REALTIME POTHOLE DETECTION SYSTEM

Nikhith, Shravan, Shreyas Rai k, PrjwalKrishna Shastry G, Flavita Janice Pinto

Electronics and Communication Engineering,

Srinivas Institute of Technology, Valachill, Mangalore

Abstract: **Transportation technology is becoming increasingly vital in today's world, and it must be developed over time. Thereare so many road expansions during development to counter the substantial increases of motorised vehicles. The growing number of automobiles has resulted in issues such as road damage and a lack of road upkeep. Lack of awareness about the importance of repairing damaged roads, like as potholes, makes it more unsafe for riders to drive without causing injury. These issues are becoming increasingly alarming as the number of accidents and fatalities continues to rise. The pothole detecting sensor can be employed on the automotive system to reduce the risk of an accident. The concept of a pothole detecting sensor was borrowed from the proximity sensor system in this study. This work develops a low-cost sensor with the same quality as the present technology. Despite the use of low-cost sensors, maintenance is similarly low-cost and straight forward. It was revealed as a result of this research and investigation that the distance between the sensor and the observed pothole should be less than 4%.**

Index Terms–IoT, Mqtt, Pothole.

I. INTRODUCTION

The construction of road is one of the bigger issues in developing countries. Pothole detection not only aids drivers in avoiding accidents and car damage, but it also aids authorities in road maintenance. However, the majority of the India's roadways are built, with poor surface quality, and road maintenance requirements are not failed to meet. The raising vehiclenumbers have resulted in issues like traffic jam and a lot of roads accidents. Traffic jam and accidents are caused by bad road conditions. Potholes have formed as a result of severe rains. Potholes, which emerge as a result of heavy rains and themovement of large vehicles, are another cause of accidents and human deaths. In order to properly maintain roadways, maintenance departments must conduct regular assessments of their condition. Currently, this is done through yearly inspections or in reaction to public complaints. Workers visits to the streets inspecting the conditions and recording them manually, which is then entered into a database. The price of monitoring is higher in most of cases. To address the aforementioned issues, a cost-effective solution is required. This not only collects data on the severity of potholes, but it also assists authorities in keeping roads in good repair. The suggested system provides a more accurate, faster, and dependable approach for detecting, avoiding, and maintaining potholes. Lidar sensor and an accelerometer are used to identify potholes. Potholes are located using GPS technology. The database contains all of the information. As a result, thesystem will be beneficial to both the interested agencies and the general public. The device depends on transportation systemthat travel the road network on a daily basis, such as buses or Uber that run number of times per day on different routes, While the vehicle is on the road, data is continuously collected.

II. LITERATURE SURVEY

Road monitoring is a fascinating research issue, and pothole detecting algorithms have been developed. This section provides a summary of the current solutions for collecting data of potholes on road ways.Kwok Yu presented a pothole detection system that is easily removable and user friendly and specializes in identifying potholes as well as close range obstacle identification. The device is built of two different systems, one of which is fixed to front of a car and the other of

which is used by the driver. The first system searches for an impediment, while the another device vibrates and blinks LEDsto alert the user to the presence of the barrier Two ultrasonic sensors detect objects, and the device is controlled by two basicunits. The sensing portion, which comprises of two distance sensors, is installed on the vehicle's lower front half. When one of the detectors detects an object, a signal is transmitted wirelessly to the second system, which receives it via the pair's wireless receiver. The second system is worn on the user's wrist. It features a vibrator engine that begins vibratingimmediately a signal of fault detection is received, as well as two LEDs that illuminate when the sensor detects an obstacle.Two non-contact ultra - sonic sensors detect impediments, and two basic stamp processors control the gadget. Thesensing portion of the vehicle, which consists of two sensing devices, is mounted on the lower front half of the vehicle. When one of the scanners detects an object, it sends a signal to the other device, which receives it via the couple's receivingantenna. The second device is worn around the wrist of the user. It has a vibrator engine that starts vibrating as soon as thesensor senses a defect, as well as two LEDs that light up whenever the sensor detects an impediment.

III. PROPOSED SYSTEM

For pothole detection, the suggested system employs ToF sensors and an accelerometer. The ToF determines the depth of potholes, while the accelerometer senses the car shaking. Threshold for Both sensors have set. A pothole is detected whenthe measured value exceeds the threshold value when a pothole is identified, the GPS module communicates the location. The data from the microcontroller is sent to the computer server (XAMPP). When the LIDAR sensor receives a trigger pulse from the Arduino, it sends out high-frequency waves. To begin measuring by sending ultrasonic waves, the trigger pin must be held high for 10 seconds. For a period of time equal to the time it takes for the ultrasonic wave to return to thesensor, the echo pin rises high. The distance is computed based on that time period. A pothole is detected if the distance isgreater than the threshold value. Accelerometer module used is ADXL335has 3-axis analog accelerometer chip. When thereis vibration, it reads off the X, Y, and Z acceleration or variation in the axis as analog signal.
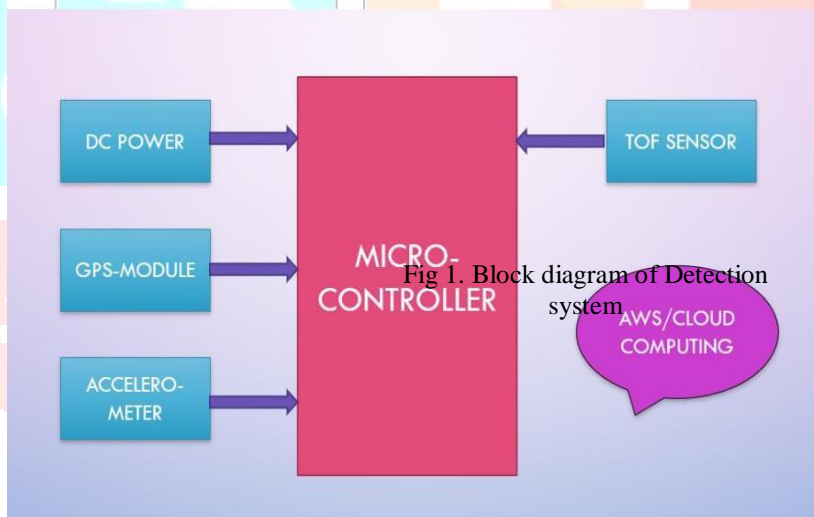

Fig 1. Block diagram of Detection system

The microcontroller used here will be communicating with every sensor that used in system. When the lidar sensor measures distance and compare with threshold value, the GPS module get activated and shares exact coordinate of that place and displays in maps, this location also can be monitored through the mobile Application and save location for offline.

III. Flowchart of detection

The Lidar senses the distance between the vehicle and the road. If that distance, d is greater than the threshold distance, a pothole is detected and if the distance is lesser than the threshold distance, it is considered as the speed breaker. Thresholddistance will be taken from the ground-clearance to the vehicle. Similarly, the accelerometer finds whether there is a jerkingor not. It is done by measuring the variation in the axis of accelerometer.
If there is a variation, jerking is detected. In both cases, a bad road is found and the GPS senses location and transmit it to the server. Otherwise, the road is good. The better road can be identified from the Lidar detects the vehicle's distance fromthe road.
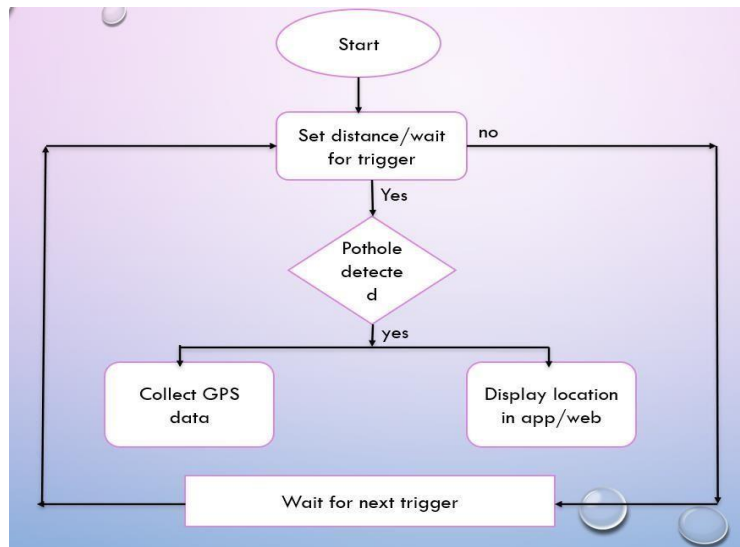
Fig 2. Flowchart

IV. ADVANTAGES AND DISADVANTAGES

A. Advantages

- Pothole detected location saved for offline.
- Node MCU is used so cost is low.
- Power consumption is low.
- Efficient data transmission

B. Disadvantages

- Since the whole process is through the Internet, the device must be connected to internet.

V. RESULTS

The replica is put through its paces by mounting it on an automobile. The s
footboard area. For the test run, a 2 km distance was covered, and the test car was sent out to look for potholes.

fig 3. The device that could be fixed under any vehicle.

Fig 4. Detected Potholes locations in World map.

The figures 4 shown above are the potholes detected places in Mangalore. This map is obtained by the default inbuilt function of Node RED, and it uses the AWS server.

VI. CONCLUSION

This research focuses on pothole identification and road monitoring in real time. It provides a lowcost method of detectingdangerous potholes. The data on the potholes is processed and transferred to the server. It is then monitored in the node RED server. The system aids in the creation and maintenance of a database of discovered potholes. For the government authority, this system is a useful technique. It reduce the time it takes to manually look for and locate potholes

VII. REFERENCES

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