

# Detection of Path Holes, Speed Balancing and Owner Identification of Vehicles

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**Abstract – One of the major problems of developing countries is the maintenance of roads. Well maintained roads contribute a major portion of the country's economy. Identification of pavement distresses such as path holes, unexpected vehicle breakdown due to over speed not only helps drivers to avoid accidents or vehicle damages, but also helps authorities to maintain roads. The proposed approach discusses about previous path hole detection methods that have been developed and proposes a cost-effective solution to identify the irregularities on road surfaces, balancing speed of vehicles and provide timely alerts to drivers to avoid accidents or vehicle damages along with owner identification. Ultrasonic sensors are used to identify the path hole. The proposed system captures the geographical location coordinates of the path holes using a global positioning system receiver. The sensed-data includes the geographic location of the path hole, which is stored in the database and displayed on LCD, a buzzer is also provided to alert the driver. This proposed system also controls the speed of the vehicle by using an accelerometer which calculates the changes in the accelerations and also analyses the vertical vibration signals produced by the vehicle, displays them on LCD and also alerts driver through a buzzer. Besides if any unauthorized person tries to start the vehicle, then by sensing the fingerprint of that particular person using biometric sensor an SMS alert will be given to the owner of the vehicle and the engine will be immobilized.**

**Index Terms – Path holes detection, Speed Balancing, Timely alerts, Owner Identification.**

## 1. INTRODUCTION

India is one of the most populated countries in the world and it has a fast growing economy. Roads are the dominant means of transportation in India today. Poor road conditions may cause damages to both the vehicle and the person who is driving the vehicle. However, in India most of the roads are narrow and congested. It has a poor surface quality and less maintenance. Since, we are in India driving is a breath holding, potentially threatening affair every person. According to the survey of U.S. Federal High Way Administration, thousands of people are hurt or killed each year on roads and highways due to poor road quality and conditions. Vehicle population has been increased tremendously increased from the last two decades. Nowadays

traffic congestion and road accidents are increasing mainly due to this proliferation of vehicles. A road accident can be defined as any accident involving one road vehicle in which if at least one person is injured or even died. Heavy rains and movement of heavy vehicles are the main reasons for the formation of path holes on the road surfaces. This also leads to major traumatic accidents and loss of human lives. These types of traumatic road accidents can cause many effects such as financial, physical and mental effects to everyone who involved in it. Distract driving or reckless driving (driving the vehicle more than speed limit) is also one of the major causes for road accidents. Some of the major problems faced by the commuters are as follows: accidents due to running over irregular roads, unexpected vehicle breakdown due to over speed and no guarantee of safety for vehicles from thefts in crowded areas. Irregularities on roads include speed breakers, path holes (a hole which occurs on the road surface due to heavy rains or due to poor road conditions). Many teenagers are losing their lives due to driving the vehicles more than the speed limit. There is no guarantee of safety to vehicles for crowded areas. There is a chance of losing the vehicles in crowded areas. Thus, some frequent methods are required to solve these problems and to reduce the road accidents.

The finding of path hole detection system mainly consists of two modes such as testing mode and training mode. In testing mode, vehicle will be in running position and if any path hole is present, then the distance to that path hole is measured using the wave sent by the ultrasonic sensor. And the GPS values of that path hole location are stored in the database. Whereas in the testing mode, if any value matches with the GPS values of the database then a buzzer will produce sound indicating the distance to that path hole. To control the speed of the vehicle, an accelerometer is used which calculates the changes in the accelerations (changes in speed, velocity, angle) and also analyses the vertical vibration signals produced by the vehicle. If any unauthorized person tries to start the vehicle, then by sensing the fingerprint of that particular person using biometric sensor an SMS alert will be given to the owner of the vehicle and the engine will be immobilized.

## 2. RELATED WORK

The existing system is a reliable path hole detection using machine learning method. It is done using machine learning system. It uses a basic IOT architecture which consists of four layers as shown in the figure below.

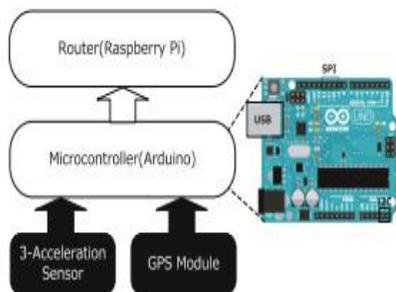


Fig. 1: Hardware view of existing system.

All the data processing will be done in the above four layers. The first layer is sensing layer which consists of acceleration sensor which is used to collect the accelerations. The second layer is network layer is used to collect the raw data. The most critical layer is third layer i.e. data processing layer.

### 2.1 Drawbacks in the existing system:

The main drawback in the existing system is to work with the machine learning system. This system is not easily understandable to the user and it requires large amount of data. There is no guarantee that the Machine Learning System will work in all cases and even this system may also fail in some cases. So, to reduce this complexity and to make the system easy a real time path hole detection system is proposed along with speed balancing and owner identification of vehicles.

## 3. PROPOSED MODELLING

The proposed system is a real time path hole detection using ultrasonic sensor. Along with the path hole detection some additional features are added such as speed balancing and Owner identification of the vehicles. A biometric sensor is used to identify the owner of the vehicle by sensing the finger print of the particular person. If any unauthorized person tries to start the vehicle, then an SMS alert will be given to the owner of the vehicle by using GSM module. Accelerometer is used to sense vehicle vibration signals and to alert the owner of the vehicle, if the speed limit exceeds.

ARM LPC 2148 is used as the main module in this process for connecting all the modules. GPS (global positioning system) module is used to find out the location of the irregularities present on the road surfaces. A mode switch will be present which is used to the select modes such as

testing mode and training mode. In testing mode the locations of the path holes will be taken and stored in the data base. In training mode, these data base values will be useful to identify the irregularities on the road surfaces. The block diagram of the proposed methodology is shown below.

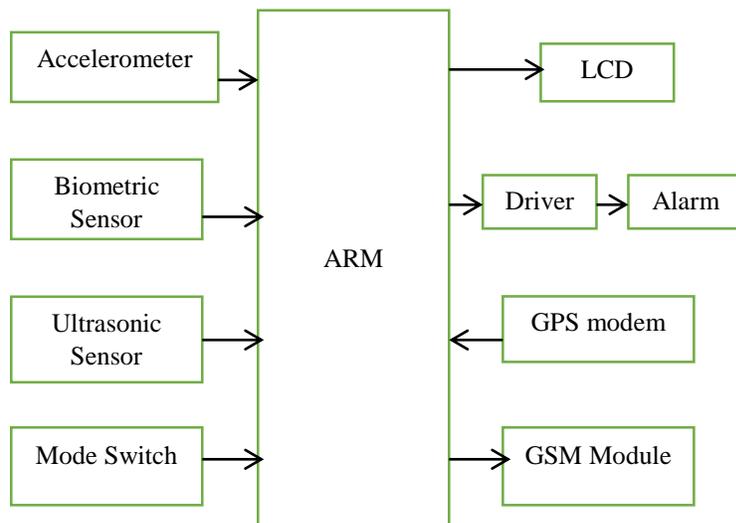


Fig. 2: Block diagram of proposed system

A 16\*2 LCD (liquid crystal display) is used to display the outputs such as path hole detected, speed limit exceeds, user valid or invalid etc. A buzzer or alarm is used to alert the driver if there is any path hole detected on the road surface. This buzzer will also produce sound if there is any change in the angle of the vehicle due to more speed. A motor driver is used for rotating the motors both in clockwise and anticlockwise directions.

### 3.1 ARM LPC 2148:

It is the main module used for connecting all the components which are mentioned in the block diagram. LPC means linear program control which is also known as linear optimization. LPC is used for getting better output at low cost. It consists of 2 ports with 64 pins. Each port is having 32 pins. It consumes less power and gives fast response. LPC 2148 is a microcontroller which is built on arm CPU.



Fig 3: ARM LPC 2148

3.2 Power Supply:

Power supply is a primary requirement for all the project works. The required DC power supply for the base unit as well as for the recharging unit is derived from the mains line. For this purpose center tapped secondary of 12V-012V transformer is used.

3.3 16x2 LCD Display:

Liquid crystal displays (LCD's) have materials which combine the properties of both liquids and crystals. A 16\*2 liquid crystal display is used for displaying the output results.

3.4 Ultrasonic sensor HC-SR04:

The active ultrasonic sensor is used to transmit and receive the signal. The distance is calculated is based on the object travels through the roads. Where the sensor works at frequency of 40 kHz that use to measure the distance ranges from 2 to 400 cm.

3.5 Biometric Module:

A biometric sensor is an electronic used to capture the fingerprint of the user. Pattern finger print technique is used which means comparison between two measures. Here, in the proposed system the finger print of the owner will be stored in the data base so that any unauthorized person cannot start the vehicle.

3.6 GPS Receiver (Global Positioning System):

Global Positioning System is a satellite navigation system which is used to capture the location of the irregularities and time irrespective of the conditions on the road surfaces.

3.7 GSM (Global System for Mobile Communication):

GSM is also known as global System for Mobile Communication for standards second generation. The modem which we are using to receive the alert text message and also which can make the voice call is a quad band modem.

3.9 Accelerometer:

An accelerometer is a device that measures the changes in the accelerations such as speed, velocity, angle etc. Here, it measures the changes in the angle of the vehicle if it bends more than limit and alerts the driver of the vehicle.

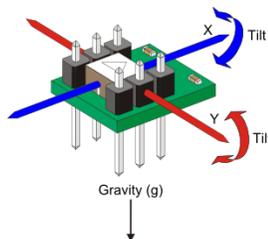


Fig 4: Accelerometer

3.8 Mode Switch:

A mode switch is used when the user needs access to the system resources. When the user requires changing from one mode to another mode then a mode switch can be used depending upon the necessity. Here in the proposed system there are two modes such as testing mode and training mode. If the user wants to take the database values then testing mode will be selected. Whereas if the user wants to check the GPS values stored in the data base then training mode will be selected.

4. SOFTWARE TOOLS

4.1 Flash magic:

Flash magic is used for uploading the hex files. The IC should be selected from the menu and then select the COM port. Baud rate should be in between 9600 to 115200 and oscillator frequency is 12MHZ. The selected hex file will be browsed. The entire process of uploading the hex files using flash magic is shown in the figure below.

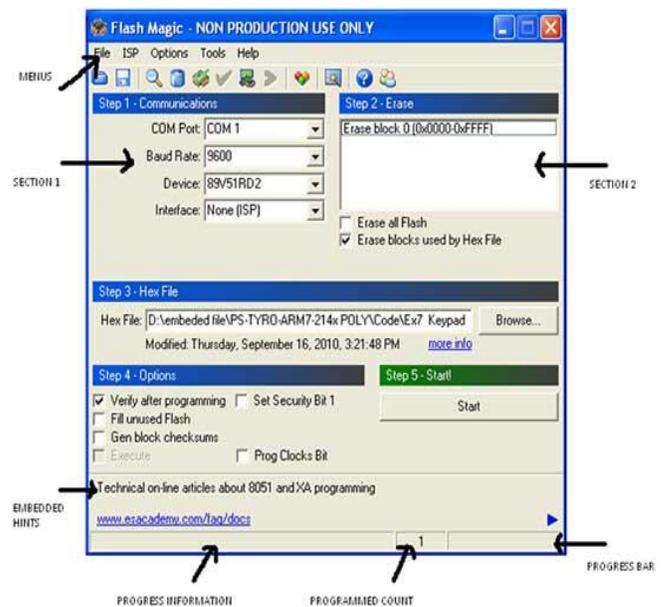


Fig.5: Screen shot of Flash magic window

4.2 Embedded c:

Embedded c language is used to write the required code or program to run the process. Embedded c language is chosen because it is easily understandable to the user. It is an extension to the C-language. If C is written on computer then it is known as C-language and if C is written on embedded things then it is known as embedded c language. The two main features of embedded c language are its code speed and code size. The main advantage of choosing embedded c is user can get maximum features in minimum space and minimum time.

#### 4.3 Keil Software:

Keil software is the world's leading developer of all embedded systems software. It offers the complete development environment required for the arm LPC 148 module. KEIL MDK is also known as microcontroller development kit. IT is easy to learn and use, and usable for the most demanded embedded applications. All the development tools such as IDE, Compiler and debugger are included in the MDK core.

### 5. RESULT



Fig.6: Hardware View of the proposed system



Fig.7: Irregularity detection using ultrasonic sensor



Fig.8: Finger detection using biometric sensor



Fig.9: Alerting the driver by measuring speed

### 6. CONCLUSION

The working of the experiment is done with the real time applications. And it was almost tested with the artificial path holes and humps by fixing the experiment in the bike and car and the first test was taken to record and store the values in the data base. The second test was taken to find the alerts generated based on the humps and path holes on the road. The mobile application is the advance technology used additionally in this system provides the alert to the owner if any theft occurs. The main aim of the experiment is to avoid the accidents on the roads and to control the speed of the vehicle along with the theft identification.

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