ADVANCED NAVIGATION SYSTEM AND DETECTION OF SPEED BREAKERS

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***Abstract* — Speed breakers when excessively used on highways, city roads etc. distract the vehicle drivers. When speed breakers are unmarked or if their appearance is unrecognizable then there are high chances of losing control of the vehicle. The main goal of the project is to implement a system/software that will help tackle this problem. This led to a system that facilitates speed breaker detection and warning generation for the users. Speed breaker data collection is done and mapped onto backend database and is accessed by the software. This helps generate the alerts for the user before approaching a speed breaker whose location is fed into the system.**

Keywords—Speed breakers, warnings, location, data collection, Detection, database, backend

I. INTRODUCTION

Speed breakers are introduced on roads so discomfort is caused when moving at a higher speed than the predetermined speed. Due to speed breakers users are forced to reduce their speed at every interval there is a speed breaker. This helps increase safety of the users and others in the neighboring area by preventing accidents. However, even though speed breakers are known to prevent accidents, there have been cases where they have been said to cause accidents and injuries to vehicle users. When a vehicle user approaches speed breaker with a speed higher than predetermined speed, chances of accidents are considerable and major. During conditions when it is raining or there is snow or fog and even conditions when there is no sufficient lighting on the roads, speed breakers become undistinguished. These are some different conditions under which speed breakers are undetectable or forgotten by the vehicle user and are major causes of accidents. It was realized that an early warning system might be the solution to these problems. This system is an application which is smartphone based to alert and send warnings to the vehicle user in advance. Prior to approaching a speed breaker, the user is alerted. A text on the screen of the user's map pops up as well as a sound alert is generated.

The warning is generated at a sufficiently prior distance which alerts the user and user is presented with enough time to slow down and gain control. This is especially useful when there are no warnings on the roads or sufficient lighting and also when the speed breakers are undetectable due to special conditions.
The smartphone application has the coordinates of all the speed breakers in vicinity fed into the backend which is accessed by the application and alerts are then generated onto the user's screen. This is a feasible solution as smartphone-based applications are available at low cost.

II. EXISTING WORK

Earlier work on speed breaker detection is based on various aspects like detection using Gaussian Filtering, lidar and vision for urban autonomous navigation and algorithms that detect and recognize urban road markings using images. There are other significant methods proposed that make use of machine learning whose main methodology is identifying and recognizing the speed breakers. This machine learning model is employed to observe speed breakers in time by deploying a tensor flow trained deep learning model as associate application on automaton smartphones and has the ability to detect speed breakers in real time using CNN which is Convolutional Neural Network algorithm. The dataset was collected using Microsoft's Bing Image Search API. A special testing was conducted for speed breakers that are undetectable dueto conditions not in man's hand like speed breakers that are illegal(wrong dimensions) or covered with dust and also speed breakers present in areas with bad lighting. The accuracy of this model is said to be very high, approximately 97.14 percent.

1) A combination of artificial vision techniques and digital camera is used in this approach.

2) Digital image processing, stereo vision, machine learning, and a convolutionary neural network are used to determine whether the images contain speed bumps or not. Pre-trained neural network is the main ideology behind this approach.

III. INCORPORATED PACKAGES

A. Geolocator

A Flutter geolocation plugin that provides easy access to platform-specific location services is used. This package is incorporated with the following features some of which were used in this application:

- Get the last known location
- Get the current location of the device
- Get continuous location updates
- Check if location services are enabled on the device
- Calculate the distance (in meters) between two geocoordinates
- Calculate the bearing between two geocoordinates

B. Geocoding

A Flutter Geocoding plugin that gives straightforward geocoding and reverse-geocoding options is employed. This plugin uses the free Geocoding services provided by the iOS and automaton platforms. This means that there are restrictions on their use.

Geocoding in Flutter is a plugin that helps us to retrieve the complete address with the help of Latitude and Longitude and vice-versa.

C. Location

This plugin for Flutter handles getting a location on golem and iOS. It additionally provides callbacks once the placement is modified. The user needs to settle for the placement permission to forever enable to use the background location. The golem eleven choice to forever enable isn't bestowed on the placement permission dialog prompt. The user needs to alter it manually from the app settings. this could be explained to the user on a separate UI that redirects the user to the app's location settings managed by the package.

D. Flutter Local Notification

A cross-platform plugin for displaying native notifications. This package is incorporated with the subsequent options a number of that were employed in this application:

- Display basic notifications
- Periodically show a notification (interval-based)
- Specify a custom notification sound
- Scheduling once notifications ought to seem
- Schedule a notification to be shown daily at a nominal time
- Schedule a notification to be shown weekly on a nominal day and time

E. Google Maps

A Flutter plugin that provides a Google Maps widget. A Flutter plugin that gives a Google Maps convenience. The map read will be controlled with the Google Map Controller that is passed to the Google Map's on Map Created asking. to induce started we tend to initially have to be compelled to fetch the API key that is particular for each user. It permits the users to look for various places around the world. It additionally provides some info concerning the various places that the user desires. The user will get directions for one more location regarding his location.

F. Firebase Core

A Flutter plugin to use the base of operations Core API, that permits connecting to multiple bases of operations apps. the base of operations may be a Backend-as-a-Service (BaaS) app development platform that has hosted backend services like true time info, cloud storage, authentication, crash news, machine learning, remote configuration, and hosting for your static files.

IV. THE PROPOSED METHOD

The planned methodology consists of an Associate in the Nursing application that produces the use of navigation options that is the methodology for the determinant position, speed breakers, and direction of the rider. The application detects speed breakers and alternative obstacles on the route and once the rider is at a pre-defined distance, off from the speed breaker, he's notified before he arrives at the speed breaker.

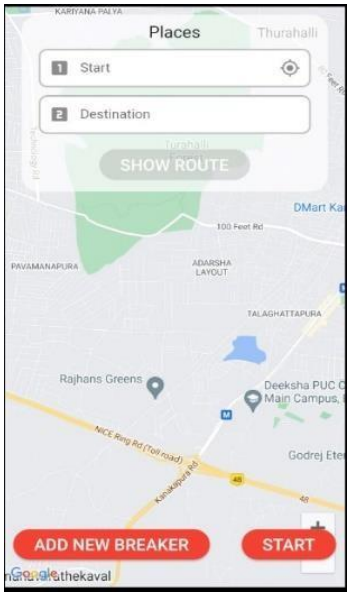

Fig. 1. Landing Page of Application

The application is employed as an indispensable routing mechanism. It generates an alert, some meters before the obstacle. The user is alerted right before they approach the speed breaker. The package necessities for the project were Flutter, VSCode, mechanical man Studio, and Windows. The vital libraries required were Google Map Flutter, Flutter native Notification, Geo surveyor for latitude and line of longitude, base Core and Geocoder.

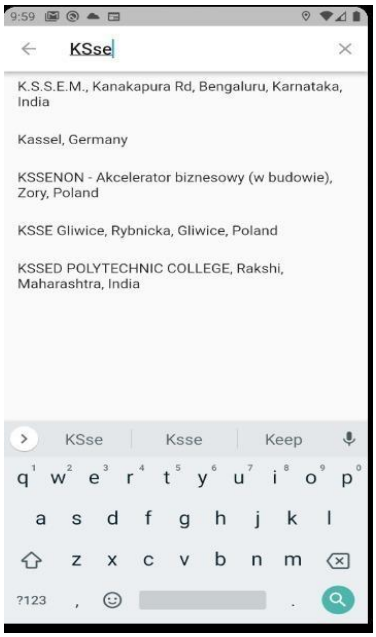

Fig. 2. Part of Initial Interface

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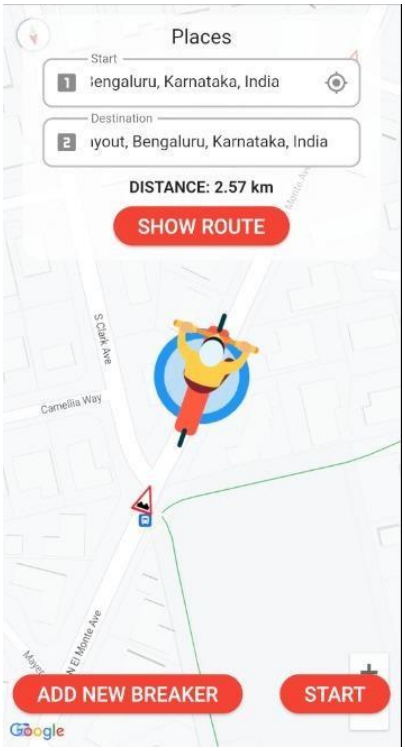

Fig. 3(a). Navigation (initial and final locations entered)

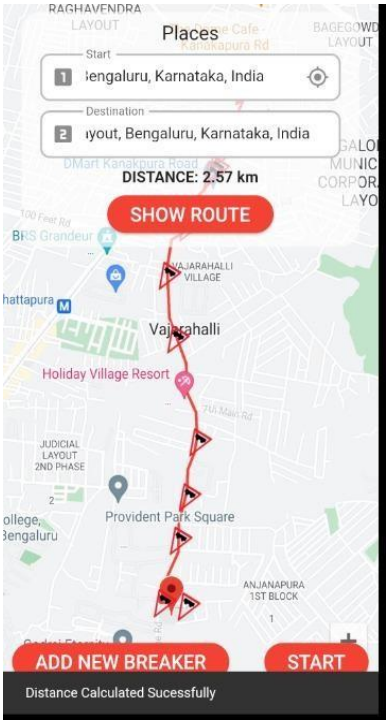

Fig. 3(b). Navigation (route displayed)

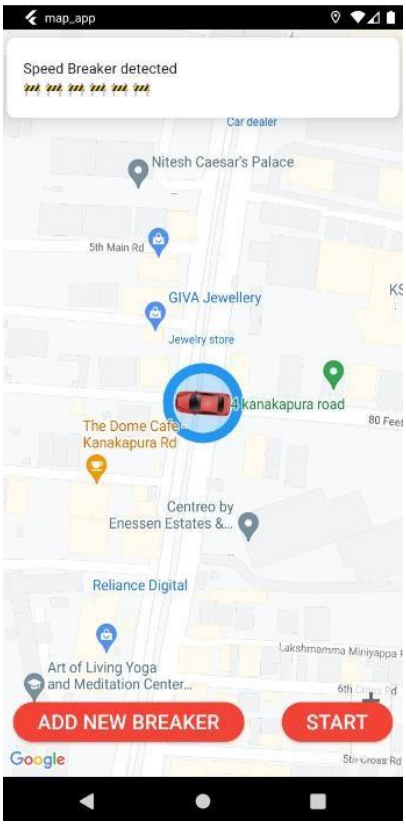

Fig. 4. Notification Generated

When the user opens the application, he/she must make sure that the location service is enabled, else a trigger is generated requesting location access as shown in Fig 8.1. The interface is developed using the google maps API. The API is invoked when the application first loads and is the base for the entire running of the application. It looks very similar to the Google maps environment. It consists of the search bars for the Start and Destination locations. It also consists of buttons for playing the route, which is the start. button. The 'Add Breaker' button is used to add new breakers. These locations get updated into the firebase as geographic coordinates. The user's location is indicated by a unique image used to identify the rider on the map.

When the route is played later, this image traverses along the specified path from the start to the destination in synchronization with the rider using the location access. The figure shows the image used to depict the rider and the user's initial position. The initial location itself is taken as the Start point for the route by default. To set a specific Start location, the rider can use the search bar provided. As the user begins typing, a list of drop downs is provided as shown in the figure. Similarly, the Destination can be set by typing in the search bar provided. Suggestions will be provided in the drop down.

The user can select a specific destination and the click on 'Show route' button. The show route button uses the Google map API to select the best path available between the two places and displays it on the map. The path is indicated with the help of a polyline in red. The start and the destination are indicated utilizing markers. A marker is a visual representation of a specific coordinate or point feature on a map. The default marker uses a standard icon, common to the Google Maps look and feel. It's possible to change the icon's color, image or anchor point via the API. The distance between the input initial and final location is calculated and displayed above the 'Show Route' option. Another notification appears at the bottom of the application with the message, 'Distance calculated successfully'.

If a route cannot be found, the message indicates 'Error calculating distance'. The user can then re-check the location access or other parameters that maybe causing an error. There may be an error in the locations input too. The distance helps the user to analyze the route and make changes in the locations as necessary. The route preview also consists of the special icon used for speed breakers. The speed breakers are indicated along the entire path using the icons. More breakers can be added along the way. A breaker added during the previous navigation along the route is reflected when the same path is traversed next. Hence, this allows for periodic updates in the application to inculcate any new breakers.

V. PREVIOUS WORK

A machine learning technique to sight road anomalies and braking events from measuring devices and meter knowledge is planned. the strategy needs a meter for reorientation however a meter isn't a gift-all-told phone that is prone to magnetic interference and will increase battery consumption also. Another technique for detective work speed bumps and braking events was conjointly planned that failed to differentiate between potholes and speed-breakers. It needs GPS for reorientation, increasing overall complexness and battery consumption. To avoid reorientation complexness, an itinerant crowd-sourcing-based hole detection rule is developed. associate degree early warning system that uses a smartphone-based application to alert the motive force ahead once the vehicle is approaching a speed breaker is being developed. the application perpetually monitors the smartphone measuring device to sight antecedently unknown speed-breakers. Their system depends solely on an associate degree measuring device and inherent GPS detector in smartphones. however, generally, the GPS service on smartphones takes a protracted time to urge fastened in associate degree adverse atmosphere and it doesn't invariably provide particular accuracy. In our planned system, the associate degree autonomous system is unrolled for speed breaker knowledge assortment, and detection also on warn the vehicle drivers and advise the homeowners that area unit economical in terms of your time and value and needs less information measure also as restricted access to the information.

VI. RESULT AND ANALYSIS

As a result, the associate choice for manual addition of speed breakers created potential within the application. the opposite feature is that their area unit 2 ways that of addition:

1) Updating within the base

2) Addition of breakers exploitation the button Warning generation system was created use of whereby audio alerts were created out there together with customization of sound. The Google Maps API permits suggestions to the user concerning the foremost appropriate path that may be chosen. After analysis of the system, future enhancements that may be created were found:

1) Provide additional path choices per the users' wants.

2) Automatic detection of speed breakers. The main challenges round-faced by the tactic principally comprise of non-availability of clear satellite pictures of speed breakers that LED to manual addition of them. However, manual addition had its advantages like the addition of speed breakers into the base is feasible at any time and 'n' a variety of them are often fed and fetched.

VII. CONCLUSIONS

In this paper, we tend to shortly explain the motivation of the work on initial. Then, we tend to disclose what a complicated navigation system is at the side of what options it holds, of which, the special feature enclosed in our system is the speed breaker detection and alert generation. This application works for a two-wheeler further as a hackney-coach. The Google Maps incorporated into this application help in providing the following data of the user World Health Organization is running the application. Current locations also are half-track that is created and used by the app for generating alert notifications of approaching speed breakers. during this system, the speed breakers will be manually else by the user and therefore the admin. Early warning systems are a crucial feature that requires to be enforced for the security of the drivers.

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