# Pothole Detection And Complaint System

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***Abstract-****A road-surface-monitoring system, which helps to detect the damages to the surface before it gets worse, can bring down the cost of road maintenance significantly. However, most government-funded road authorities in the developing countries are unable to afford such expensive systems. We have come up with a low-cost, road-surface-monitoring method. According to this method, the application records vertical accelerations experienced by the vehicle on its route while a GPS device separately logs its corresponding GPS coordinates. The collected data can be then processed to locate potholes along the path traversed earlier by the vehicle. In this project, we present a technique to analyse and process the acceleration data obtained from the sensors to send the report and locate the pothole location on map.*

***Keywords***-Sensors, Accelerometer, Road, Vehicles, GPS.

## I. INTRODUCTION

This project is a smartphone application on the Android platform[9] that will detect potholes on the roads while the user is driving and report the location to Local Authorities for maintenance. When the user starts their journey, they launch the application on their phone and set it to record. The application launches the accelerometer and the GPS (Global Positioning System) in the phone. The application monitors for changes in acceleration. When such a change is recorded, the application asks for the coordinates of the pothole. The application then adds the geographic coordinate of the pothole to the database. If user wants to report the pothole then it will send the data to Local Authority. The benefit of this project is that it provides Local Authorities with the location and the severity of potholes, which they can repair and ultimately will result in safer and a more enjoyable driving experience.

## II. REVIEW OF LITERATURE

### A) Domain explanation

Potholes[16] are cracks and cavities on roads caused by freezing. Over long periods of time roads weaken under the weight of heavy vehicles. This causes small cracks to form. Water from rain causes the cracks to expand, continued pressure on the cracks lead to potholes. As India continues to suffer from worsening weather conditions each year, the issue of potholes remains an important issue. However Local Authorities are falling behind in repairing damage to the roads. According to the TOI[10], there were 3,416 reported deaths in 2015 due to potholes.

Potholes.ie[11] are one of several websites used by members of the public to support pothole reporting. However these websites require the user to remember exactly where the pothole was. Recent smart phone applications such as FixMyStreet[12] encourage users to stop and take a photograph of the pothole (however this is not always an option).

### B) Existing solution

1. Moazzam et al.[1] have proposed a low cost model for analysing 3D pavement distress images. It makes use of a low cost Kinect sensor, which gives the direct depth measurements, thereby reducing computing costs.

2. The Kinect sensor consists of a RGB camera and an IR camera, and these cameras capture RGB images and depth images. These images are analysed using MATLAB environment, by extracting metrological and characteristic features, to determine the depth of potholes.[2]

3. Youquan et al.[3] developed a model to detect the three-dimensional cross section of pavement pothole. The method makes use of LED linear light and two CCD (Charge Coupled Device) cameras to capture pavement image. It then employs various digital image processing technologies including image pre-processing, binarization, thinning, three dimensional reconstruction, error analysis and compensation to get the depth of potholes. However, results get affected by LED light intensity and environmental factors.

Android platform[9] that will detect potholes on the roads

4. Lin and Liu[4], have proposed a method for pothole detection based on SVM (Support Vector Machine). This method distinguishes potholes from other defects such as cracks. The images are segmented by using partial differential equations. In order to detect potholes, the method trains the SVM with a set of pavement images. However, the training model fails to detect the pavement defects if the images are not properly illuminated.

5. Orhan and Eren[5], have proposed a work developed on android platform to detect road hazards. There are three

components in this proposed work viz, Sensing component, Analysis component and Sharing component. The sensing component basically works by collecting raw data from accelerometer and synchronizes with interface, hence leading to ease of access. In analysis component, the values obtained from the sensors are used for developing analysis modules. The sharing component works as follows: the developed frame work is connected with the central application, where it can directly communicate with the social network. All the collected data is stored at central repository for further processing. Although this method communicates traffic events with other drivers, it increases the cost and complexity of implementation.

6. Mednis et al.[6] have proposed a real time pothole detection model using Android smartphones with accelerometers. Modern smart phones with android OS, have inbuilt accelerometers, which sense the movement and vibrations. The accelerometer data is used to detect potholes. Different algorithms such as Z-thresh, which measures the acceleration amplitude at Z-axis, Z-diff to measure the difference between the two amplitude values, STDEV (Z) to find the standard deviation of vertical axis acceleration and G-Zero are used to identify potholes.

7. Zhang et al.[7] have made use of stereo camera images coupled with a disparity calculation algorithm to identify potholes. The location coordinates of the potholes are also captured and stored in the database.

8. Strutu et al.[8] have proposed a method for detecting defects on the road surface using accelerometers. It also makes use of GPS system to identify the exact location of the defects. Pothole detection algorithm runs on a mobile platform (moving vehicles), which is installed with accelerometer, GPS, local computer and a wireless router. It is quite expensive.

## III. PROPOSED SYSTEM

The Accelerometer measures acceleration on three axes- Azimuth (X), Pitch (Y) and Role (Z)[14]. The X axis is horizontal and points to the right, the Y axis is vertical and points up and the Z axis points towards the outside of the front. Any sudden significant changes to one of the Axes should indicate that the car has hit a bump while driving.

The Android API[13] has three classes:
1. SensorManager

2. SensorEvent

3. SensorEventListener

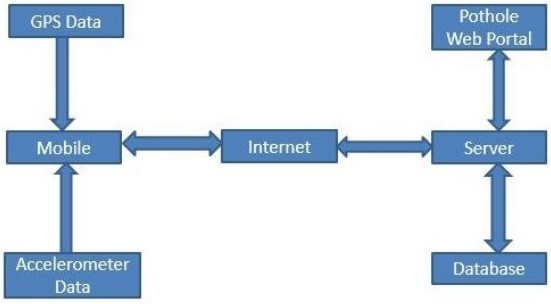

Fig. 1 Block diagram of proposed system

accuracy, reliability and ease of access.

The GUI is built on the top of the pothole detection engine. However, the detection system could be used programmatically. The GUI is used to control and start the detection process:

1. Source program at client: The user is supposed to log into the system, start the GPS if not started earlier and tap the start button.

2. Running: After this, the app starts detecting potholes. The detected pothole is displayed along with its geographical co-ordinates. User will have the choice to send this data to the server or not

3. End of session: Once the journey is complete, the user exits the system by pressing stop button.

4. Source program at server: The admin logs into the system, checks and updates the pothole detection co-ordinates. He/she also sends the updated information of the pothole to the client.

## IV. METHODOLOGY

Our project will be built on the waterfall model[15]. This model suggests work cascading from step to step like a series of waterfalls.
Constraints of the system
A) Environmental Constraints

1. The development or operating environment is new, and no non-technical people are familiar with it.
2. The project environment is new and the components have not yet been successfully integrated.
3. The project depends upon the successful and timely completion of associated projects.

B) Budgetary Constraints

1. Statistics used in preparing the estimates are unreliable.
2. Outside consulting requirements cannot be accurately estimated.

C) Functionality Constraints

The project depends upon receiving data from other, external applications.

## V. RESULT AND DISCUSSIONS


Fig. 2 Pothole application

The system is economically feasible as it is cost beneficial. The various advantages of it outweigh the actual cost of the project. It is operationally feasible since it helps even nontechnical person to evaluate it in standard circumstances. It is technically feasible since it uses the technology and system which is already used and implemented in the organization.

Cost Benefit Analysis is used to ensure that the system is economically feasible.

## VI. FUTURE SCOPE

This system has been developed to be simple and user-friendly. Hence, even a non-technical user can use the system effectively and without any difficulty. Other benefits are as follows:

1. The system is a GUI and hence user-friendly.
2. It is upgradeable. Hence further enhancements to the system are possible.
3. The system is capable of generating the necessary reports.
4. The system maintains speed and accuracy.
5. It solves all problems encountered in the previous manually handled system.
6. It takes care of database security by restricting unauthorized access to the system.

## VII. CONCLUSION

We have built the client side & server side which can be connected in network using mobile hotspot. We have created user database & administrator database in server side. Administrator is provided with login id and password to login. System provides the facility of observing the complaints & marking it as repaired to an administrator and send email to the corresponding user when reported pothole is repaired. In client side system provides users to register by giving their name, mobile number, email id and password. All the registered users are facilitated to login in the system by giving registered email id and password detect the pothole and send it to server.

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