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MACHINE LEARNING-BASED EMERGENCY RESPONSE SYSTEM

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ABSTRACT

Due to a number of variables, the number of fatalities from traffic accidents in metropolitan areas is significantly rising today. By giving early medical care, these Mortality rates can be significantly decreased. The primary factors that cause medical assistance to be delayed include traffic congestion, a shortage of ambulance services, network connectivity issues, and negligence. An automatic response mechanism is needed to address these issues. Smartphones are good construction platforms for these automated systems due to their built-in sensors. The Automated Accident Detection and Rescue System (ADRS), which would reduce the lag time and assure quick medical aid, is introduced in our project. The server and the ADRS software are the two primary parts of this system. The Smartphone's many sensors will aid in locating the accident's scene. In the event of an accident, the ADRS system will notify the ambulance. With the help of built-in sensors in the smartphone, the ADRS client system will locate the position and notify the closest medical assistance provider. This will make it possible for the response team to reach the scene of the accident promptly and treat the victim with medical care. By shortening the time it takes to take action, this effort will help prevent deaths.

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1. INTRODUCTION:

In India, there are roughly 1214 traffic accidents every year, with 377 fatalities on average per day. Most accidents result in fatalities because emergency medical services are not called right away and because people don't report incidents to fear being questioned by authorities. It's possible for the accident to happen in a remote area where nobody is around to report it. Modern automobiles come equipped with hardware modules that can detect and report accidents. Such systems are pricey and immobile. Only luxury vehicles have such systems; other vehicles do not. As a result, we present our methodology, which uses sensors in smartphones to recognize accidents. As many smartphones are equipped with the essential sensors and powerful processors, they might be used to detect accidents and send out a request for assistance. Smartphones are portable compared to hardware accessories; we can use them while driving or travelling in any vehicle. This system will be low-cost and life-saving thanks to the manner we would

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utilize their sensors. Accident detection procedures can be quickly updated and have room for future improvements. Due to the fact that we use smartphones for communication, we have a variety of options for reaching the server. For instance, SMS might be used to contact the server for assistance if there is no internet availability. The main goal of is to effectively identify accidents and convert them so that emergency medical personnel can quickly get to the scene of the accident. The acceleration waveforms created by the incidents might be analyzed and studied using the data from this system.

2. LITERATURE SURVEY:

The system is entirely hardware-based and includes components like a microcontroller, modem, drivers, GPS, etc. It consists of the three fundamental units of the Traffic unit, Ambulance control unit, and Vehicle unit. The author has created a hardware system that, in the event of an accident, provides the appropriate information about the accident's location to an ambulance. By adjusting traffic lights, the ITLS system will assist the ambulance in getting to the hospital as quickly as possible. With the aid of a smartphone's built-in sensor and Google Maps, this may be done effectively. Also, there is a delay when transmitting messages to the ambulance control unit due to the system's use of a GSM modem (since it is a queue based technique) Also, the procedure for maintaining or upgrading this ITLS system is quite expensive

[1] It has been claimed that we can create a reliable accident detection system with the help of sensors like vibration sensors, MEMS (micro electrical mechanical systems), GPS, and GSM. The sensors needed to implement this system properly can readily be obtained with the use of smartphones and their built-in sensors. Due to the usage of external GSM, a technique that uses a queue, there can be a delay. Also, the sensor's upkeep will be expensive.

[2] Here, they have created an Android app that uses variations in acceleration characteristics to pinpoint the accident. After detecting the accident application spontaneously creates the topographical information using GPS and send pre-recorded audio message to emergency response service. The main tenet of this application's operation is that the driver of the vehicle shouldn't carry their phone with them at all times. It has to be fastened inside the car. The system's major flaw is that the phone could accidentally tilt or fall inside the car without causing a real-time collision, generating false positives.

[3] Here, the researcher creates an accident reporting and detection system that connects a smartphone to a vehicle using second-generation On-Board Diagnostics (OBD-II), which serves as an interface to model smart vehicles and offer user emergency facilities. The researchers have developed an Android application that sends an SMS with pertinent information about the accident location to a pre-stored address. Moreover, the emergency service is contacted. OBD-II standard is the sole need for achieving this system's objective. This method is only applicable to the United States, Europe, and Japan because the OBD-II standard was made mandatory in those regions starting in 2001. Also, the system's maintenance and upgrade process is quite expensive.

[4] Here, the researcher presents a new system with a unique algorithm that detects accidents with the aid of the tilt direction of the accelerometer sensor and other varied hardware, such as a GSM modem and GPS. The researchers have also created an Android application that, in the event of an accident, will show the accident location. The key components on which the system is totally dependent are the 3-axis accelerometer sensor and GSM modem, which can be replaced with a single device i.e. 'Smartphone' as it comes with the full specified sensor above pre-built in it. Also, because this system uses a queue-based GSM modem, there may be a delay when the user receives an emergency alert. In addition, the hardware system needs to be maintained is quite expensive

[5] Proposed a prototype architecture dubbed e-NOTIFY that will enable passengers in auto accidents have a better probability of surviving. The suggested solution uses the capabilities of vehicle communication technology to provide automatic detection, reports, and aid to the victims. The system's architecture should enable the following: 1. Automated transmission of data files containing incident-related information to the control unit. 2. Evaluation of the damage done to the car and its occupants, based on the data gathered from the occurrence. The system will notify the necessary rescue organization to maximize accident assistance based on the reported information and the preliminary accident estimate.

3.EXISTING SYSTEM:

Accident detection and rescue systems are currently in place, however, they are generally used in constrained scenarios such as in vehicles, highways or specific areas.

4.PROPOSED SYSTEM:

A proposed system for accident detection and rescue would be an integrated platform that can monitor diverse events and warn emergency services in real-time. Algorithms supported by ML could be used by this system to find accidents.

4.1 ARCHITECTURE:

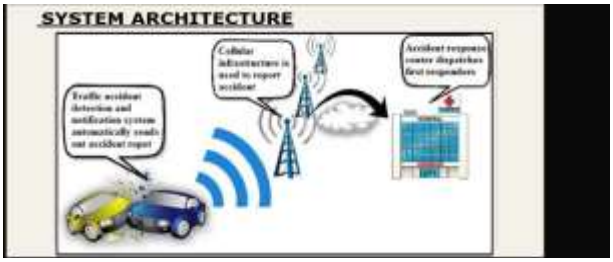

Figure1:System Architecture

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4.2 DATA FLOW DIAGRAM

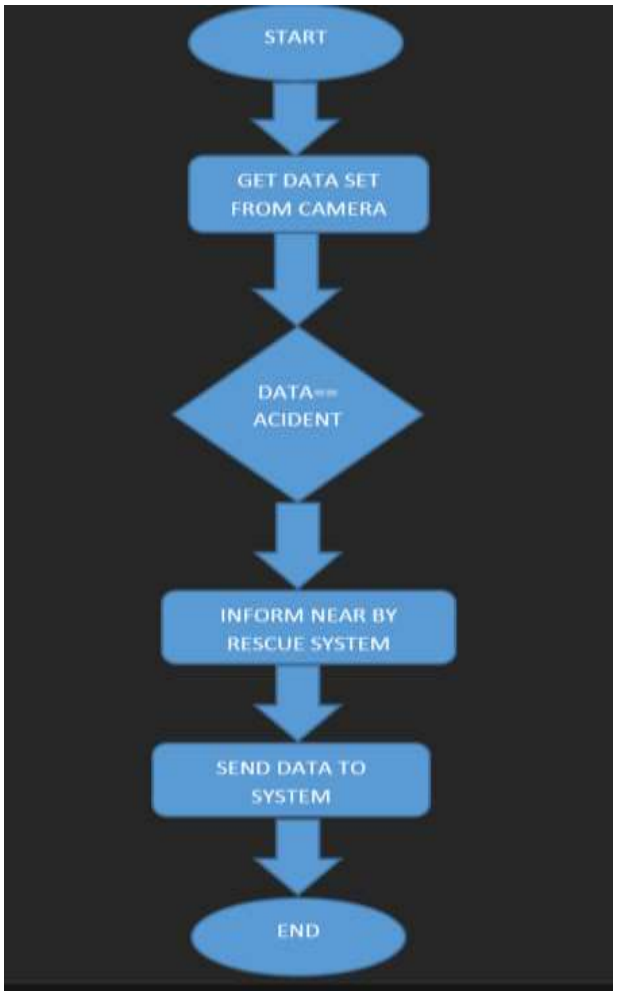

Figure2:Flow Diagram

5.IMPLEMENTATION:

5.1MODULES:

1. SMARTPHONE GPS TRANSMITTER IN THE IMPLEMENTATION MODULES
2. MOBILE MOBILE SMARTPHONE
3. MOBILE PHONE CAMERA

DETAILS OF THE MODULE:

1. SMARTPHONE GPS TRANSMITTER: The programme will extract GPS data and assist in locating the precise location of the car on the earth.
2. SMARTPHONE MICROPHONE: This device can detect loud acoustic events, such as the sound produced when an airbag is deployed or when two vehicles collide. The likelihood of spotting accidents will rise with the use of a microphone.
3. SMARTPHONE CAMERA: The camera will also help make it more likely that an accident will be discovered. Both the client's and the observers' smartphones include cameras that may be used to record and upload photos or videos to the server part, which will then send an emergency dispatch to the scene of the accident.

6. SYSTEM STUDY:

6.1 FELIBLITUDE STUDY:

The feasibility of the project is examined in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. The proposed system's practicality must be investigated during system analysis. This will guarantee that the suggested solution won't burden the business. Understanding the main system requirements is crucial for the feasibility analysis.
The following three factors are crucial to the feasibility analysis:
Economic feasibility,
Technical feasibility, and
Social feasibility are all factors.

6.2 FINANCIAL SUITABILITY:

This study is being done to see what kind of financial impact the system will have on the company. The corporation has a finite amount of money to invest in the system's research and development. The costs must be supported by evidence. As a result, the developed system came in under budget, which was made possible by the fact that most of the technology were public domain. Only the specialised goods needed to be bought.

6.3FEASIBILITY IN TECHNOLOGY:

This study is being done to evaluate the system's technical requirements, or technical feasibility. Every system created must not place a heavy burden on the technical resources at hand. This will lead to high demands on the existing technical resources. This will lead to significant demands being placed on the client. The created system must have a low demand because its implementation merely necessitates little or no adjustments.

6.4SUITABILITY OF SOCIETY:

The goal of the study is to determine how much the user accepts the system. This includes the instruction needed for the user to operate the system effectively. The system shouldn't make the user feel threatened; instead, they should view it as a need. The techniques used to inform and acquaint the user with the system are the only factors that affect the level of acceptance by the users. As the system's ultimate user, his confidence must be increased so that he may offer some helpful criticism, which is encouraged.

7. TESTING:

Testing is done to look for mistakes. Testing is the process of looking for any flaws or weaknesses in a piece of work. It offers a means of examining the operation of parts, subassemblies, assemblies, and/or a finished product. It is the process of testing software to make sure that it satisfies user expectations and meets requirements without failing in an unacceptable way. Several test types exist. Every test

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type responds to a certain testing requirement.

7.1Using Artificial Test Data:

Since they may be produced to test any combination of formats and values, artificial test data are made specifically for testing. In other words, testing of all login and control paths through the programme is made feasible by the artificial data, which may be swiftly created by a data generating utility software in the information systems department. The best test programmes make use of simulated test data produced by somebody other than the program's authors. A testing strategy is frequently created by an independent team of testers utilising the system requirements. The "Virtual Private Network" package was approved because it met all the criteria outlined in the software requirement specification.

7.2USER EDUCATION:

In order for the people for whom the system has been primarily built to be able to use it effectively, user training is necessary whenever a new system is developed. The project's typical operation was shown to potential consumers for this purpose. As people who are familiar with computers are the target audience for this system's users, it is simple to understand how it operates.

8.MAINTAINENCE:

This includes a wide range of tasks, such as fixing code and design flaws. We have more precisely defined the user needs during the system development process to decrease the long-term demand for maintenance. This system has been created to the greatest extent possible in order to meet the requirements. Future technological advancements may make it possible to add a lot more functions dependent on demand. Maintenance will be simpler because to the straightforward coding and design.

TESTING AND RESULT

Test Case ID	Test Case Description	Expected Result	Actual Result
001	Verify that the system can detect a collision and send an alert to emergency contacts	The system detects the collision and sends an alert.	The system detects the collision and sends an alert.
002	Verify that the system can provide a log of all the alerts and send it to the user's email.	The system provides a log of all the alerts and sends it to the email	The system provides a log of all the alerts and sends it to the email

Figure3:Testing And Result

ACCIDENT DETECTION:

Figure4: Accident Detection

8.1SYSTEM TESTING:

After being validated, software must be integrated with other system components (e.g. Hardware, people, database). System testing ensures that every component is functioning properly and that the system as a whole performs as intended. Additionally, it checks for inconsistencies between the system's current specs, system documentation, and its original aim.

9.CONCLUSION:

Emergency responders can quickly access vital information thanks to the accident detection and alert system. Mortality rates can be decreased by shortening the period between an event and its discovery. Consequently, this initiative will significantly lower the accident death ratio on both rural and urban roadways. Even in a rural location, this proposed activity will provide crucial information regarding the accidents. So, the pre-configured contacts may be able to assist the victims more effectively, and they may arrange to have significant first aid packages that must be taken to the accident scene with them. Consequently, this approach guarantees a decrease in the death rate and fatalities in a nation like India, which will also be more significant in day-to-day living.

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