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An Intelligent Smartphone Based Approach using IOT for Ensuring Safe Driving

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Abstract—Road accident is wide spread problem all over the world. The number of vehicles is increasing rapidly. Therefore, the probability of an accident is also increasing. So in this paper, we propose an IoT-based system for providing safe driving it will collect data using smartphone and show the information about shortest path to the destination, condition of the road ,weather condition of the destination and nearby hospital, restaurants of their current location. If there is any inconvenience, the user can check for the another path to the destination. We have developed an android based application which will collect the data from the vehicle. The result will shown in Google map of driver's smartphone. This information will be stored in the cloud for further use. We have tested our proposed system through statistical as well as experimental evaluations.

Keywords: Accelerometer sensor , Firebase server, GPS ,Google Maps API

I. INTRODUCTION

In this 21st century, probabilities of accidents are increasing due to increasing the number of vehicles and dangerous condition of the roads. So now, safe driving becomes one of the most frequent urges in urban life. Safe driving not only assures less time for driving but also it secures an accident-free drive. Though driving could never risk-free, one should aim to drive 'low-risk.' For low-risk driving, one should be aware the road circumstances. There are various conditions on the road because of which vehicle may fall unexpectedly like- potholes, bumps, speed breaker, etc. These measures can cause not only variable speed but also can lead to an accident. The driver should be aware of these steps to have more secure, accident-free and comfortable driving.

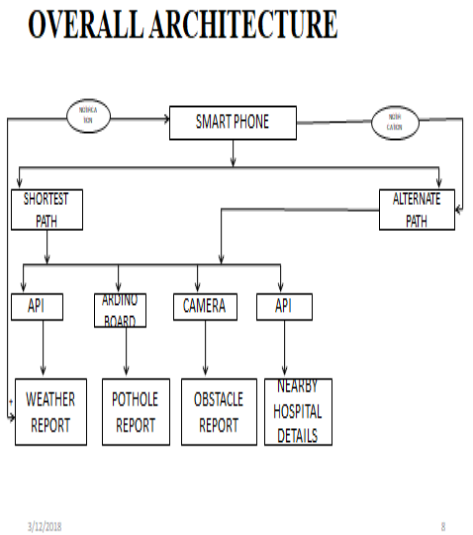
The key contributions of the proposed system can be summarized as follows:

In our proposed system, the application will show the additional information such as weather condition, nearby hospital and restaurants of the current location and road conditions.

It also provides information of the potholes and bumps on the road to the user through our application.

Longitude, latitude values of current location have been collected and displayed to the Android application of user.

II. SYSTEM ARCHITECTURE



III. MODEL DESCRIPTION

A.WEATHER CONDITION

Our application will display the weather condition of upcoming places for safe driving

The system uses weather API to collect weather information and forecasts

Our android application uses openweathermap API for weather forecasting

B. NEARBY HOSPITALS AND RESTAURANTS

Our application will give the nearby hospitals and restaurants of the current location of the user

The system uses android API to collect location of the nearby hospitals

Our android application uses Google places API and Google maps API V2 to detect nearby hospitals of the current location

C.DETECTION OF PATHOLES

The system consists of a device that is designed by integrating a smartphone accelerometer and GPS

These coordinates are used to indicate notification about the potholes before 300 meters on our mapping android applications

IV. PROPOSED SYSTEM

The primary target of our proposed system is to ensure safe driving. In our proposed system, the application will show the safety ensuring information such as weather condition, nearby hospital and restaurants of the current location and potholes and pumps of the road.

V. IMPLEMENTATION AND RESULT

***A**.EXPERIMENTAL SETUP:*

1) Smartphone: We use Asus Zenfone 5 smartphone to collect raw data. It has Accelerometer, Compass, GPS and Proximity Sensor.

The details features of the phone which we will need for our experiment are

Accelerometer Sensor:
Type: KXTJ9 3-axis Accelerometer.
Power Consumption: 0.570mA.
Refresh Rate: 50 Hz.
Minimum Delay: 20000 s.

GPS:
A-GPS: Yes.
GLONASS: Yes.

B.EXPERIMENTAL RESULTS

In this section, we will also show the result of detecting potholes and speed breakers/bumps.

1) Impact of vehicle speed & accelerometer z-axis over time for detecting road anomalies:

If the speed of a vehicle suddenly decreases lower than the threshold speed and in the same time if the z-axis value decreases less than the z-axis lower threshold or increases the-axis value higher than the upper limit, then we have detected speed-breaker/bumps or potholes. The red boxes are showing the points of potholes and speed breakers/bumps. In our approach we are considering both speed and z-axis value for detecting potholes and speed breakers/bumps. So it gives us more accurate result.

C.RESULT ON GOOGLE MAP

We have used Google Map API to show the effect. Drivers can beware of the road condition while they are driving by seeing this map. In figure 1 screenshot, it is showing the weather condition. In Figure 2 screenshot, it is showing the nearby hospitals and restaurants of the current location.

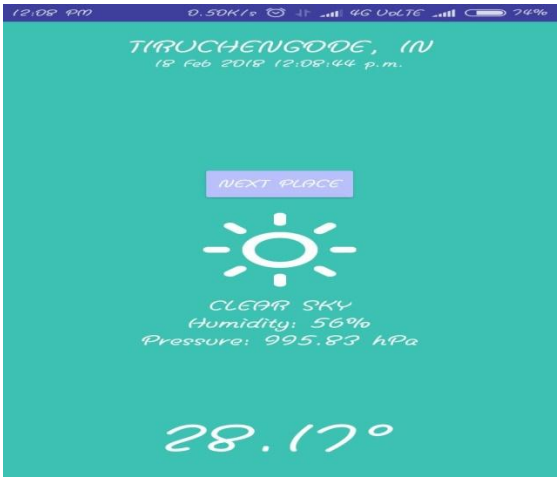


Figure 1: Showing weather condition

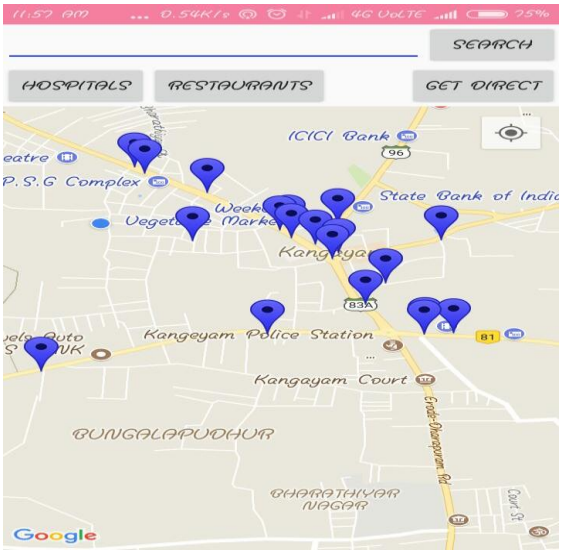


Figure 2: Showing nearby hospitals and restaurants

VI. CONCLUSION

Road accident cannot be erased entirely, but it can be controlled by demonstrating the condition of the road to the vehicle driver. In this study, to avoid road accident- we propose a model for ensuring safe driving by the implementation of IoT that connected every device to another device. Here, the model inputs (longitude, latitude, and speed, acceleration data of vehicles) are obtained using Android application to have real-time implementation capability. In this work, the smartphone is used aiming to remove the need for deploying specialized sensors in a vehicle or at any road junctions. Though, the primary motivation for this approach is to be able to provide a real-time traffic monitoring system that can ensure safe, accident-free and quick driving; there are also many scopes to improve. The further scopes of this work that we want to work in future are - (predicting early accident, suggesting safe path comparatively to other, suggesting path that consumes less time to ride, etc.)

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