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Implementation of Intelligent Accident Detection and Notification System for Emergency Assistance

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ABSTRACT: Every day in the world, a most of the people die from traffic accidents. An effective approach to reduce road accident deaths is first to build the automatic road accident detection system, second, to reduce the time between when an accident occurs and when the first emergency person is sent to the scene of the accident. Recent approaches use the integrated system of automatic accident detection and accident notification. While these approaches work well, but they are expensive, they require complex maintenance tasks and are not available in all cars. On the other side, the ability to detect traffic accidents with android phones was only possible thanks to advances in processing capacity and sensors implemented in android phones. Most android-based accident detection systems depend on the vehicle's high speed (fetched from the GPS) and the G-Force value (fetched from the accelerometer sensor) to detect an accident. We proposed the system which consists of two phases; the detection phase which is used to detect car accident using android phone. The notification phase which is used to send information such as latitude and longitude to the emergency responder for fast recovery using android and Hadoop Framework.

KEYWORDS: Big data, GPS, Traffic accidents, accident detection, accelerometer, android Smartphone, real-time tracking, emergency services.

I. INTRODUCTION

Traffic accidents square measure a significant public issue worldwide. Street crashes square measure the second driving reason for death. The most reason for the death of an individual throughout associate accident is that the lack of handiness of the resources. Thus, within the case of incidents involving conveyance accidents, interval is crucial for the timely delivery of emergency medical services to accident victims and is anticipated to own a sway on fatalities. Moreover, every minute is passed whereas associate contused crash victims don't receive emergency treatment will create an outsized distinction in their survival rate, as an example, Analysis shows that if we tend to decrease simply 1-minute in accident interval which will increase probabilities of saving associate individual's life up to 6 %.

The aim of this projected system is to style and implement such an automatic system that uses Smartphone to notice vehicle accidents and report it to the closest obtainable responders to assist counter these rising issues and scale back casualties the maximum amount as attainable. The identification framework would facilitate diminish fatalities thanks to vehicle mishaps by decreasing the response time of crisis administrations. During this work we tend to square measure utilizing mechanical man Smartphone to notice accidents and report it to the closest obtainable emergency with the precise location of victims in emergency. On associate emergency communicator aspect, they're going to settle for the placement and medical information from the incident that occur almost about them and rescue them as presently as attainable. Accident detection and operation is time essential operation. Real time action is needed. System ought to be able to notice and react to the things in real time. Real time response ought to be thought of whereas coming up with the design. Traffic density currently daily is big. Accident detection and rescue system is important for each vehicle.

Motivation

The huge range of injuries and death as a result of road accident uncovers the story of worldwide crisis of road safety. The foremost obvious reason for an individual's death throughout accidents is inconvenience of the primary aid provision that is thanks to the delay within the data of the accident being reached to the car or to the hospital. Our projected system "Intelligent Accident Detection And Notification System For Emergency Assistance" facilitates to



beat this downside that incorporates 2 parts Detection phase to detect the accident and notification phase to tell the emergency center to urge help within a less amount of time.

II. RELATED WORK

Literature survey is the most important step in any kind of research. Before start developing we need to study the previous papers of our domain which we are working and on the basis of study we can predict or generate the drawback and start working with the reference of previous papers.

In this section, we briefly review the related work on accident detection system and their different techniques

In the article [1], they implemented a device of this type that not only detects any accidents that occur in the car, but immediately informs the corresponding authorities as soon as the accident occurs. We have connected 8 digital sensors to μc positioned in various positions of the vehicle. As soon as an incident is detected, a μc pulse is applied. The μc then activates a buzzer and sends an emergency SMS (using the AT commands) to the interested persons [1].

In the article [2], Automatic detection of Intelligent Accidents (ASAD) is a self-detection unit system that immediately notifies you Emergency contact via a text message when a moment changes in acceleration, rotation and impact force at one end of the vehicle is detected by the system, specifying the position and the moment of the accident. The idea is that as soon as an accident is detected by the system, authorities should be immediately notified to avoid further car congestion and to allow passengers who will be escorted to the hospital in a timely manner. The system involves the use of fuzzy logic as a decision support integrated into the Smartphone application that analyses the data coming from the sensors and makes a decision based on a set of rules. The simulated results show an accuracy of 98.67% of the system with failures resulting from the "gray regions" of the variable values.

In the article [3], presents HDy Copilot, an Android application for integrated incident detection with multimodal alarm dissemination, both through eCall and IEEE 802.11p. The proposed the incident detection algorithm receives the vehicle entries, through ODB-II and smart phone sensors, or the Accelerometer, magnetometer and gyroscope. The Android the Smartphone is also used as a human-machine interface; therefore the driver can configure the application, receive the danger on the road warnings issued by other vehicles nearby and cancel Countdown procedures for detecting false incidents. A prototype the implementation was validated through laboratory tests.

In the article [4], the results prove it Algorithm improves the estimate of the risk of an accident compared to the estimated risk based only on the historical records of accidents. It was found that the algorithm is more efficient, especially in the case of analysis of fatal and pedestrian accidents. Impact on industry: the result of the proposal the algorithm can help authorities effectively identify areas with a high risk of accidents. Furthermore, you can to serve as a reference for urban planners who consider road safety.

In the article [5], they present a new method for automatic traffic incident detection, based on the hydrodynamics of the softened particles (SPH). In our method, we obtain a movement flow field of video through the dense optical flow extraction. So a thermal diffusion process (TDP) is exploited to activate the movement flow field in a coherent motion field. Approximation particles moving towards individuals, their forces of interaction, represented as endothermic reactions, are calculated using the measurement of enthalpy, thus obtaining potential particles of interest. Furthermore, we use SPH that accumulates contribution of each particle in a weighted form based on a function of the kernel Experimental evaluation is performed in a series of video sequences compiled by YouTube and the results obtained are compared with a state of the art technique.

III. METHODOLOGY

This section logically illustrates the mechanism of the proposed system structure alongside each module that constructs the general system architecture. The proposed system, called Intelligent Accident Detection and Notification System for Emergency Assistance, consists of two phases; the detection phase, is used to identify the occurrence of an accident and notification phase, is used to inform nearest Responder for emergency help.

Every Smartphone based accident detection and notification system have chances to detect false positives. Within the proposed system, helpful supporting features were added to the system to extend the accuracy of detection process and reduce the probability of false positives.



“Intelligent Accident Detection and Notification System for Emergency Assistance” presents a confirmation screen which provides the user the chance to verify the accident, thus just in case of false positive occurs the user can cancel the alarm and notification is aborted. If he is not able to cancel then the accident is detected.

Detection Phase:

This phase constitutes the most objective of this work which is liable for discovering the existence of car accident. The detection phase depends on the knowledge extracted from Smartphone accelerometer sensor and GPS receiver to work out the occurrence of car accident. The following steps illustrate the operation of various interoperated components:

- Smartphone Accelerometer sensor: The detection phase continuously extracts accelerometer sensor information to record the G-force (acceleration force) experienced by the victim.
- Smartphone GPS receiver: The detection phase continuously extracts GPS data for the aim of determining vehicle speed. Vehicle speed is employed to extend the probability of detecting accident supported accelerometer sensor information.

To detect an accident we are developing an android application for User/Victim side which provides the facility to user to register his data along with medical data. After successful registration information will be saved on hadoop cluster. When accident is detected one dialog box will be displayed on screen with 20 second countdown timer, in case of false alert the user can abort the sending emergency help by pressing the “cancel” button. If there is no response from the user in 20 seconds, it will be considered as an actual accident and the application will send an emergency notification to the nearest responder.

Our system uses on-board accelerometer sensor of a Smartphone to detect accidents. The question is that what to try to with the values that are being generated by the accelerometer sensor and setting a threshold value which will trigger the accident alert. Accelerometer delivers acceleration values for each of the three axes. Accelerometer values are based on

$$A_D = -g - (\sum F_s / m) \text{ ----- (1)}$$

Equation (1) shows that the acceleration values that an accelerometer sensor (A_D) generates is force (F_s) divided by mass (m) which is affected by gravitational acceleration ($-g$). Acceleration for every axes (a_x, a_y, a_z) springs supported (1). Now we'll use Pythagorean Theorem to derive values from accelerometer as shown in (2).

$$a = \sqrt{(a_x^2 + a_y^2 + a_z^2)} \text{ ----- (2)}$$

By using the worth of (a) we will calculate the worth of g- force (gravitational force). Equation (3) shows how g-force is calculated.

$$G = a/g \text{ ----- (3)}$$

Equation (3) shows that g-force value is calculated from acceleration (a) divided by gravitational acceleration (g). G-force value will be approximately 1 if Smartphone is resting on a table and will exceed 1 if the device is moving. Accidents can be detected by checking if g-force value exceeds a specified threshold, if exceeds then emergency alert will be send to the responder.

Notification Phase:

Car accident detection phase without notification phase is like doing nothing. Logically the foremost important task of the detection phase is that the accuracy of the detection process, while the foremost important task of the notification phase is that the speed and therefore the sort of information that are supplied to the emergency responders to reply for an accident .

Another application is for Responder side. Responders have the facility to login with provided user name and password after login Responder details will store in database with unique token ID. Responder application is always turned on to give emergency help to requested victim. When responder application receives emergency help with location and name of the victim along with medical data then he receives the notification with sound and vibration. After receiving notification responder is ready to help to victim.

Hadoop cluster is used for fast retrieval of latitude and longitude with victim name and send to the nearest Responder to get help.

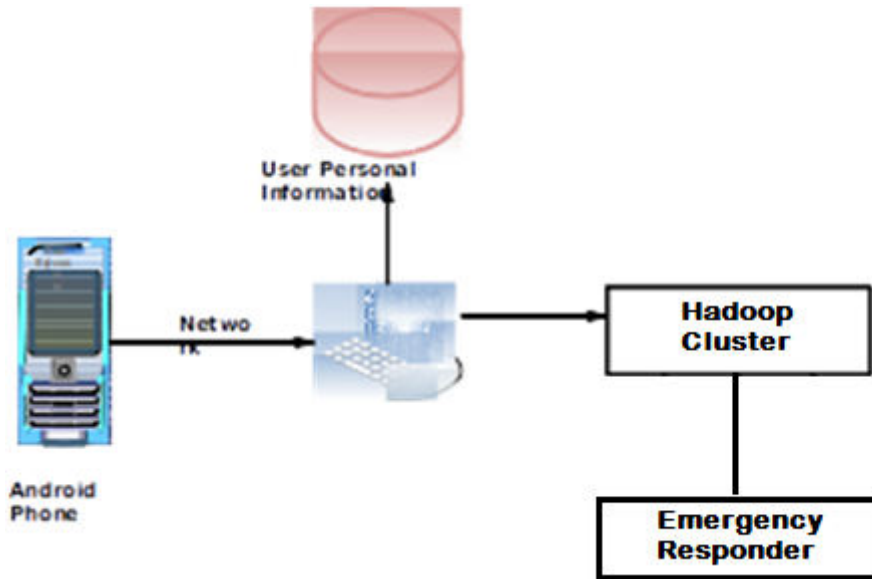


Figure 1 : Proposed System Architecture

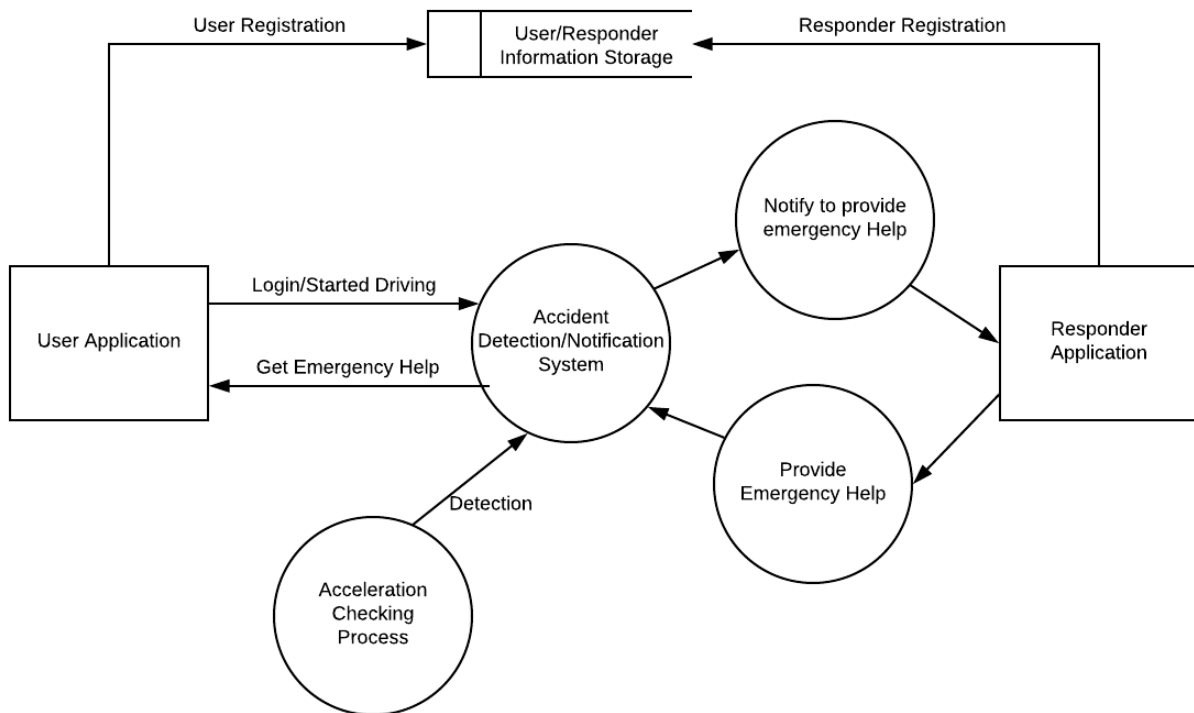


Figure 2: Data Flow Diagram of proposed system

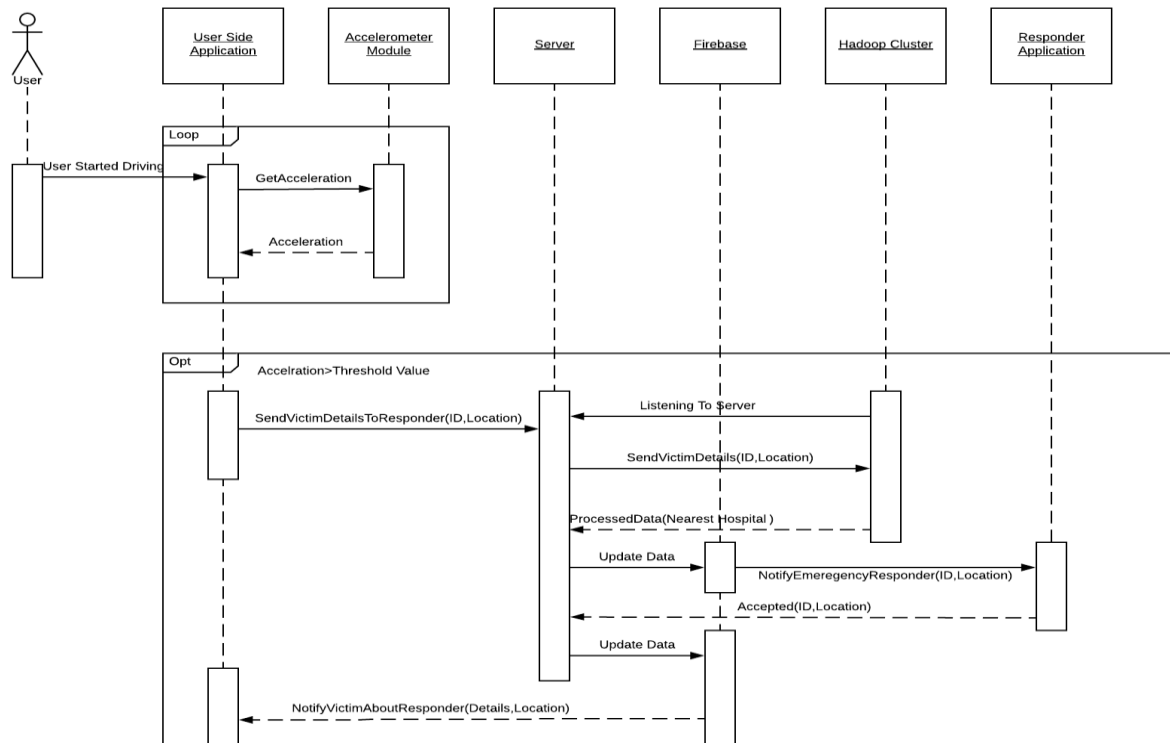


Figure 3: Sequence Diagram of proposed System

IV. EXPERIMENTAL RESULTS

Detection Phase:

Figure a) and b) shows the User Login (For Already Registered User) and Sign Up (For new User) screen of “Intelligent Accident Detection and Notification System for Emergency Assistance”.



A) Login

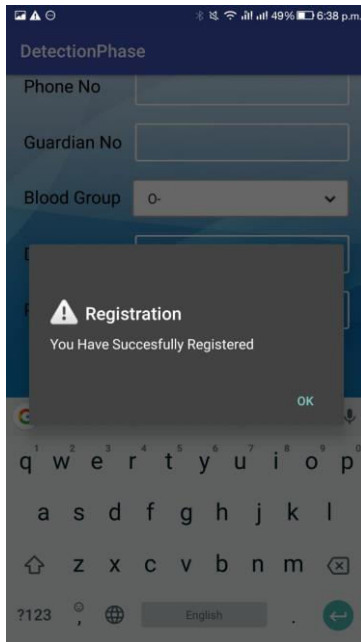


B1) Sign Up

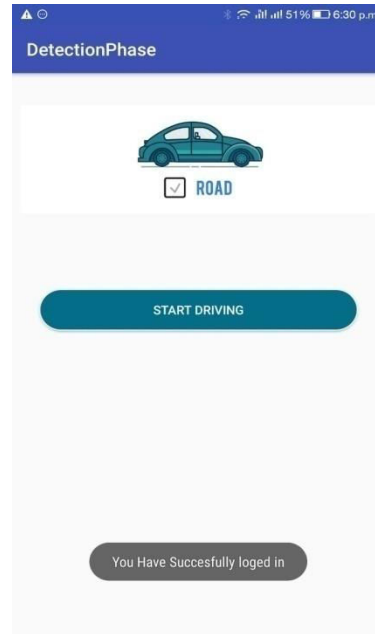


B2) Sign Up

Figure c) shows successful registration of User and Figure d) shows home screen after successfully login of user.

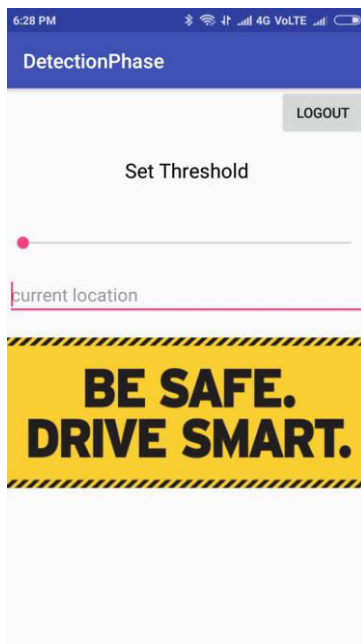


e) Successful Registration

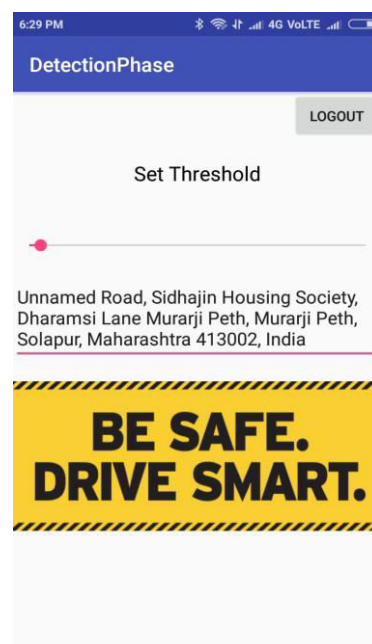


d) Successful Login

When user click on “Start Driving” button Figure e) will display which allow user to set threshold value for accident detection. If Acceleration value is greater than threshold value accident is detected. Figure f) will display after accident detection which shows current location of victim.

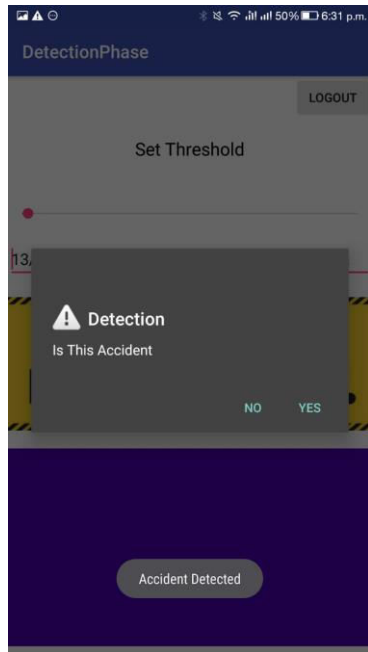


e) Set Acceleration threshold value

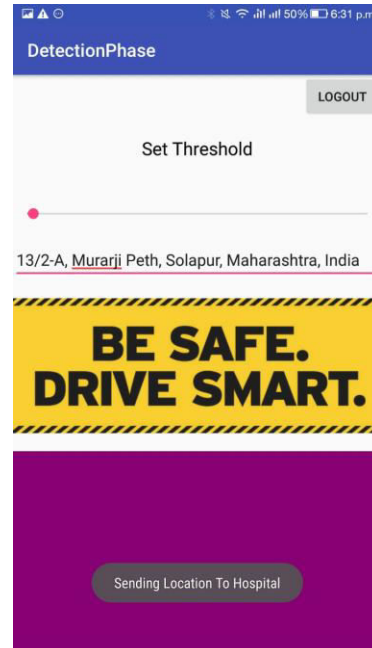


f) Detect Current Location

Figure g) displays confirmation screen for accident detection. Users have the facility to cancel accident detection in case of false positives. Figure h) shows user data is sending to nearest Responder.



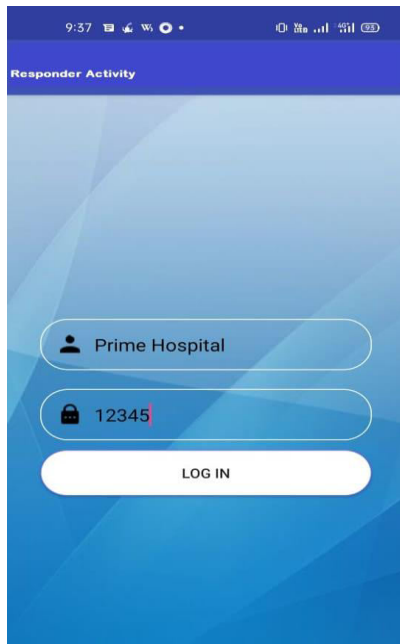
g) Confirmation Screen



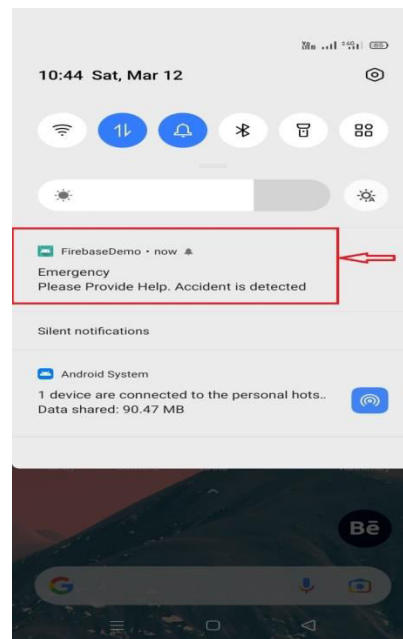
h) Data Sending to Responder

Notification Phase:

Responder has the facility to login with provided user name and password. Figure i) show the login screen of Responder. When user login first time the unique token ID for his device will generate and store it into the remote server database. When accident is detected it will find nearest Responder and send the notification to that responder. Responder receives notification and further assistance will take place.



i) Responder Login



j) Accident Detection Notification



User Registration Details:

localhost / localhost / user / users_table | phpMyAdmin 4.9.0.1 — Mozilla Firefox

localhost/phpmyadmin/sql.php?server=1&db=user&table=users_table

Showing rows 0 - 9 (10 total, Query took 0.0010 seconds.)

SELECT * FROM 'users_table'

firstname	lastname	address	gender	age	phoneno	guardianno	bloodgroup	disease	password
abc	xyz	fhj	Male	28	5689	5686	A+	xdj	1234
ss	ss	ss	Male	12	5888855588	855899558	A+	d	ss
sukrut	shinde	hyderabad	Male	28	9096105579	7397824963	A+	no	1234
supriya	as	sa	Male	12	88	45	A+	xc	1234
abc	fnf	dd	Male	xc	88	88	A+	dx	1234
ss	fgdf	ff	Male	vg	56	55	A+	f	12
sukrut123	dh	dj	Male	28	456	5989	A+	no	1234
arjun	n	hn	Male	10	8956134676	4613791643	A+	no	1234
arti	a	as	Female	20	568	868	A+	no	1234
tanu	s	dk	Female	5	56	86	A+	no	1234

Responder Login Details:

localhost / localhost / Hospital / hospital_table | phpMyAdmin 4.9.0.1 — Mozilla Firefox

localhost/phpmyadmin/sql.php?server=1&db=Hospital&table=hospital_table

Showing rows 0 - 2 (3 total, Query took 0.1188 seconds.)

SELECT * FROM 'hospital_table'

hospital_name	password	tokenid
Apolo Hospital	12345	fhOcWsVcz10-APA91bFOVU1wNDJBawykesT5f5sn5qIURSAUWt...
Mamatha Hospital	123456	cSbDKGDUndo:APA91bEnnybPJ4A0SoXlxdFwzhzQMaiz5Nv5P...
Prime Hospital	1234	eEmcA4cU3Ww:APA91bFOicVgEjYkYDkwD2D25SUqll7h1RSqH...

Accident Detection Data:

localhost / localhost / user / accidentdetectionuserdata | phpMyAdmin 4.9.0.1 — Mozilla Firefox

localhost/phpmyadmin/sql.php?server=1&db=user&table=accidentdetectionuserdata

Showing rows 0 - 24 (27 total, Query took 0.0010 seconds.)

SELECT * FROM 'accidentdetectionuserdata'

firstname	lastname	address	gender	age	phoneno	guardianno	bloodaroud	disease	LATITUDE	LONGITUDE
supriya	as	sa	Male	12	88	45	A+	xc	17.4395279	78.4470835
abc	fnf	dd	Male	xc	88	88	A+	dx	17.4395279	78.4470835
abc	fnf	dd	Male	xc	88	88	A+	dx	17.4395279	78.4470835
abc	fnf	dd	Male	xc	88	88	A+	dx	17.4395279	78.4470835
ss	fgdf	ff	Male	vg	56	55	A+	f	17.4395279	78.4470835
ss	fgdf	ff	Male	vg	56	55	A+	f	17.4395279	78.4470835



V. CONCLUSION

The System design methodology is proposed automatic system for detecting and Notify Accidents. Volume, speed, Big Data Aspects of Variety and Veracity are taken into consideration when designing architecture. An architecture and design methodology is proposed for intelligent accident detection and notification System for Emergency Assistance. Cost effective Smartphone based accident detection system reduce the time between when an accident occurs and when first emergency responders are dispatched to the scene of the accident which help a lot in accident situations to save human life. Every Smartphone based accident detection and notification system have chances to detect false positives. Within the proposed system, helpful supporting features were added to the system to extend the accuracy of detection process and reduce the probability of false positives. Proposed system presents a confirmation screen which gives the user the opportunity to confirm the accident, thus in case of false positive occurs the user can cancel the alarm and notification is aborted.

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