Real Time Speed Analyzer
(SpeedySafe)

Report submitted in partial fulfillment of the requirement for the degree of

B. Tech

in
Computer Science & Engineering

Under the supervision
of
Ms. Richa Sharma
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DECEMBER-2020

DECLARATION

-

This is to certify that the Report titled "**Real Time Speed Analyzer (Speedy Safe)**", is submitted by us in partial fulfillment of the requirement for the award of degree B.Tech. in Computer Science & Engineering to BPIT, GGSIP University, Dwarka, Delhi. It comprises our original work. The due acknowledgement has been made in the report for using others' work.

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CERTIFICATE BY SUPERVISOR

This is to certify that Report titled "**Real Time Speed Analyzer (SpeedySafe)**" is submitted by **Vaishali Garg (07920802718), Kritika Sharma (35620802718), Kunal Sharma (75120802718), Urvashi Dhangar (20120802718)** in partial fulfillment of the requirement for the award of degree B. Tech in Computer Science & Engineering to BPIT, GGSIP University, Dwarka, Delhi. It is a record of the candidate's own work carried out by them under my supervision. The matter embodied in this Report is original and has not been submitted for the award of any other degree.

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Date: **Ms. Richa Sharma**

CERTIFICATE BY HOD

This is to certify that Report titled "**Real Time Speed Analyzer (SpeedySafe)**" is submitted by **Vaishali Garg (07920802718), Kritika Sharma (35620802718), Kunal Sharma (75120802718), Urvashi Dhangar (20120802718)**, under the guidance of **Ms. Richa Sharma** in partial fulfillment of the requirement for the award of degree B. Tech in Computer Science & Engineering to BPIT, GGSIP University, Dwarka, Delhi. The matter embodied in this Report is original and has been duly approved for the submission.

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Date: **Dr. Achal Kaushik**

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(Signature of the students)

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ABSTRACT

GPS or Global Positioning System is basically a radio navigation system that provides the location and time information using the radio waves send between satellites and receivers. Using this one will be able to receive data from four or more of the 28 satellites in orbit that are dedicated for geolocation use. GPS receivers are now an integral part of smartphones. However, phone-based GPS measurements display much less accuracy as compared to professional grade receivers.

The aim of our project is to predict vehicle speed using mobile phone GPS, and alert users at various speed levels set by them. The alert of the speed limit will be given using a dynamic voice message at a regular interval of time till the user reduces/decreases the speed.

For this to be successfully we are required to estimate the true speed of the vehicle. In this paper, we have solely used GPS measurement to estimate true speed.

CHAPTER – 1

INTRODUCTION

In recent times, driving has become an important part of our lives. Driving is the controlled operation and movement of a vehicle, including cars, motorcycles, trucks, buses, and bicycles. Permission to drive on public highways is granted based on a set of conditions being met and drivers are required to follow the established traffic laws in the location. The Driving type is classified into two types aggressive and non-aggressive driving. Aggressive driving refers to dangerous driving that disregards safety and courtesy. Recently it is a great subject for study and research as it is directly correlated to accidents. It includes excessive speeding, sudden lane changes, and hard breaks.

Speed thrills but kills. If we speed, we will be liable to a hefty amount of Rs.4000 depending on the type of vehicle we are driving. The high-speed limits are often the cause of accidents leading to serious injuries and death. The speed limit should be in control so that we can avoid accidents caused by high-speed driving, pollution, and the high cost of operation and insurance (speed ticket). Hence, it’s not surprising to see the authorities’ imposing penalties on traffic rule violators, with the severity of the punishment varying as per the nature of the offense. Many drivers exceed the posted speed limits. Sometimes this may be intentional, sometimes it is unintentional. So, to avoid speed ticket and accident, we are proposing a system that predict the vehicle speed using mobile GPS and alerts the user at various speed levels set by them.

Theoretically GPS based measurement is not dependent on phone's orientation and this can be used to measure the driving behavior. However, GPS satellites broadcast their signals in space with a certain accuracy but the accuracy of GPS receivers depend on number of additional factors like satellite geometry, signal blockage influenced by buildings or trees, atmospheric conditions and receiver design features/quality. Mobile GPS comes handy when we need to detect one-time position, but its accuracy is not sufficient enough when we need a sequence of measurements for predicting distance or velocity values due to the error accumulation.

The proposed system evaluates the speed of moving vehicle through the GPS positions and alerts the user through voice messages. It also provides the user with a functionality to check the current weather conditions predicted for the location.

The system also provides the functionality of SOS (Save Your Soul). It lets your primary (saved) contacts know where you are, your current location, voice recordings and pictures along with providing the details of your nearest hospital locations (with accessing your current positions).

CHAPTER – 2

RELATED WORK

There is an application called Speedometer which is used for showing speed. This application is based on GPS. It is basically a GPS-based Speedometer showing the speed of the device it is installed on. The speed in this app is displayed both with an analogue gauge and as a digital value.

In this application there are four different speedometer resolutions for the analogue gauge: 0 - 30, 0 - 60, 0 - 120, 0 – 240 speed units. This application can be displayed in three different units: kilometers per hour (km/h), miles per hour (mph) or knots (nautical miles per hour). When unit km/h is selected the speed in m/s (meter/second) is also displayed. When unit mph is selected the speed in fps (feed per second) is displayed.

This application also provides the possibility to pause the meters by a “long click” on the screen. This app is last updated in 2018 and is a version of 1.6.0 android.

Our application is also GPS based measurement is not dependent on phone's orientation and this can be used to measure the driving behavior. The GPS receiver in your mobile device compares the time signals it receives from the satellites with its internal clock. Knowing the speed of light and when the signals were sent and received, your device can calculate your distance from each satellite, and thereby home in on your longitude, latitude and altitude. Mobile GPS comes handy when we need to detect one-time position, but its accuracy is not sufficient enough when we need a sequence of measurements for predicting distance or velocity values due to the error accumulation.

So here in this application we used to calculate the speed of moving vehicle through the GPS positions and alerts the user through voice messages. It also provides the user with a functionality to check the current weather conditions predicted for the location.

This application also provides us the feature of SOS (Save Your Soul). Application used primary (saved) contacts know where you are, your current location, voice recordings and pictures along with providing the details of your nearest hospital locations (with accessing your current positions).

This chapter also deals with the survey of various papers that have contributed to the estimation ofthe speed of vehicle.

Aziz, T., Faisal, T. M., Ryu , H. G., & Hossain, M. N. proposed Vehicle Speed Control and Security System [1]. It introduces a multi-layer security system which includes a theft alerting feature, owner speed-limiting system, and emergency monitoring vehicle feature. It introduces limiting the speed of the vehicle if it is robbed and geolocation tracking using GPS and GSM module. By GPS module we get the longitude and latitude and using that we get our location on the map and by GSM module we get the text message where the location is mentioned. And also monitoring the vehicle through a webcam.

Lattanzi , E., & Freschi , V. proposed Machine learning techniques to identify unsafe behavior by means of in-vehicle sensor data [2]. It introduces unsafe driving behaviors of a driver by taking advantage of sensors already present in modern vehicles using machine learning techniques (SVM, Artificial Neural Network). Here relationship between acceleration and speed which when plotted, it splits out in two areas representing safe and unsafe driving domains.train the two classifiers: Support Vector Machines(SVM), Artificial Neural Networks. A binary- class SVM was used to find a hyperplane that best divides the dataset into the desired classes. A simple feedforward network was used with a single hidden layer composed of 50 neurons. The network was trained by means of a backpropagation Levenberg . Lastly, graphs were plotted for dataset showing safe(blue circle) and unsafe(red triangle) against different features.

Kang JM, Kim HS, Park JB, Choi YH proposed An Enhanced Map-Matching Algorithm for Real-Time Position Accuracy Improvement with a Low-Cost GPS Receiver [3]. It introduces accuracy of a low-cost GPS receiver based on map data without using any additional sensors. It loaded the digital databases and constructing RPS the Iterative Closest Point (ICP) algorithm and the translation vector

from which minimized horizontal position error is concluded. However, this transformation does not sufficiently reflect the change value between the trajectory and the GPS information, which were newly obtained, hence least squares method was used to calibrate the rotational error. The state estimation which implies the correct position of the vehicle is linked to RPS to eliminate the residual disparity using vector projection theorem, which is from the current state estimation and the two points near the estimation point. The lateral error is reduced, and the vehicle position is located on the road of the digital map.

Merry, K., & Bettinger, P.proposd Smartphone GPS accuracy study in urban environment[4].This paper aims to understand relative position accuracy in an urban environment by an iPhone 6 using Avenza software for capturing horizontal position. locations were captured during two seasons of the year(leaf-on and leaf-off), two times of day(AM and PM) and two perceived WiFi usage periods(High and Low, when human activity was hight and low respectively) and also -GPS-only and WiFi enabled. It was concluded that overall average horizontal position error of the iPhone 6 is in the 7–13 m range, depending on conditions(the time of year and weather conditions did not influence the average horizontal position error), which is consistent with the general accuracy levels observed of recreation-grade GPS receivers in potential high multipath environments. Horizontal position error seemed to improve in general during perceived high WiFi usage periods (when more people were present) within each season and during each time of day most prominently in the afternoon. In general, directional error was consistent at each data collection point during both GPS-only and WiFi collection.

Feng, K., Li, J., Zhang, X., Zhang,X., Shen, C., Cao, H., ... & Liu, J. proposed An improved strong tracking cubature kalman filter for GPS/INS integrated navigation systems[5]. improved strong tracking cubature Kalman filter is proposed to suppress the process uncertainty induced by the severe manoeuvring for the low-cost GPS/INS integrated navigation systems. Based on the improved strong tracking technique, the process uncertainty can be detected and suppressed by modifying the prior state estimate covariance online according to the change in vehicle dynamics. The car- mounted experiments are utilized to demonstrate that the proposed IST-7thSSRCKF can achieve high estimation accuracy and has better robustness for the suppression of process uncertainties.

Lohrer, J., & Lienkamp, M. proposed an approach for predicting vehicle velocity in combination with driver turns [6]. The model revolves around the two main stages, The first stage is the prediction of upcoming turns and trip segments based on the historical features and the currently driven road segments. The second stage uses this information to predict the vehicle's speed. The model is completely based on the prediction, it analyses the data obtained from Field operational testing in order to detect the future turns, trip and vehicles velocity. The main setback for the model is, if the destination is unknown, the preview is limited to the end of the road section, which limits the user to a particular region.

Reddy, N. R., & Subhani, S. proposed Monitoring Vehicle Speed using GPS and Categorizing Driver [7]. The proposed work is an endeavor to control speed of the vehicle structured with Pc programming to empower the outsider or proprietor to get the area, speed and action of the driver. GSM/GPRS are utilized to track the objects and provide the up-to-date data. This data is stored in the server and sent to the users.

Hua, S., Kapoor, M., & Anastasiu, D. C. proposed Vehicle tracking and speed estimation from traffic videos [8]. The model was basically designed to aid the traffic department in empowering the traffic rules, to prevent vehicles from rash driving and over speeding. the basic approach of the model to track the vehicles using vehicle detection algorithms and then detecting the speed of vehicles using optical flow and speed estimation algorithms. In order to predict the speed of a moving vehicle and track the vehicle the camera recording traffic should be static, which also adds ups as a downfall of the proposed model. Shukla, D., & Patel, E. proposed Speed determination of moving vehicles using Lucas Kanade Algorithm [9]. The model takes simple video file as input and calculates speed of vehicle using Lucas- kanade algorithm, which makes use of Optical flow of the input video to derive the necessary equations which are then replaced by the values as per rate of change of pixels will give the velocity of the moving vehicle.

Yu, J., Zhu, H., Han, H., Chen, Y. J., Yang, J., Zhu, Y., ... & Li, M. proposed Sen speed: Sensing driving conditions to estimate vehicle speed in urban environments [14]. Estimating the speed using GPS reading often suffer from low accuracy, low update frequency. To overcome this new approach

of estimating the speed using accelerometer (embedded in phone) reading come into play. But it is observed that directly integrating the speed provides a large deviation ang is linearly dependent on time. This is because the accumulative error cause large deviation. Therefore, to overcome this the accumulative error needs to be eliminated hence model proposes the use of unique reference points (making turns, stopping (at traffic light, due to traffic or at stop sign), even road surfaces). Then the model measures the error in the readings between two adjacent reference point and eliminates such error to obtain high accuracy.

Chowdhury, A., Chakravarty, T., & Balamuralidhar, P. proposed Estimating true speed of moving vehicle using smartphone-based GPS measurement [11]. This paper proposed a speed calculation approach using the GPS measurement in smartphones. The readings may suffer due the urban canyon effects, also the accurate speed turn measurements are required to be captured. Since the GPS measurements are not dependent on phone orientation, it is better to use. GPS data provides the values timestamp, horizontal accuracy, latitude, longitude. The GPS measurement takes some time to deflect the sudden change in speed. To overcome this the model proposes the use of two moving average filters with normalized weight coefficients.

Laghari, S. M. N. U. Z., & Farrukh, M. A. M proposed GPS Estimation using Kalman Filter [12]. GPS receiver links with four satellites provide four values (longitude, latitude, elevation). The accuracy of GPS values relies on the respective devices. To avoid this Kalman filter is brought in use which takes noisy data as input and provides less noisy data.

Ustun, I., & Cetin, M. proposed Speed estimation using smartphone accelerometer data [13]. The integration of the acceleration values theoretically provides the value of speed. Using this basic approach, the idea of the paper was to estimate the speed using the accelerometer (embedded inside the smartphone) readings. However, this may accumulate other factors also like gravity component, sensor bias, noise effect, vibrations etc. The accelerometer provides with three readings (along x, y, z axis). For the purpose of calculation readings along y axis is only taken into consideration.

Yu, J., Zhu, H., Han, H., Chen, Y. J., Yang, J., Zhu, Y., ... & Li, M. proposed Sen speed: Sensing driving conditions to estimate vehicle speed in urban environments [14]. Estimating the speed using GPS reading often suffer from low accuracy, low update frequency. To overcome this new approach of estimating the speed using accelerometer (embedded in phone) reading come into play. But it is observed that directly integrating the speed provides a large deviation ang is linearly dependent on time. This is because the accumulative error cause large deviation. Therefore, to overcome this the accumulative error needs to be eliminated hence model proposes the use of unique reference points (making turns, stopping (at traffic light, due to traffic or at stop sign), even road surfaces). Then the model measures the error in the readings between two adjacent reference point and eliminates such error to obtain high accuracy.

Tamilselvan, K., Murugesan, G., & Suthagar, S. Android Based Vehicle Speed Control System In Critical Zones Using GPS Technology [15]. This paper proposed a technique to develop an android application with GPS technology in order to identify the critical location and control the speed of vehicle automatically in two wheelers. The speed measurement and control are accomplished via microcontroller with signal being received wirelessly from GPS. In this system when the vehicle reached the critical zone, the GPS device transmit the message to the hardware(receiver) to reduce the speed through Bluetooth and the mechanism automatically reduced the speed.

ÖZDEMİR, Z., & TUĞRUL, B. proposed Geofencing on the Real-Time GPS Tracking System and Improving GPS Accuracy with Moving Average, Kalman Filter and Logistic Regression Analysis[16]. In his paper real-time tracking and geofence were performed. Here we, distance between the coordinates. Smooth circle-shaped geofence area is useless. This problem was solved by defining geofence in the form of polygon., the geofence area is customized in two ways as static and dynamic. Static predefined polygon. The fact that the polygon drawn in real-time in a newly travelled area can be used as a geofence without saving is defined as dynamic geofence and has provided a very flexible use to the study.GPS data has errors for various reasons. It is aimed to reduce the error rate in the data in order to make the system run faster and to be stable.The comparative results given. Moving average, logistic regression and Kalman filter were applied for error reduction.

Li, Z., Wang, R., Gao, J., & Wang, J. proposed An Approach proposed to Improve the Positioning Performance of GPS/INS/UWB Integrated System with Two-Step Filter [17]. AN enhanced GPS/INS/UWB integrated schema with position error correction is proposed to improve the position accuracy, which is based on predicting the position difference between GPS/INS and GPS/INS/UWN. Based on analytical and experimental results, the GPS/INS/UWB integrated navigation with error correction outperforms the GPS/INS integrated navigation by 48% and 23% in the north and east directions, respectively, when the UWB signal is unavailable. The integrated positioning method based on a multi-sensor is able to realize the integration of advantages from different sensors. The ability of UWB was tapped further in the proposed method, but the cooperative level of different sensors was also not high, such as the modification of system error from the UWB observation and robustness of the original observation.

Verma, P., & Bhatia, J. S. proposed Design and Development of GPS-GSM based tracking system with Google Map based monitoring [18]. GPS is one of the technologies that are used in a huge number of applications today. One of the applications is tracking your vehicle and keeping regular monitoring on them. This tracking system can inform you the location and route traveled by vehicle, and that information can be observed from any other remote location. It also includes a web application that provides you the exact location of the target. This system enables us to track targets in any weather conditions. This system uses GPS and GSM technologies.

Singhal, M., & Shukla, A. proposed Implementation of Location based Services in Android using GPS and WebServices[19] . Location based Services offer many advantages to the mobile users to retrieve the information about their current location and process that data to get more useful information near to their location. With the help of A-GPS in phones and through Web Services using GPRS, Location based Services can be implemented on Android based smartphones to provide these value-added services: advising clients of current traffic conditions, providing routing information,helping them find nearby hotels. In this paper, we propose the implementation of Location based services through Google Web Services and Walk Score Transit APIs on Android Phones to give multiple services to the user based on their Location.

Liu, W., Yamazaki, F., & Vu, T. T. proposed Automated Vehicle Extraction and Speed Determination From QuickBird Satellite Images[20]. A new method has been developed to automatically extract moving vehicles and subsequently determine their speeds from a pair of QuickBird (QB) panchromatic (PAN) and multispectral (MS) images. Since the PAN and MS sensors of QB have a slight time lag (approximately 0.2 s), the speed of a moving vehicle can be determined from the difference in the positions of the vehicle observed in the PAN and MS images due to the time lag. An object-based approach can be used to extract a vehicle from the PAN image, which has a resolution of 0.6 m. However, it is difficult to accurately extract the position of a vehicle from an MS image because its resolution is 2.4 m. Thus, an area correlation method is proposed to determine the location of a vehicle from an MS image at a sub-pixel level. The speed of the moving vehicle can then be calculated by using the vehicle extraction results.

CHAPTER-3

SYSTEM ANALYSIS AND DESIGN

3.1 Functional Requirements

Functional requirements of this application are as follows:

- The application must have user registration and login option.
- The application must have tracking location system.
- The application must have process speed and voice alerts.
- The application must have option to view nearby hospital.
- This application also provides SOS.

3.2 Non-Functional Requirements

- The application must have a user interface.
- The user interface must be mobile-friendly.
- Exception handling methods must be used.
- Users should get confirmation and warning message

3.2.1 Hardware Requirements

1	Android phone

3.2.2 Software Requirements

Number	Description	Type
1	Operating System	Windows XP / Windows
2	Language	Java
3	Database	Firebase
4	IDE	Android Studio

3.3 USE CASE DIAGRAM

A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use-cases in which the user is involved. A use case diagram can identify the different types of users of a system and the different use cases and will often be accompanied by other types of diagrams as well. The use cases are represented by either circles or ellipses.

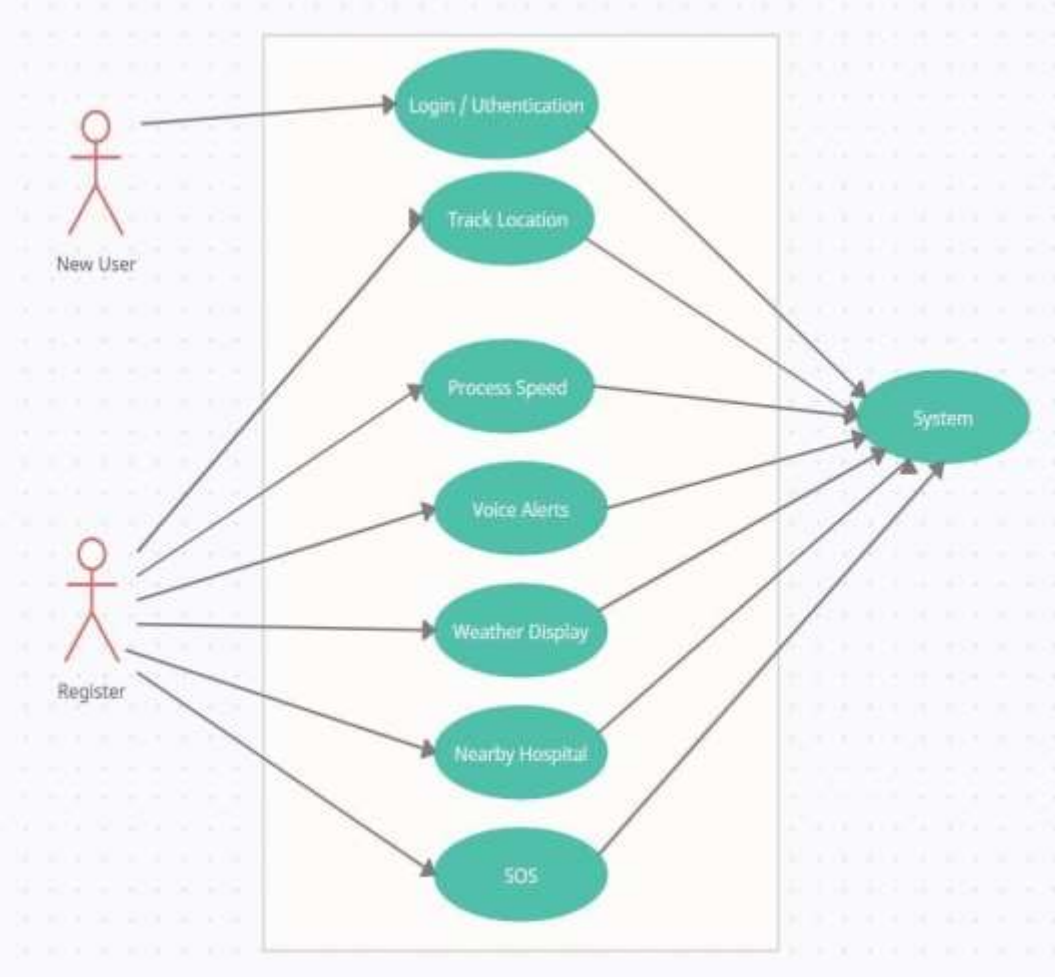

Figure – 3.1 Use case Diagram

The proposed system evaluates the speed of moving vehicles through the GPS positions and alerts the user through voice messages. It also provides the user with a functionality to check the current weather conditions predicted for the location.

The system also provides the functionality of SOS (Save Your Soul). It lets your primary (saved) contacts know where you are, your current location, voice recordings and pictures along with providing the details of your nearest hospital locations (with accessing your current positions).

3.4 DATA FLOW DIAGRAM(DFD):

Data Flow Diagrams are used to represent the flow of data from one part of the system to another part of the system. Mainly these DFDs are used to represent the existing system. We can divide the study of DFDs into 3 parts.

Notations

Rules

Levels

DFD-0:

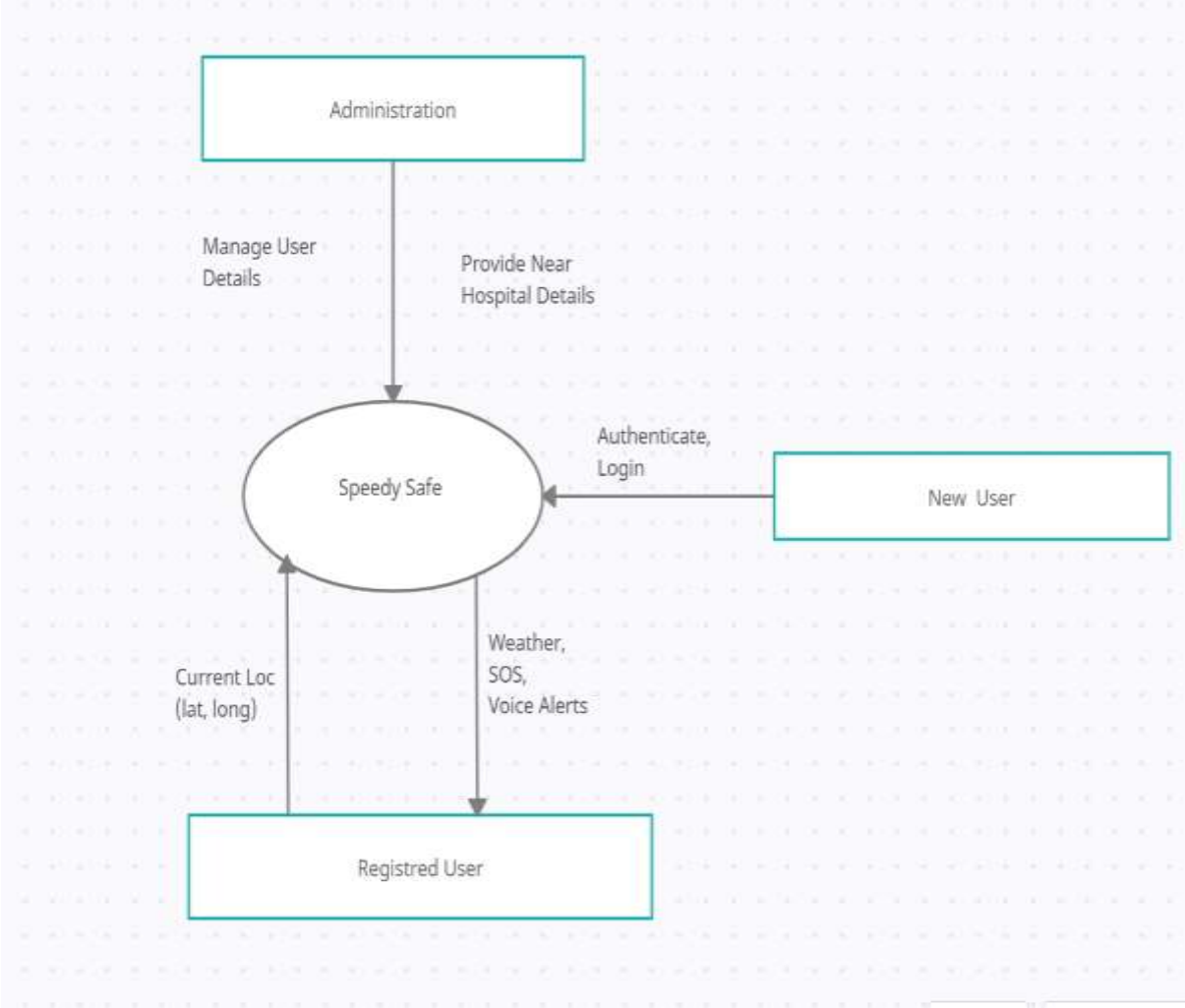

Figure -3.2 DFD Level 1

The proposed system evaluates the speed of moving vehicles through the GPS positions and alerts the user through voice messages. It also provides the user with a functionality to check the current weather conditions predicted for the location.

The system also provides the functionality of SOS (Save Your Soul). It lets your primary (saved) contacts know where you are, your current location, voice recordings and pictures along with providing the details of your nearest hospital locations (with accessing your current positions).

3.5 DATA FLOW DIAGRAM (LEVEL 1)

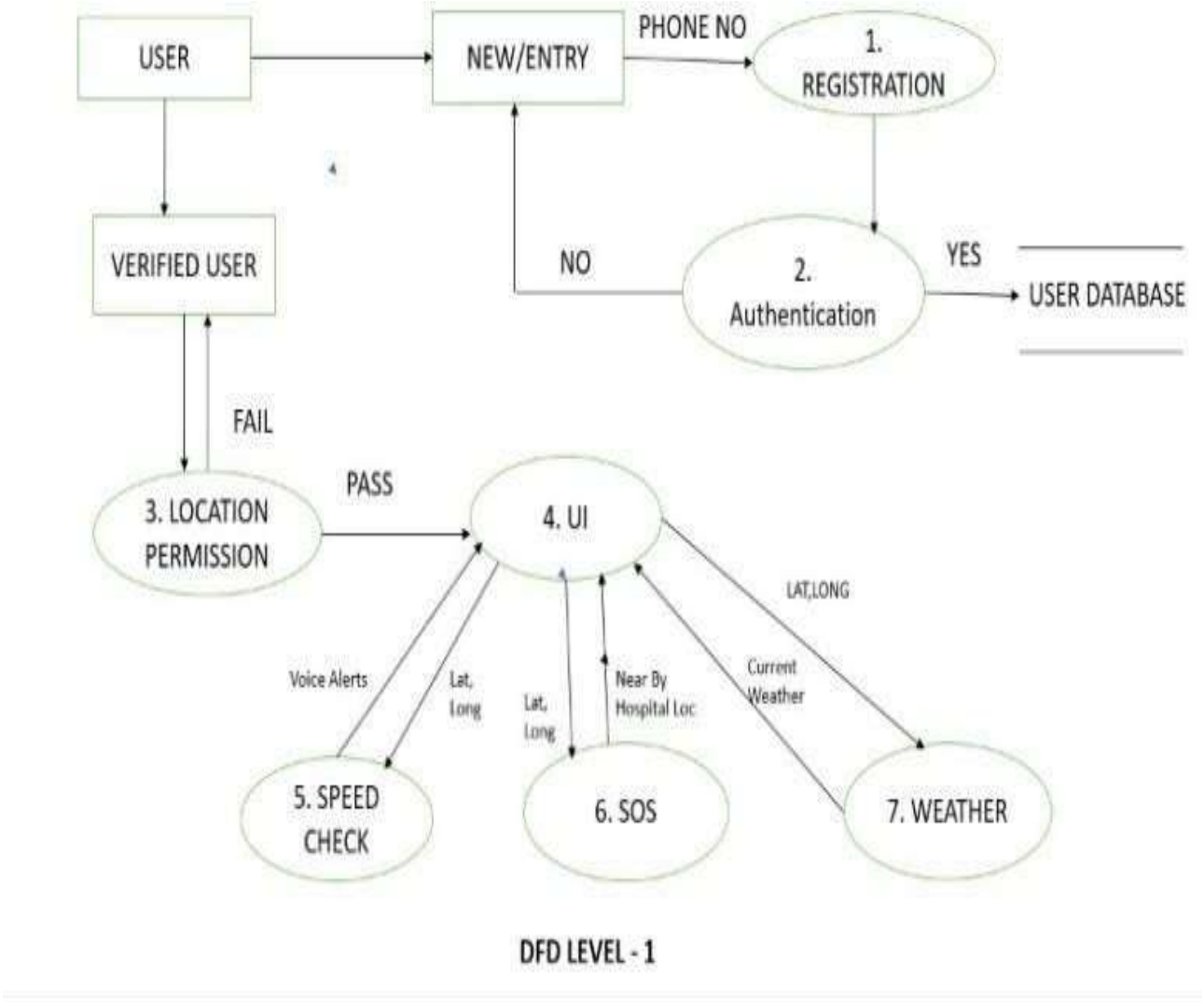

Figure – 3.3 DFD Level 1

This diagram describes the basic flow of dfd for our proposed system. The user needs to authenticate himself first. The new user will be allowed to register himself using mobile no. (existing) & an OTP Will be sent to authenticate. Once the process is successful the user will be verified & a new user will be created in the database. This is one - time process.

Then verified user will be asked for location access. Until the access is granted no further process can take place. The once the permission is granted the user can check the current weather condition, will have access to sos . The speed of the user will continuously be evaluated & alerts are sent through audio messages. Also the system provides the location of nearby hospitals in case of emergencies.

CHAPTER – 4

PROPOSED WORK

This application is GPS based measurement is not dependent on phone's orientation and this can be used to measure the driving behavior. Where GPS satellites broadcast their signals in space with a certain accuracy but the accuracy of GPS receivers depend on number of additional factors. Mobile GPS comes handy when we need to detect one-time position, but its accuracy is not sufficient enough when we need a sequence of measurements for predicting distance or velocity values due to the error accumulation.

This application is used to calculate the speed of moving vehicle through the GPS positions and alerts the user through voice messages. It also provides the user with a functionality to check the current weather conditions predicted for the location.

The system also provides the functionality of SOS (Save Your Soul). It lets your primary (saved) contacts know where you are, your current location, voice recordings and pictures along with providing the details of your nearest hospital locations (with accessing your current positions).

4.1 FEASIBILITY STUDY:

A feasibility study is a high-level capsule version of the entire System analysis and Design Process. The study begins by classifying the problem definition. Feasibility is to determine if it’s worth doing. Once an acceptance problem definition has been generated, the analyst develops a logical model of the system. A search for alternatives is analyzed carefully. There are 3 parts in feasibilitystudy.

4.1.1 OPERATIONAL FEASIBILITY

Operational feasibility is the measure of how well a proposed system solves the problems, and takes advantage of the opportunities identified during scope definition and how it satisfies the requirements

identified in the requirements analysis phase of system development .The operational feasibility assessment focuses on the degree to which the proposed development projects fits in with the existing business environment and objectives with regard to development schedule, delivery date, corporate culture and existing business processes .To ensure success, desired operational outcomes must be imparted during design and development. These include such design-dependent parameters as reliability, maintainability, supportability, usability, producibility, disposability, sustainability, affordability and others. These parameters are required to be considered at the early stages of design if desired operational behaviors are to be realized. A system design and development require appropriate and timely application of engineering and management efforts to meet the previously mentioned parameters. A system may serve its intended purpose most effectively when its technical and operating characteristics are engineered into the design. Therefore, operational feasibility is a critical aspect of systems engineering that needs to be an integral part of the early design phases.

4.1.2 TECHNICAL FEASIBILITY

This involves questions such as whether the technology needed for the system exists, how difficult it will be to build, and whether the firm has enough experience using that technology. The assessment is based on outline design of system requirements in terms of input, processes, output, fields, programs and procedures. This can be qualified in terms of volume of data, trends, frequency of updating in order to give an introduction to the technical system. The application is the fact that it has been developed on windows XP platform and a high configuration of 1GB RAM on Intel Pentium Dual core processor. This is technically feasible

The technical feasibility assessment is focused on gaining an understanding of the present technical resources of the organization and their applicability to the expected needs of the proposed system. It is an evaluation of the hardware and software and how it meets the need of the proposed system.

4.1.3 ECONOMICAL FEASIBILITY

Establishing the cost-effectiveness of the proposed system i.e., if the benefits do not outweigh the costs, then it is not worth going ahead. In the fast-paced world today there is a great need of online social networking facilities. Thus, the benefits of this project in the current scenario make it economically feasible. The purpose of the economic feasibility assessment is to determine the positive economic benefits to the organization that the proposed system will provide. It includes quantification and identification of all the benefits expected. This assessment typically involves a cost/benefits analysis.

CHAPTER – 5

IMPLEMENTATION

5.1 GPS

Turning ON the GPS module on the phone would not cost us anything but getting a location usually involves a transaction with cell phone service provider so as to extract the location fast and with as little network connectivity as possible plus non visibility of satellites. In short: no cell phone service implies any GPS location, as far as handheld devices are considered.

Normal GPS

The method is called trilateration. The receiver listens to a particular frequency and gets data packets in the form of time coded messages from satellites. The receiver figures which satellites it can hear from. It starts gathering those messages containing time information from atomic clocks, current satellite positions etc. Nominal time to get a location is around 30-60 seconds. The same information needs to be confirmed by at least two other satellites.

Only Using Mobile Services

The user location in an area is calculated with the help of signal measurements with the information received from cell towers. Information analyzed are angle to approach towers, multipath fading characteristics with signal strength comparisons. No GPS module used.

Assisted GPS

This is what a cell phone normally uses for mapping and GPS use purposes. User location information is retrieved within 5-10 seconds. The GPS components are shared with other mobile components and hence simultaneous use of GPS and normal voice/video usage is done. First, gross positioning information from service provider based on what cell tower is being accessed and the same is fed to the GPS receiver. Next, the phone switches from phone to GPS mode for around 0.1 seconds and collects

raw GPS data from satellites. It then switches back to phone mode and sends the data to the service provider to be analyzed.
The service provider uses its servers to process the data and send the most accurate location back to the phone to be displayed on a map overlay.

Full Chip GPS Receiver

The module still gets data from the service provider such as tower positioning and satellites to hear from. Switching is for 1 second but after that the receiver keeps track of information with very low power drawn from circuit.

5.2 Fused Location Provider Client

Fused Location is actually a location service which combines GPS location and network location to achieve balance between battery consumption and accuracy.

It's just a upgraded type of service which reduces battery usage and provides you the accurate location by different basis.

Not only based on GPS and network location but also via WiFi and other technologies.

The FusedLocationProviderClient provides several **methods to retrieve device location information**. Choose from one of the following, depending on your app's use case: getLastLocation() gets a location estimate more quickly and minimizes battery usage that can be attributed to your app.

public class **FusedLocationProviderClient** extends GoogleApi<Api.ApiOptions.NoOptions>

The main entry point for interacting with the fused location provider.

public class FusedLocationProviderClient

Fused location class, which is used for interaction during location. An instance of this class will be returned when the getFusedLocationProviderClient(Activity activity) method of the LocationServices class is called.

```
1. private FusedLocationProviderClient fusedLocationProviderClient;
2. fusedLocationProviderClient = LocationServices.getFusedLocationProviderClient(this);
```

5.3 LocationManager

android.location.LocationManager. This class **provides access to the system location services**. These services allow applications to obtain periodic updates of the device's geographical location, or to be notified when the device enters the proximity of a given geographical location.

Android provides the developers with its location API. This makes it easy for us to make applications that support location. Location-based services in android are those services **that deal with the device's geographical location**. The best live example is finding restaurants, petrol pumps or stores near you.

Using the Location Manager

1. Declare Proper Permissions in Android Manifest.
2. Get a Reference to LocationManager.
3. Pick a Location Provider.
4. Verify the Location Provider is Enabled.

The first step of setting up location update access is to declare proper permissions in the manifest. If permissions are missing, the application will get a SecurityException at runtime.

Depending on the LocationManager methods used,
either ACCESS_COARSE_LOCATION or ACCESS_FINE_LOCATION permission is needed. For example, you need to declare the ACCESS_COARSE_LOCATION permission if your application uses a
network-based location provider only. The more accurate GPS
requiresthe ACCESS_FINE_LOCATION permission. Note that
declaring
the ACCESS_FINE_LOCATION permission implies ACCESS_COARSE_LOCATION already.

Also, if a network-based location provider is used in the application, you'll need to declare the internet permission as well.

```
<uses-permission android:name="android.permission.ACCESS_COARSE_LOCATION" />
<uses-permission android:name="android.permission.INTERNET" />
```

Get a Reference to LocationManager

LocationManager is the main class through which your application can access location services on Android. Similar to other system services, a reference can be obtained from calling the getSystemService() method. If your application intends to receive location updates in the foreground (within an Activity), you should usually perform this step in the onCreate() method.

```
LocationManager locationManager =
    (LocationManager) this.getSystemService(Context.LOCATION_SERVICE);
```

Pick a Location Provider

While not required, most modern Android-powered devices can receive location updates through multiple underlying technologies, which are abstracted to an application as LocationProvider objects. Location providers may have different performance characteristics in terms of time-to-fix, accuracy, monetary cost, power consumption, and so on. Generally, a location provider with a greater accuracy, like the GPS, requires a longer fix time than a less accurate one,such as a network-based location provider.

Depending on your application's use case, you have to choose a specific location provider, or multiple providers, based on similar tradeoffs. For example, a points of interest check-in application would

```
LocationProvider provider =
    locationManager.getProvider(LocationManager.GPS_PROVIDER);
```

Alternatively, you can provide some input criteria such as accuracy, power requirement, monetary cost, and so on, and let Android decide a closest match location provider. The snippet below asks for a location provider with fine accuracyand no monetary cost. Note that the criteria may not resolve to any providers, in which case a null will be returned.

```
// Retrieve a list of location providers that have fine accuracy, no monetary cost, etc
Criteria criteria = new Criteria();
criteria.setAccuracy(Criteria.ACCURACY_FINE);
criteria.setCostAllowed(false);
...
String providerName = locManager.getBestProvider(criteria, true);

// If no suitable provider is found, null is returned.
if (providerName != null) {
   ...
}
```

Verify the Location Provider is Enabled

Some location providers such as the GPS can be disabled in Settings. It is good practice to check whether the desired location provider is currently enabled by calling the isProviderEnabled() method. If the location provider is disabled, you can offer the user an opportunity to enable it in Settings by firing an Intent with the ACTION_LOCATION_SOURCE_SETTINGS action.

```
@Override
protected void onStart() {
    super.onStart();

    // This verification should be done during onStart() because the system calls
    // this method when the user returns to the activity, which ensures the desired
    // location provider is enabled each time the activity resumes from the stopped state.
    LocationManager locationManager =
            (LocationManager) getSystemService(Context.LOCATION_SERVICE);
    final boolean gpsEnabled = locationManager.isProviderEnabled(LocationManager.GPS_PROVIDER);

    if (!gpsEnabled) {
        // Build an alert dialog here that requests that the user enable
        // the location services, then when the user clicks the "OK" button,
        // call enableLocationSettings()
    }
}

private void enableLocationSettings() {
    Intent settingsIntent = new Intent(Settings.ACTION_LOCATION_SOURCE_SETTINGS);
    startActivity(settingsIntent);
}
```

5.4 The Location Object

The **Location** object represents a geographic location which can consist of a latitude, longitude, time stamp, and other information such as bearing, altitude and velocity. There are following important methods which you can use with Location object to get location specific information −

Sr.No.	Method & Description
1	**float distanceTo(Location dest)** Returns the approximate distance in meters between this location and the given location.
2	**float getAccuracy()** Get the estimated accuracy of this location, in meters.
3	**double getAltitude()** Get the altitude if available, in meters above sea level.
4	**float getBearing()** Get the bearing, in degrees.
5	**double getLatitude()** Get the latitude, in degrees.
6	**double getLongitude()** Get the longitude, in degrees.

7	**float getSpeed()** Get the speed if it is available, in meters/second over ground.
8	**boolean hasAccuracy()** True if this location has an accuracy.
9	**boolean hasAltitude()** True if this location has an altitude.
10	**boolean hasBearing()** True if this location has a bearing.
11	**boolean hasSpeed()** True if this location has a speed.
12	**void reset()** Clears the contents of the location.
13	**void setAccuracy(float accuracy)** Set the estimated accuracy of this location, meters.
14	**void setAltitude(double altitude)** Set the altitude, in meters above sea level.
15	**void setBearing(float bearing)** Set the bearing, in degrees.
16	**void setLatitude(double latitude)**

	Set the latitude, in degrees.
17	**void setLongitude(double longitude)** Set the longitude, in degrees.
18	**void setSpeed(float speed)** Set the speed, in meters/second over ground.
19	**String toString()** Returns a string containing a concise, human-readable description of this object.

5.5 Android Studio

Android Studio is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems. It is a replacement for the Eclipse Android Development Tools (ADT) as primary IDE for native Android application development.

Android Studio was announced on May 16, 2013 at the Google I/O conference. It was in early access preview stage starting from version 0.1 in May 2013, then entered beta stage starting from version 0.8 which was released in June 2014. The first stable build was released in December 2014, starting from version 1.0. The current stable version is 3.1 released in March 2018.

Gradle:

In Android Studio, Gradle is a custom build tool used to build android packages (apk files) by managing dependencies and providing custom build logic.

Advantages:

- ➢ This system helps admin to keep track of the driver so that driver cannot do any type of cheating.
- ➢ This system helps admin to keep record of user details and able to get every details related to drivers movement using Firebase.
- ➢ This application enables admin for an easy and hastle free tracking of vehicle from anywhere.

Disadvantages:

- ➢ If there is network failure due to environment hazardous, system will fail to track location of the vehicle.
- ➢ Once the user or driver log out of their account, admin won’t be able to track their details.
- ➢ If the location of the mobile is turned off intentionally admin will not be able to track the location.

5.6 Firebase

Firebase is a mobile and web app development platform that provides developers with a plethora of tools and services to help them develop various applications.
Brief history: Back in 2011, before Firebase was Firebase, it was a startup called Envolve. As Envolve, it provided developers with an API that enabled the integration of online chat functionality into their website.

What's interesting is that people used Envolve to pass application data that was more than just chat messages. Developers were using Envolve to sync application data such as a game state in real time across their users.

This led the founders of Envolve, James Tamplin and Andrew Lee, to separate the chat system and the real-time architecture. In April 2012, Firebase was created as a separate company that provided Backend-as-a-Service with real-time functionality. After it was acquired by Google in 2014, Firebase rapidly evolved into the multifunctional behemoth of a mobile and web platform that it is today.

Real-time Database.
The Firebase Real-time Database is a cloud-hosted NoSQL database that lets you store and sync between your users in real-time.

The Real-time Database is really just one big JSON object that the developers can manage in real-time. Firebase is a Google provided API for database storage and syncing into your android, IOS or web application. A real-time database is one which stores data to database and fetches data from it very quickly but Firebase is not just a real-time database, it is much more than that. Firebase provides us with many SDKs for the different platforms such as node.js and python for server side and android, ios, web for client side. This article covers an overview on how to use firebase as a backend for your Web application development. Google Firebase has many features like Authentication, database, storage, hosting, notification, analytics, dynamic links, remote config, test lab. Analytics feature enables the application developer to understand how users are using his application. Authentication allows developers to store users and integrate with authentication providers such as Facebook, Google,

Github. Firebase Supports Cloud Messaging allowing developers to send notifications to its users. Firebase is a backend platform for building Web, Android and IOS applications. It offers real time database, different APIs, multiple authentication types, hosting platform and much more. Firebase frees developers to focus crafting fantastic user experiences. They don't need to manage servers. You don't need to write APIs. Firebase is your server, your API and your data store, all written so generically that you can modify it to suit most needs. Firebase can power your app's backend, including data storage, user authentication, static hosting and more. Focus on creating extraordinary user experiences. Firebase will take care of the rest. Build crossplatform native mobile and web apps with our Android, IOS and JavaScript SDK's. You can also connect Firebase to your existing backend using server-side libraries or it's REST API.

Benefits of Firebase

- Forget about infrastructure

The developer doesn't have to worry about the backend of the application; it just has to provide an interactive UI for the users of the application.

- Make smart, data-driven decisions

During the development of the application, the developer is supported by many of the services provided by Firebase. So the developer doesn't have to think about storage of data, and use the data as requires.

- Free to start, scale with ease

Firebase is absolutely free to start; all its services are provided to the developer without any charges. But as the application grows there are charges involved in it.

- Work across platforms

Firebase is providing support for many platforms such as Web, Android and IOS. There is scope for C++ and Unity is well.

Services of Firebase

A. Analytics: -

This feature enables the application developer to understand how users are using his application. The SDK capture events and properties on its own and also allows you to get custom data. The dashboard provides details like your most active user or what feature of your application is used most. It also provides you with summarized data.

- Designed for apps
- Event and user centric
- Connects across Firebase
- Free and Unlimited

B. Development

i. Firebase Authentication: -

Authentication feature in firebase let you let only authorized users access your application. Firebase provides login through Gmail, Github, twitter, facebook and also let the developer create custom authentication.

- Authentication & account management
- Supports:
    - Email & password
    - Social providers
    - Existing authentication systems

ii. Firebase Real-Time Database: -

Database in firebase is a cloud-based database and does not need SQL-based queries to store and fetch data. Database is highly reliable and superfast means that data is updated and synchronized in no time and data is maintained even user lose internet connection.

- Cloud-hosted No-SQL database
- Synchronization & conflict resolution
- Access directly from your app

iii. Firebase Cloud Messaging: -

Firebase cloud messaging lets you to deliver messages to different platforms at no cost. Messaging is also used for notifications purposes.

- Firebase Cloud Messaging
- Enable Push Notifications
- Based on GCM(Google Cloud Messaging)

iv. Firebase Hosting: -

Firebase is also used for hosting purposes. Firebase delivers web content very fast and content is always deliveredsecurely.

- Serve static assets (images)
- SSL (Security) by default
- Free custom domains

v. Firebase Storage: -

Firebase also provides storage facility. It can store and retrieve content like images, videos and audio directly from client SDK. Uploading and downloading is done in the background. Data stores are safe and the only authorized user can access it.

- Easy file storage
- Handles poor connectivity
- Backed by & accessible from Google Cloud Storage

C. Grow

i. Firebase Notifications: -

This feature lets you create attractive push notifications. You can send to particular users or to all the users. Fast and Easy to create and send a notification.

- Lets you re-engage users quickly and easily
- No additional coding required
- Messages can be sent to particular devices or all devices
- Integrates with analytics

ii. Firebase Remote Config: -

This feature is very helpful for your application to test your application before applying any updates to it. You can test a user's behavior by inspecting its use with your application.

- Run A/B experiments or change app behavior
- Control custom key-value pairs from the Console
- Changes propagate instantly

iii. Firebase Dynamic Links: -

By using this feature you can check whether your application is responsive amongst all the platforms or not, It display similar in Android, IOS and web or not.

- Customize different user experiences via a single URL
- Works across platforms
- Preserves URL state, even through app install flow

Add Firebase to your app

1. Create a Firebase project in the Firebase console and click Create New Project.
2. Click Add Firebase to your Android app and follow the setup steps.
3. When prompted, enter your app's package name. It's important to enter the package name your app is using; this can only be set when you add an app to your Firebase project.
4. To add debug signing certificate SHA1 which is required for Dynamic Links, Invites, and Google Sign-In support in Auth, go to your project in Android Studio, click on Gradle tab on the right side of your window, click on Refresh button, go to project(root) -> Tasks -> android - > signingReport. This will generate MD5 and SHA1 both in Run tab. Copy paste SHA1 into firebase console.
5. At the end, you'll download a google-services.json file. You can download this file again at any time.
6. If you haven't done so already, copy this into your project's module folder, typically app.

Firebase Database Rules

With Firebase Realtime Database, your Database rules is your server-side security. You need to be very careful and aware of who has access to your database. It is important that no one gains access to your data that shouldn't. By default, the Firebase Realtime Database rules allow any authenticated user to read and write all the data, this is probably not what you want your app to do.

The Firebase Realtime Database provides a flexible, expression-based rules language with JavaScript-like syntax to easily define how your data should be structured, how it should be indexed, and when your data can be read from and written to. Combined with our authentication services, you can define who has access to what data and protect your users' personal information from unauthorized access.
By default, your database rules require Firebase Authentication and grant full read and write permissions only to authenticated users. The default rules ensure your database isn't accessible by just anyone before you get a chance to configure it.

How to configure rules

1. Go in the Firebase console.
2. Choose your project
3. Click on the Database section on the left, and then select the Rules tab.

If you would like to test your security rules before putting them into production, you can simulate operations in the console using the Simulate button in the upper right of the rule’s editor.

The default rules

The default rules require Authentication. They allow full read and write access to authenticated users of your app. They are useful if you want data open to all users of your app but don't want it open to the world.

```
// These rules require authentication
{
  "rules": {
    ".read": "auth != null",
    ".write": "auth != null"
  }}
```

How to set your files publicly readable and writable

Just define:

```
// These rules give anyone, even people who are not users of your app,
// read and write access to your database
{
  "rules": {
    ".read": true,
    ".write": true
  }
}
```

It can be useful during development but pay attention because This level of access means anyone can read or write to your database.

How to disable read and write access

You can define a private rules to disable read and write access to your database by users. With these rules, you can only access the database when you have administrative privileges (which you can get by accessing the database through the Firebase console or by signing in from a server).

```
// These rules don't allow anyone read or write access to your database
{
  "rules": {
    ".read":
     false,
     ".write":
     false
  }
}
```

How to disable read and write access

You can define a private rules to disable read and write access to your database by users. With these rules, you can only access the database when you have administrative privileges (which you can get by accessing the database through the Firebase console or by signing in from a server).

```
// These rules grant access to a node matching the authenticated
// user's ID from the Firebase auth token
{
  "rules": {
    "users": {
      "$user_id": {
        ".read": "$user_id === auth.uid", ".write": "$user_id === auth.uid"
      }
    }
  }
}
```

How to allow reading specific item from group, but prevent listing group members

It is common practice to create groups of items by creating simple value nodes with item ID as key. For example, we can add a user to the group "administrators" by creating a node at **/administrators/$user_id** with a value true. We don't want anyone to know who administrators are, for security reasons, but we still want to check if an Authenticated user is an administrator. With these rules we can do just that:

```
{
  "rules":              {
    "administrators":
    {
      // No one can list administrators
      ".read": "false",
      "$uid": {
        // Authenticated user can check if they are in this group
        ".read":"$uid === auth.uid",
        // Administrators can write
        ".write": "data.parent().child(auth.uid).val() === true",
        // Allow only add or delete, no duplicates
        ".validate": "!data.exists() || !newData.exists() || newData.isBoolean()",
      }
    }
  }
}
```

How to connect Realtime database with Android Application

Following is the steps for do it.

1. First install firebase sdk, If you dont know how to install then following is the URL for help. Install Firebase SDK
2. After that register your project in firbase console, URL of the firbase console is Firebase Console Url
3. After successfuly complet above to step add following dependency in you application level gradel. compile 'com.google.firebase:firebase-database:9.2.1'
4. Also, one more thing configure your firebase database rules. If you don’t how to configure then following is the URL which help you. Configure firebase Rules

5. Now after all thing done, original code is start, First retrieve your database instance throw FirebaseDatabase like following,

FirebaseDatabase database = FirebaseDatabase.getInstance();

DatabaseReference myRef =database.getReference("message");

You can now create different different object of DatabaseReference for the access different node,

6. Now you can save or retrieve data using DataBaseReference like following way, For the save: myRef.setValue("Demo for Save");

Read data :

```
myRef.addValueEventListener(new ValueEventListener() {
    @Override
    public void onDataChange(DataSnapshot dataSnapshot) {
        // This method is called once with the initial value and again
        // whenever data at this location is updated. String value
        = dataSnapshot.getValue(String.class); Log.d(TAG,
        "Value is: " + value);
    }

    @Override
    public void onCancelled(DatabaseError error) {
// Failed to read value
        Log.w(TAG, "Failed to read value.", error.toException());
    }
});
```

Note : This is the only introduction topic how to implement database in android application lost of more thing available in FirebaseRealtime database.

CHAPTER – 6

RESULTS

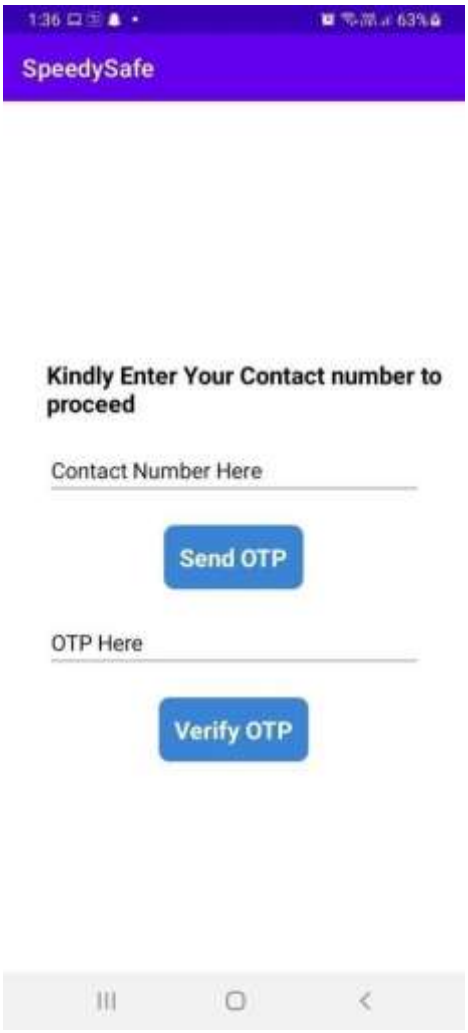

Figure – 6.1 Authentication Page

This is the first screen of the application where the application asks the user to enter their contact number. After entering their valid contact number and clicking on “Send OTP” button, an OTP will be sent to the entered contact number. The user will have to enter the given OTP and in the OTP section input box and click on verify OTP.

Figure – 6.2 Home Page

After verifying the OTP this is the next screenshot of the application. In this there are three sections first where the user can enter or edit the maximum speed second where there is a button name start monitoring third there is the navigation bar at the bottom of the screen.

Figure – 6.3 Start Monitoring Page

When clicked on “START MONITORING” a speedometer will appear on the screen add which will measure the speed of the device the user is carrying.

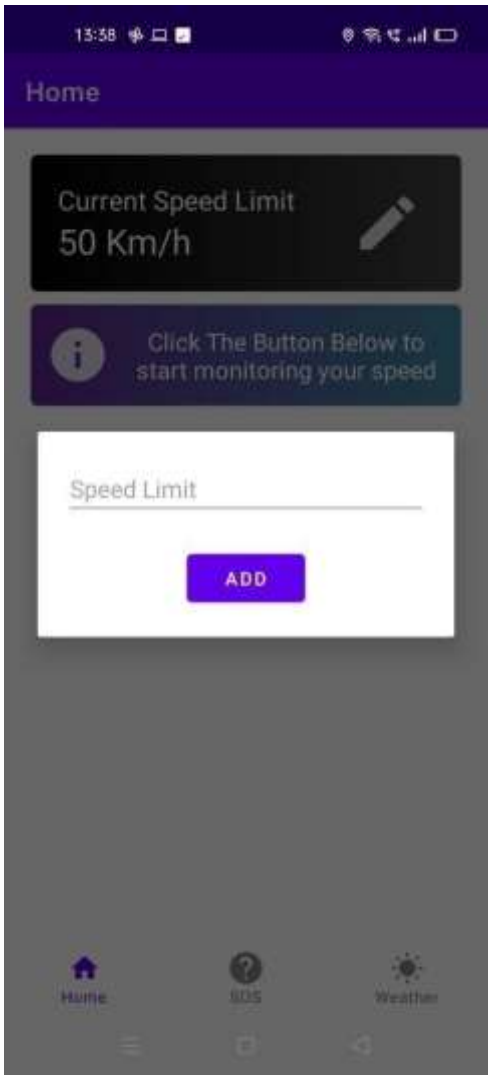

Figure – 6.4 Edit Speed Limit Page

When click on edit the maximum speed this screen will show where you can add the maximum speed limit or edit the given the previous maximum speed limit.

Figure – 6.5 Adding New Speed Limit Page

In this screenshot we have edited the previous 50 kilometres per hours maximum speed limit 230 kilometres per hour.

Figure – 6.6 Updated Speed Limit Page

When clicked on “ADD” button, the maximum speed will get changed.

Figure – 6.7 SOS Page

This is the next tab in the navigation bar which is the South in this tab there are two features. First, is the SOS contact details in which when in emergency the user can contact one relative. In this there are three feels the relatives name relation with the relative and the contactnumber. In the next feature is the nearest hospital details in which according to the location obtained by the GPS of the user this tab shows the nearest hospital its address and its phone number which can be contacted at the time of need.

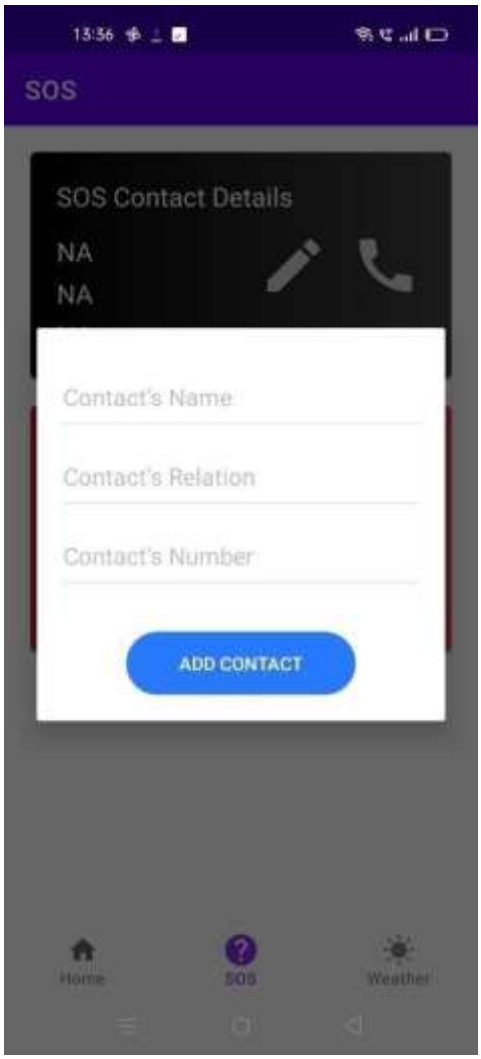

Figure – 6.8 Edit Relative Details Page

When we click on edit the South contact details this dialogue box appears where we can add the contacts name relation and contact number.

Figure – 6.9 Updated Relative Details Page

As we put nothing in the edit contact details dialogue box there appears any in every field.

Figure – 6.10 Weather Details Page

This is the 3rd tab of the navigation bar. This this shows different parameters of the weather according today users current location obtained by the GPS. it shows speed of wind, percentage of humidity, visibility, UI, temperature, Air pressure.

CHAPTER – 7

CONCLUSION

This system is implemented on GPS based measurement is not dependent on phone's orientation & this can be used to measure the driving behavior. Where GPS satellites broadcast their signals in space with a certain accuracy but the accuracy of GPS receivers depend on number of additional factors. Mobile GPS comes handy when we need to detect one-time position, but its accuracy is not sufficient enough when we need a sequence of measurements for predicting distance or velocity values due to the error accumulation.

This system is used to calculate the speed of moving vehicle through GPS position mas alert the user through voice messages. It also provides the user with a functionality to Check the current weather condition predicted for the location. We also provide functionality of SOS.

Later On, we are going integrate the Google maps with our existing system and also going to improve accuracy of calculated speed & better user interface.

CHAPTER – 8

FUTURE SCOPE

This system is implemented on GPS based measurement is not dependent on phone's orientation & this can be used to measure the driving behavior. Where GPS satellites broadcast their signals in space with a certain accuracy but the accuracy of GPS receivers depend on number of additional factors. Mobile GPS comes handy when we need to detect one-time position, but its accuracy is not sufficient enough when we need a sequence of measurements for predicting distance or velocity values due to the error accumulation.

1. Integration of Google Maps with our Existing System. Improving the accuracy of Calculated Speed.
2. Improving User Interface.
3. Developing user friendly login & sign up.
4. Adding Parameters like average speed, average distance travelled etc in our application.Sorting Top rated places as per users interest near users current location.

CHAPTER – 9

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