract data from them. The foundation or primary tool utilised in artificial intelligence is computer vision. Self-driving cars, robotics, and photo-editing apps all heavily rely on computer vision. OpenCV is a sizable open-source library for image processing,

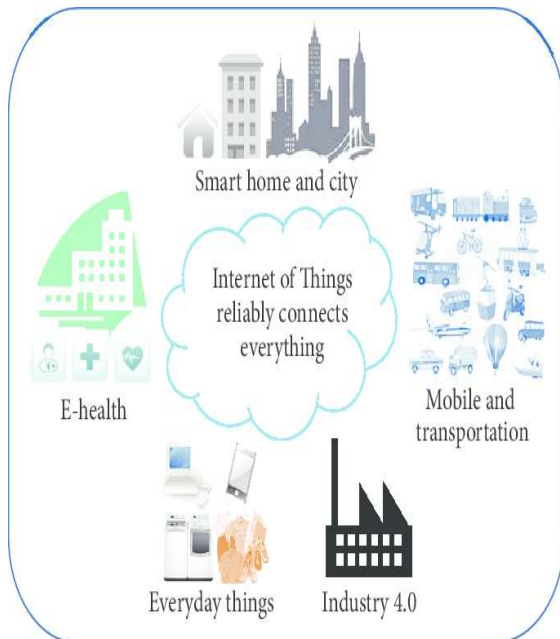
machine learning, and computer vision. It now plays a significant part in real-time operation, which is crucial in modern systems. Using it, one can analyse pictures and videos to find faces, objects, and even human handwriting. Python is able to process the OpenCV array structure when it is integrated with different libraries, such as NumPy.

### 3.6. Image-Processing

Picture processing is the process of applying various procedures to a photograph in order to improve it or extract some useful information from it. The simplest definition states that "image processing is the analysis and manipulation of a digitised image, particularly to improve its quality." Digital-Image: In order to conceptualise an image, one can utilise the two-dimensional function  $f(x, y)$ . The spatial (plane) coordinates are X and Y. The intensity or grey level of the image at each specified pair of coordinates,  $(x, y)$ , is determined by the amplitude of the function at those locations. In other words, a picture is simply a two-dimensional matrix (or three-dimensional in the case of coloured images) that has been mathematically specified.

### 3.7. IOT

The internet of things, or IoT, is a network of interconnected computers, mechanical and digital machinery, items, animals, or people who may exchange data across a network without needing to interact with other people or computers. The term "thing" refers to any living or non-living entity that can be assigned an Internet Protocol (IP) address and has the capability of exchanging data over a network, such as people with implanted heart monitors, farm animals with biochip transponders, cars with integrated tyre pressure monitors, and other examples. IoT is being used more frequently by businesses across a variety of industries to increase operational effectiveness, better understand customers, and deliver.



#### IoT works

The majority of the work is done by the devices without assistance of people, even though they can be configured, given instructions, or given access to data. The connection, networking, and communication protocols used by the IoT devices communicate the sensor data they gather by connecting to an IoT gateway or other edge device, which either analyses data locally or sends it to the cloud for analysis. These devices occasionally communicate with other items of a similar nature and take action based on the information they share. The majority of the work is done by the devices without the assistance of people, even though they can be configured, given instructions, or given access to data.

#### IoT is important

People who use the internet of things are able to live more shrewdly, work more efficiently, and have complete control over their lives. Along with offering smart home automation devices, the Internet of Things is essential to business. Organisations can use IoT to examine how their systems actually work in real time and obtain insights on everything from equipment performance to supply chain and logistics operations. Thanks to IoT, businesses can automate processes and save money on labour. In addition, it lowers the cost of producing and shipping items, improves service delivery, and increases customer transaction transparency.

#### IV. WORKING OF PROPOSED METHOD :

- Camera: A camera attached to a car takes pictures of the road's surface.
- Image Processing: Computer vision algorithms examine these photographs to find potholes and humps as well as detect changes in the road's surface.
- Machine Learning: To categorise potholes and speed bumps according to their severity and give drivers more specific information, machine learning techniques are used.
- The ESP8266 module and Node mcu are used to collect and send data from the system to the cloud for additional processing and analysis.
- LCD Display: An LCD display alerts drivers in real time to potential road hazards.
- Internet of Things (IoT): The system makes use of IoT technology to facilitate data exchange and remote monitoring, giving authorities useful information to repair damaged roads and enhance overall road quality.

#### V. RESULT



#### VI. CONCLUSION

In conclusion, the Automatic Detection and Notification of Potholes and Humps on Roads to Aid Drivers system proposed in this project offers an innovative solution for detecting and notifying drivers about road hazards. The system uses a combination of technologies such as Arduino, LCD display, image processing, camera, Open CV, ESP8266 module, and IoT technology to provide real-time information about potholes and humps on roads. The system's ability to detect and notify drivers of road hazards can significantly reduce the risk of accidents and damage to



vehicles, contributing to overall road safety. Moreover, the system's notifications can alert authorities to repair damaged roads, improving road quality and safety for all drivers. The proposed system's potential benefits make it a promising solution for road safety, and it can be implemented on a larger scale to provide comprehensive road safety solutions. Overall, this project highlights the importance of integrating technology with road safety and how it can contribute to a safer and more efficient transportation system.

### REFERENCES

- [1]. International Journal of Advanced Research in Computer Science, 10(4), 233-238.
- [2]. Sinha, A., Sharma, S. K., & Jaiswal, N. (2021). Automatic detection of potholes on Indian roads using deep learning. *Transportation Research Part C: Emerging Technologies*, 126, 103151.
- [3]. Khattar, V., Singh, N., & Aneja, A. (2017). Smart city road management system for automatic detection of potholes and humps. In *2017 2nd International Conference for Convergence in Technology (I2CT)* (pp. 1-6). IEEE.
- [4]. Chen, X., Xu, X., Zhou, Y., Zhang, Q., & Du, J. (2021). An intelligent pothole detection system based on deep learning and image processing. *IEEE Transactions on Intelligent Transportation Systems*, 22(1), 15-27.
- [5]. Das, S. K., & Mohapatra, S. (2018). Pothole detection Singh, S., & Sharma, R. (2019). Automatic detection and recognition of road potholes and humps using image processing techniques. and classification using computer vision techniques: a survey. *Transportation Research Part C: Emerging Technologies*, 95, 27-55.
- [6]. Li, X., Li, X., Jiang, Z., & Zhang, B. (2019). Real-time pothole detection and classification using deep learning-based methods. *IEEE Transactions on Intelligent Transportation Systems*, 20(8), 3034-3044.
- [7]. Rajput, S. S., & Suryawanshi, S. A. (2020). Automated pothole detection system using image processing and machine learning. *International Journal of Computer Applications*, 174(35), 11-16.
- [8]. Patil, A. D., & Bhalchandra, V. (2018). Pothole detection and alert system for vehicle safety. *International Journal of Engineering Research and Technology*, 11(2), 1-7.
- [9]. Agrawal, N., & Thakur, D. (2019). A review on pothole detection and warning system using image processing. *International Journal of Engineering and Advanced Technology*, 9(3), 291-295.
- [10]. Wu, J., Xiong, Z., Li, X., & Zhang, S. (2021). A novel pothole detection method based on a saliency network with multiple scales. *Journal of Visual Communication and Image Representation*, 76, 103070.