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"Humps and Pothole Detection and Alerting System for Safe Journey"

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Abstract - *Smart phones today are equipped with inbuilt sensors that give safety enhancement to the drivers on road. The accelerometer and a GPS tracking system of smart phone can give assistance to the driver while travelling. In this paper, the accelerometer of an Android based smart phone is used to record motions generated while passing the obstacles like humps and potholes. GPS is also used to find the location of obstacles on the road. This information will be stored on the server and will generate alert message to the drivers before 300 meters before the point of obstacles. With real time analysis and alerts of these factors, we can increase a driver's overall awareness to maximize safety. Google Earth is used to create road condition maps using GPS coordinates. We propose an early warning system that uses a smartphone based application to alert the driver in advance when the vehicle is approaching the obstacles like humps, rough roads or potholes. In addition, the application also generates the report on the condition of the road which will be helpful for the government sector to repair the road.*

Key Words: Accelerometer, GPS , Google Map.

1. INTRODUCTION

In Today's life [1] we are focused on arriving at our destination as quickly as possible. Car manufacturers are focused on passive approach, e.g., airbags, seat belts, and antilock brakes, lane departure warning system and collision avoidance systems. But we are not always aware of all the dangerous conditions that are experienced while operating an automobile. Factors such as sudden vehicle fall and hazardous road conditions such as bumps, potholes etc. which often leads to accidents of vehicles.

Roads in India normally have speed breakers [2] so that the vehicle's speed can be controlled to avoid accidents. However, these speed breakers are unevenly distributed with uneven and unscientific heights. Potholes, formed due to heavy rains and movement of heavy vehicles, also become a major reason for traumatic accidents and loss of human lives. According to the survey report "Road Accidents in India, 2011", by the ministry of road transport and highways, a total of 1,42,485 people had lost their lives due to fatal road accidents.

This paper suggests automated approach for detecting potholes or humps using smartphones embedded with numerous sensors such as accelerometers, Global Positioning Systems (GPSs). This proposal intends to describe the road condition application which aims in detecting and alerting the drivers about the obstacles on the road. Here we make use of accelerometer which is used to detect potholes, rough roads as well as humps. And the GPS is used to find the location of obstacle on the road. This data is stored in the server. When the user will be travelling on the road wherever there is an obstacle, an alert message will be generated and also shows the obstacle in the red mark in the map. Data in the server is updated by collecting it from every user.

2. METHODOLOGY

The author in the paper [1] attempts to find a way to match the local map with actual GPS traces from mobile phones. It has been found that method can be used to obtain 100% map matching, as it ensures matching by comparing the GPS data to a set of pre-determined check points. Monitoring road and traffic conditions is a major problem.
This paper proposed a method that uses sensors present on smartphones. This sensor distinguishes the bumpy road from the smooth one. This can be used to detect speed breakers, potholes and rough surface and other obstacles on the road.

Once the accelerometer values are recorded there is a need to find the exact location [1][3]. This can be done with latitude-longitude points of GPS system. The latitude-longitude information can be extracted from the location fixes returned by GPS. A GPS fix is the location identified by the GPS receiver. And this latitude-longitude point will be stored in the server along with the source and destination places.

After getting the road conditions the exact GPS location can be found out and it can be mapped on the Google Earth and alerts the users in the point of obstacles. This information makes convenience for the drivers in the vehicle to get the exact road conditions and improve the safety.

In this system different features of road conditions are collected from accelerometer and the exact location of these features of road conditions is located by the latitude-longitude coordinates of GPS system. These coordinates are sent to the server and mapped on Google Earth. So the person who is travelling for the first time on that road is aware of the road conditions and he can travel on safety.

2.1 ACCELEROMETER and GPS

The Smartphone contains the accelerometer [1] and is capable of detecting multiple motions triggered by a vehicle. It has a sensitivity range of ±2g/4g/8g with a max axial. Motions captured by the phone can be induced by a number of occurrences. For example, acceleration, braking, uneven road conditions, or any degree of change in direction performed by the automobile such as lane changes can be numerically distinguishable.

If any movement is detected, it is numerically analyzed and expressed in these directions. [4] X-axis detects lateral movement or lane changes performed by the drive, a left change is portrayed by decrease in x-axis and y-axis signifies acceleration or barking and z-axis indicate the vibrations that detect the road anomalies. After using a training data set for recording the data from the accelerometer and getting the latitude-longitude coordinates, GPS coordinates at the time when road anomalies occurred will be recorded. These anomalies are defined as a pothole, bump, uneven road, or rough road.

Each segment receives a corresponding value that designates the degree of the road: smooth road, pothole, bump, uneven road, or rough road. The data is mapped on Google Earth. Using previous phone orientation it is possible to recognize and differentiate the change. When a vehicle experiences a bump, it ascends onto the bump, resulting in a quick rise or spike in the value of the z-axis. This also results in a subsequent increase in the x-axis, depending on the bump formation.

At high speeds, the spike in the value of the z-axis is very prominent. However, for low speeds, this rise is not as obvious but still leaves an apparent impact. To detect bumps at low speeds, we compensate with the x-axis and a dynamic threshold based on speed. If the difference between two consecutive acceleration values of the z-axis exceeds the threshold, as well as an x-axis threshold, a bump can be assumed.

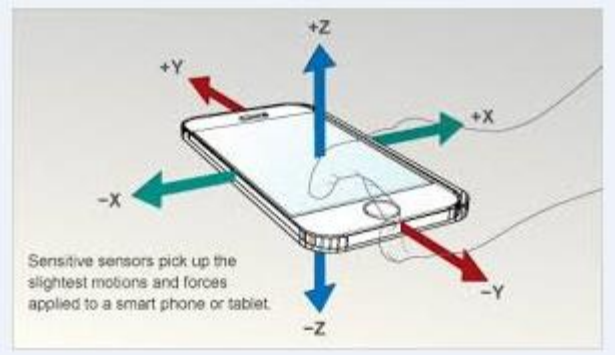
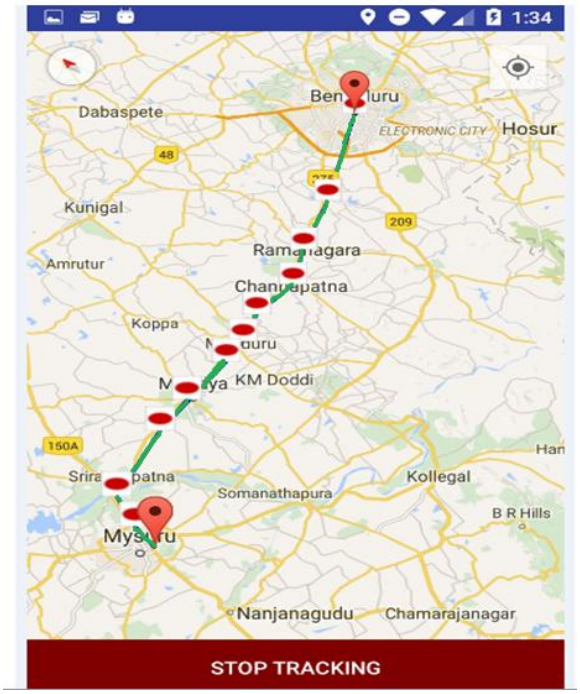


Fig -1: Name of the figure

3. RESULT

This paper discusses pothole detection methods that have been developed and proposes a cost-effective solution to identify the potholes and humps on roads and provide timely alerts to drivers to avoid accidents or vehicle damages. The proposed system captures the geographical location coordinates of the potholes and humps using a global positioning system receiver. The sensed-data includes geographic location of potholes, humps, rough roads which is stored in the server.

If the data is already present in the database then it will show the map which indicates the obstacles in red color and path in green color. If the user is travelling for first then data is collected from them. If he is not the first user then he will get the alerts.



3. CONCULSION

This paper discusses pothole detection methods that have been developed and proposes a cost-effective solution to identify the potholes and humps on roads and provide timely alerts to drivers to avoid accidents or vehicle damages. This serves as a valuable source of information to the government authorities and vehicle drivers. An android application is used to alert drivers so that precautionary measures can be taken to evade accidents. Alerts are given in the form of voice message.

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