

Road Pothole Identification Using Accelerometer

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Abstract— Nowadays road accidents are increasing and one of the main reason is road potholes on the road. Road depression and damages identification using accelerometer is a system which is focused on reducing accidents and also indicating the information about the same to nearest vehicle. This system proposed how to implement solution for the problem. The main part of the system is an accelerometer. Accelerometer is used to measure vibrations and from this vibrations will process and then to list out. At the same time GPS coordinates will also list out and join together if any vibration to be reached to higher level that to be note down and then it will process and tag to google map and then the information passes to near vehicles through near field communication. This will help to identify nearest pothole. Also can see in google map for future reference.

I. INTRODUCTION

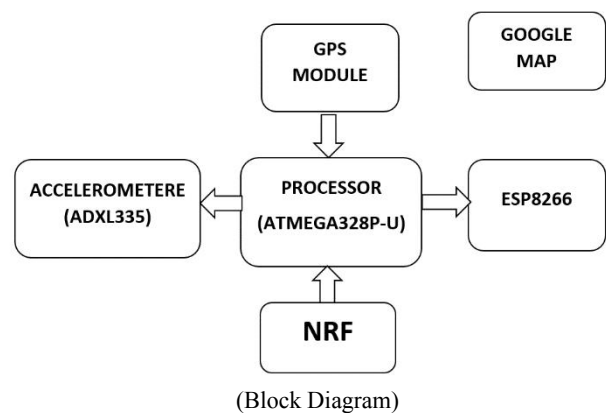
As the India is a populated country large increment of vehicles are there, proper maintenance of vehicles and roads is necessary to avoid accidents at a limit. Vehicles are important part of day to day lives. Smooth roads are decreasing accidents and increasing efficiency of vehicles. This system proposed a solution for reducing road accidents due to road potholes. Night travelling is risky by non-repairing roads and road potholes. This system introducing technologies like Global Positioning system (GPS), Near Radio Frequency Communication (NRF), Internet of Things (IoT), accelerometer is one of the main part of the system. Vehicles are passing through the road one by one, when first vehicle is meet at the pothole there will be a vibration. This vibration is identified by accelerometer which is placed in the vehicle. This information passes to next vehicle through NRF and google map by the help of processor. So coming vehicle can get the information about the pothole. It indicate by any indication method like alarm or light.

II. ROAD POTHOLE IDENTIFICATION PROCEDURES

India is a populated country large increment of vehicles are there, proper maintenance of vehicles and roads is necessary to avoid accidents at a limit. When road is put into use after construction, it will lead to develop various anomalies due to continuous rolling under the wheels, and snow, rain and other natural factors. This will affect the quality of driving. With the availability of information regarding the road conditions,

road users can be cautious about or avoid the bad roads. Vehicles are important part of day to day lives. Smooth roads are decreasing accidents and increasing efficiency of vehicles. In this paper discuss about the finding of road pothole using accelerometer

The block diagram shows entire structure of the Road pothole identification using accelerometer. Accelerometers are the element of Strap down Inertial Navigation Systems for measuring non-gravitational accelerations and providing the host vehicle with Guidance and Flight-Control parameters in a self-contained manner. Ultimately, the success of the mission highly depends on how well the Strap down system performs and this falls within the limits that the accelerometers can achieve. The system includes processor ATMEGA328P which is the core of the system the processor is used to process the values. It has a modified Harvard architecture 8-bit RISC processor core. The next part of the system is NRF Transceivers NRF 24L01 is used. The vehicle tracking location through GPS tracking. AVL is an advanced method used to track and monitor any remote vehicle equipped through GPS satellite. AVL is a combination of GPS and GIS that provides actual geographical real time position of each vehicle[4]. SIM 28 GPS module is used this project Global Positioning System is globally used for the tracking and navigation purpose. GPS is used to identify the position of vehicle. NODEMIU (ESP8266) is used to IoT connectivity. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections. And it using Hayes-style commands. ESP8266 with 1.048 MB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi.



Road abnormalities identified by this system is an accelerometer. Accelerometer is used to measure vibrations. Mainly accelerometer takes 3 dimensional values that is XYZ directions the values are shown in figure 1. Here we need only one directional vibration measurements. That is the X directional vibrations. Even though we take only X direction

there will be two sides positive side and negative side vibrations. By using the directional vibration measurement set vibrational limits (positive limit and negative limit). This limit count as the damage. The table below shows the expected performance for non-gravitational accelerations applied along the sensitive axis in three different frequency ranges. The applied accelerations can be either random vibrations or sine vibrations [2].

Frequency range	VRE
50Hz – 200Hz	$\leq 25 \mu\text{g}/\text{g}^2 \text{ rms}$
200Hz – 750Hz	$\leq 50 \mu\text{g}/\text{g}^2 \text{ rms}$
750Hz – 2,000Hz	$\leq 100 \mu\text{g}/\text{g}^2 \text{ rms}$

(Table)

X=	X=
344	345
Y=	Y=
326	340
Z=	Z=
276	285

(Figure.1. Accelerometer readings.)

This values and the location status combined form will save the processor. The location status from the GPS module it will gives the exact position coordinates of altitude and longitude (figure.2) save this values and list out as the same table of accelerometer values saved. From this compare the limits from normal to damaged roads. This comparison done by the comparison of accelerometer vibration limits is different of different road type like damaged, smooth, ruff, etc. From this we can identify which type road to will pass and also identifies damages it will help avoid accidents and other damages of vehicles.

From collecting all information from the processor it will mark to google map and the values send to nearest vehicles through the near field communication here use NRF and indicate by using any indication method. Also it count if the road is re-worked there is no potholes it also taken for account this time the vibration values will reduce from this condition the stored values in processor will changes this will determines there no damages or pothole this process taken by the repeat checking of each vehicle passed through the location then database will updates. Also will changes will do with google map and NFC indication will stop, and it will remove that place tagged from google map. From this process we can determine the rod quality and the traveler can choose the good road for long travelling. It will improve the vehicle efficiency reduces the maintain works for the vehicles.

LAT: 11.133947

LONG: 76.184921

LAT: 11.133947

LONG: 76.184921

LAT: 11.133947

LONG: 76.184921

LAT: 11.133947

LONG: 76.184921

(Figure.2 .GPS readings)

III. FUTURE SCOPE

The final result of the system to identify the potholes by using accelerometer, when the technique is implemented in vehicles it will identify the potholes on road. So it can be avoid accidents and it also provide awareness to other vehicles. In this system the first vehicle should pass through the potholes. So there is the limitation. Thus know when the vehicle is moving at a normal road there will not have more vibration but when the vehicle to pass to the pothole there will have an accelerations. Thus accelerations are used to identify pothole, by the help of normal or thermal cameras capture images this will help for more clarifications to the situation for the roads and also more information get to the drivers at night vision by using thermal cameras.

This technique can have further more modification by using digital image processing that by using algorithms to processing the analog images and artificial intelligence can also be applied in the technique, it will goes to high application level to determine the potholes and update information within seconds it will provide more alerts to the drivers especially night drivers. This system also helpful the governments the repeat checking of roads will determines the road quality and the damages it will help re-building and reduce the damaged roads.

IV. CONCLUSION

In this paper we proposed a scheme of Road pothole identification which can reduce accidents and also indicates the information about potholes to nearest vehicles Pothole Identification is a system which prevent vehicle from Potholes by using accelerometer. The aim of this paper is to avoid accidents when meeting a pothole. Now there is no technique existing for identifying potholes. We have solve this problem by implementing this paper. We designed the secure and automatic technic using accelerometer, GPS module, Near Radio Frequency Communication, NODEMCU, and processor. The identified and Tracking Information is given to the database. The identified information is stored in the system. So it void the repeated identification on same road way of pothole. That way it prevents day and night accidents it is the service and security for the human life.

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