Shortest Route Finding For E-Ambulance System

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Abstract

In India, many patients lost because they were unable to get to the hospital on time in the event of an accident. Therefore, we are developing an ambulance service application that will reduce the need to get to the hospital. The main task of this project is to reduce the time between the ambulance driver and the patient and this will save his life. When the user opens the user app on their Smartphone, they will enter a place to go, then search for a nearby ambulance. Two Smartphone, one for the user and the other for the ambulance driver. Traffic accidents in the city have made loss of life from accidents even more crucial. To implement this, we will introduce a system called the Automatic Ambulance Recovery System that uses algorithms to search for shorter distances. The main theme beyond this scheme is to provide a simple flow for the ambulance to get to hospitals on time and therefore minimize propitiation. The ambulance is regulated by the primary unit which provides the longest scanning route to the ambulance and this position of the ambulance and consequently reaches the hospital safely. The GPS server also decides the location of the accident location through the vehicle that encounters the accident, and then the server walks through the ambulance to the location. This project will be fully automated, so find the crash site and help get to the hospital on time. The proposed system is designed for this monitoring system for the transportation of patients in an emergency. The system will be useful to monitor the current position of the ambulance, it must be the closest position that the ambulance can reach at the accident site.

Keywords- IoT, Shortest Path Problem, E-Ambulance

I. INTRODUCTION

Today, many cities are striving to become Smart Cities. If the city is to be called Smart City, it should have all possible advances in the smart technology sector. One of the most difficult and demanding jobs is improving efficiency in the health sector. This includes several aspects, such as obtaining an ambulance in a minimum of time, providing adequate treatment to the patient so that the chances of survival increase in a critical condition. Traffic congestion is one of the main problems in urban areas, which has caused many problems for the ambulance. In addition, traffic accidents in the city have increased and it is even more crucial to prevent loss of life due to accidents. We can overcome these limitations by using the next technology based on your functional and behavioral implementation. Both modules operate on the IOT principle using the REST APIs. The first module is used to search for ambulance locations within 5 km of the user's location. The same module is also used to find hospitals and their services within a 10 km radius of the user's current location. Here, the location of the user is tracked using the hardware GPS device.

There is loss of life due to the waiting in the ingress of the ambulance to the hospital during the golden hour. This delay is mainly due to the waiting of the ambulance at the traffic lights. It would be very useful for the ambulance if the signs on the way to the hospital are lit. Therefore, we are proposing a new design to automatically control all traffic lights and accomplish the above task so that the ambulance can cross all level crossings without waiting. Each traffic signal will have control of the RF transmitter and receiver. This RF transmitter is placed in an ambulance and the RF receiver is placed on the traffic light. We use the biological sensor in the ambulance section to find out the patient condition during a trip and send him to the hospital using the ambulance. The GPS searches for the crash site and the location of the crash when sending the GSM modem. Therefore, the hospital administration can track the ambulance closest to the patient's location and redirect it to the patient instead of sending the ambulance present to the hospital. This will help the patient to get to the hospital as soon as possible, especially in critical conditions [2]

The server will also find the nearest hospital and calculate the shortest route from the current location of the ambulance, from the location of the accident and from the nearest hospital. The shorter path contains nodes in the path. The server takes the GPS coordinates of all the nodes on the shortest route from the NODES database and with the GPS coordinates of the accident site and the hospital; forwards it to the ambulance in a format specified below. When an RF transmitter is checked and its traffic light turns green so that the ambulance passes without delay, it is said to be in good condition. In this way, the waiter guides the ambulance to the hospital by the shortest journey time. The MEMS sensor indicates careless driving [4].

A. Finding the Nearest Ambulance and Hospital to the Accident Spot

When a vehicle encounters an accident, it immediately sends its GPS position to the main server. The server maintains a database of available ambulances. The server selects the ambulance closest to the accident site using the database which contains details of the ambulances currently available and occupied. Then, the server analyzes the locations of free ambulances in the database.

Calculate the distance from the accident site to each ambulance. Then compare all calculated distances and select the nearest ambulance.

B. Ambulance System Finding Shortest Path using Dijkstra's Algorithm

The ambulance services is that intersection in a given area is fixed points and the distance between nodes is fixed, the shortest distance between the nodes can be selected using the Dijkstra's algorithm.

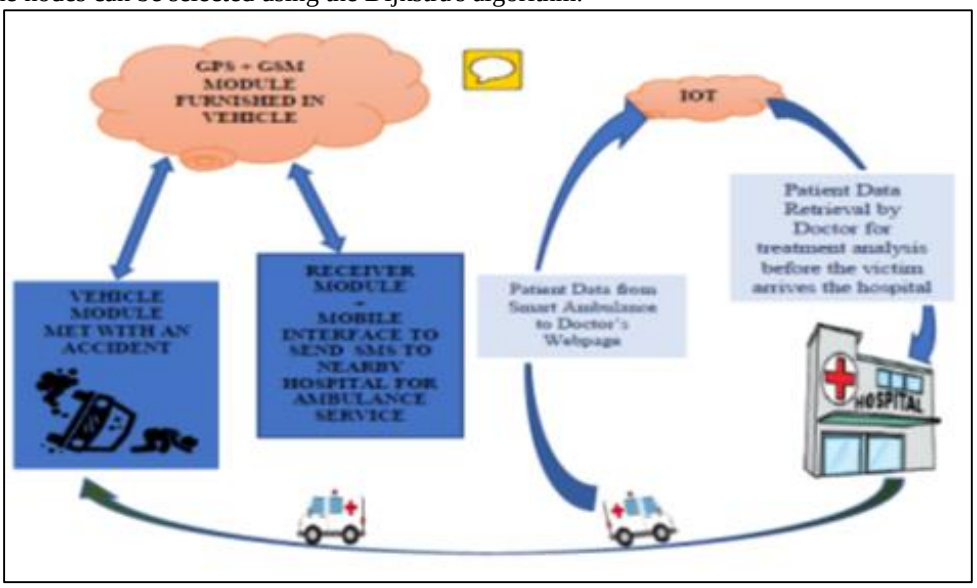

Fig. 1: System Architectural Visualization for Smart Ambulance System

Take a case where the ambulance moves from the accident site to the hospital. The database on the server as shown above contains the node and the distance between adjacent nodes ambulance system consists of the main units, which coordinates with each other and makes sure that ambulance placed the hospital without any time duration. Thus our system is divided into following units,[7]

- Vehicle section
- Ambulance section
- Signal section

1) Vehicle Section

The vehicle unit installed in the collision sensor and the MEMS sensor, they can understand the accident and send the location of the accident to the emergency center and the MEMS sensor is that it can feel the redness blush.

2) Ambulance Section

The ambulance section has its bio-sensor which can detect the condition of the victims at the accident site until the time of the hospital injury. The victim's condition can then be transported to the hospital. The LCD screen is used to display the name and specifications of the nearest hospital. The RF transmitter is controlled by the traffic signal up to a certain distance.

3) Signal Section

The signal section contains the RF receiver, while the deciding ambulance that transmits the RF transmitter will send the message to the RF receiver, then the RF receiver will provide the green signal ambulance that transmits the RF transmitter will send the message to the RF receiver, then the RF receiver will provide the green signal.

II. LITERATURE SURVEY

A. Related Work

India's emergency medical response lags behind other countries. This is partly due to the lack of technology implementation in Ground Zero. To solve the problem, we introduced an intelligent ambulance system. This would bring India to a competitive position in emergency services around the world. In recent years, there has been a revolutionary development in the field of Internet of Things (IoT). It can be easily and widely used on a large number of end systems where a subset of large amounts of data can be easily and powerfully accessed and processed. IoT and smartphone technologies help to create a platform that serves all smartphone users. The application collects location information from Global Positioning System (GPS) hardware and uses the Google Map application programming interface. [8]

Current health systems are extensively studied in research. Most of these studies focus on monitoring people's health to provide reports to actors such as on-call, professionals, and coaches for a variety of reasons. Usually used vital signs are heart rate, pulse oximetry, body temperature, and electrocardiography. The collection and dissemination of problems have been discussed in a large number of research papers. Many proposed models have been suggested; some of them point to general prototypes and others point to specific systems. Furthermore, researchers are studying the issue of heterogeneity of the health surveillance system. Middleware frameworks and design are discussed in other research papers. Most research on modern health systems, especially in health monitoring, is suggested for long-term monitoring of patients in order to collect health status information or locate and track information. This collected data can be processed locally or delivered to a remote destination for further processing using machine learning algorithms, or simply stored and then viewed by healthcare professionals. However, the collection and delivery of information in emergencies requires critical systems in real time, since the activated data is linked to the patient's state of life. For this reason, the patient's state of health should be communicated to health professionals before constantly arriving at the medical center. In addition, an automated alert mechanism must be provided within ambulances [2]

API to track ambulance details in smartphone app Google Map client. The same functionality can be used for the other module that allows the user to find the hospitals with the number of services that it provides in a short way. With the help of a technically equipped and technically advanced ambulance, information about the patient's health can be sent to the hospital for further action. The interaction between the Google smartphone has developed an API for user comfort. Google Maps provides information on nearby hospitals, along with their rating and distance from the user's current location. The downside of Google Maps is that it only sets hospitals but does not provide detailed information. Therefore, the user may need to access the hospital information by going to the particular hospital website. The intelligent ambulance system application overcomes this disadvantage and provides hospital information related to the user's medical emergency. It is a protocol that provides effective information about the patient's health, including pulse, blood pressure, etc. It also automatically indicates the respective medications and medications. All this is reported to the doctor and caregiver about the patient's condition. All these interactions are controlled and take place under the Environmental Assisted Living (AAL) system. This project facilitates the delivery of prescription drugs to patients. A device called the Ubiquitous Drug Injector (UDI) was also designed. A more ubiquitous device is designed for patients. Receive inputs from environmental sensors. He correctly deduces the patient's condition. Everything that is done in this project makes it easier to prescribe medications appropriate for the respective diseases and saves a lot of time [11]

There can be multiple routes between these nodes and the algorithm finds the shortest route. There may be one-way paths along this path, so it must be a vector quantity. The server finds the node closest to the origin and marks it as visited. The node is then considered as the source and the procedure continues until the destination. Initially, the source does not know the distance to the destination, so it will be infinite and, after completing the calculation, the shortest route will be known with the distance. The ambulance section has a biological sensor that can detect the victim's condition during the hospital accident. Then send victim status to the hospital. The LCD screen is used to display the name of the nearest hospital and the specifications of the hospital. The RF transmitter is controlled by traffic lights up to a certain distance and the network simulator can find the shortest route between several nodes. Each zone is considered as a separate node. Easily find the shortest route from the accident site to the hospital. [5]

The GSM network is used via a mobile phone to send information to the scene of the accident. GPS antenna and GPS receiver used to obtain latitude, longitude and altitude information of the vehicle that installed this prototype. The highway ambulance service uses an alarm to easily identify the vehicle on the highway and inform the passer-by of nearby vehicles and men. The MCU controls all this, it is a very advanced microcontroller that is used today. The monitored results are classified into two main categories: first, the occurrence of information about accidents detected using a vibration sensor and the location are shared using a GPS-activated module in the private Passenger Vehicle. Second, Smart Ambulance arrives and the basic personal health information of victims necessary to prove their treatment is reported to the appropriate hospital using technology provided by the activated IOT in the smart ambulance. Basic and readily available patient and health information is communicated to the designated physician before the patient arrives at the hospital for treatment. A GPS and GSM module can send the vehicle question to the accident location to the main server, which will transport an ambulance from the closest hospital to the accident site. At the same time, there would be a traffic light control on the way to the ambulance using RF communication. This will minimize the time it takes for the ambulance to reach the hospital. A patient monitoring system in the ambulance will send the patient's vital parameters to the hospital in question. This system is fully automated, so it finds the scene of the accident, controls the traffic lights and helps to get to the hospital on time GPS Imperial Journal of Interdisciplinary Research (IJIR) Vol- 2, Number -3, 2016.

This Smart Life Saver ambulance system (SLSAS) consists of GPS and GSM facilities to share the location of the accident with the nearest hospital for ambulance service. The occurrence of the accident is observed using the vibration detection system installed in a public vehicle and the location is close to the nearby ambulance service. The intelligent ambulance consists of a portable ECG and a heart rate estimation system equipped with IOT technology to send patients the basic health detailed monitor in the cloud. The action of sending the data is carried out during the trip on board of the patient to the hospital and this saves time knowing the basic health details of the patient even before the victim arrives at the hospital. These data entered are collected in the hospital database for reference to the doctor in order to make the necessary arrangements to treat the patient as soon as he arrives at the hospital. A huge time saver is saved to save the precious life of a patient with the help of this intelligent ambulance system, which is equipped with portable ECG and IOT body temperature estimation technology for perfect connectivity between the patient and the doctor, to drive the process of preparation for hospital treatment even before the patient arrives at the hospital. [13]

III. PROBLEM DEFINITION

Traffic accidents and congestion are the main problems in urban areas. There is currently no accident detection technology. In addition, due to the delay in transporting the ambulance to the accident site and the traffic congestion between the accident site and the hospital, the risk of death for the victim increases. A system must be in place to reduce the loss of life due to accidents and the time it takes for an ambulance to get to the hospital. To overcome the disadvantage of the existing system, we will implement the new system in which there is an automatic accident detection thanks to sensors provided in the ambulance. A main server unit hosts the database of all hospitals in the city.

1) The ambulance private ownership model is fundamentally at odds with its own purpose. At the outset, they were useful in that they were an ad hoc option in a society that did not question whether speed was important or not in treating an illness or injury. However, this mix of organizations across the country creates big problems beyond decrypting billing records. They want the cheapest equipment, the cheapest ambulances and the cheapest workers. The current ambulance system cannot find the shortest route. The ambulance took a long time to get to the scene of the accident. Due to a long stay in an ambulance, the patient is in critical condition.

IV. PROPOSED WORK

The proposed work will avoid these problems, the patient will use an Android application with integrated GPS technology to send the user's coordinates and details to the ambulance driver's device that will be installed on all the ambulance devices, this allowing them to locate and reach the user in no time. The server will also find the closest hospital and calculate the shortest route from the ambulance's current position, the location of the accident, and the closest hospital. The shortest path will hold nodes in the path.

The server takes the GPS coordinates of all nodes on the shortest path from the NODES database and with the GPS coordinates of the crash site and the hospital transmits it to be the ambulance unit in a format specified below.

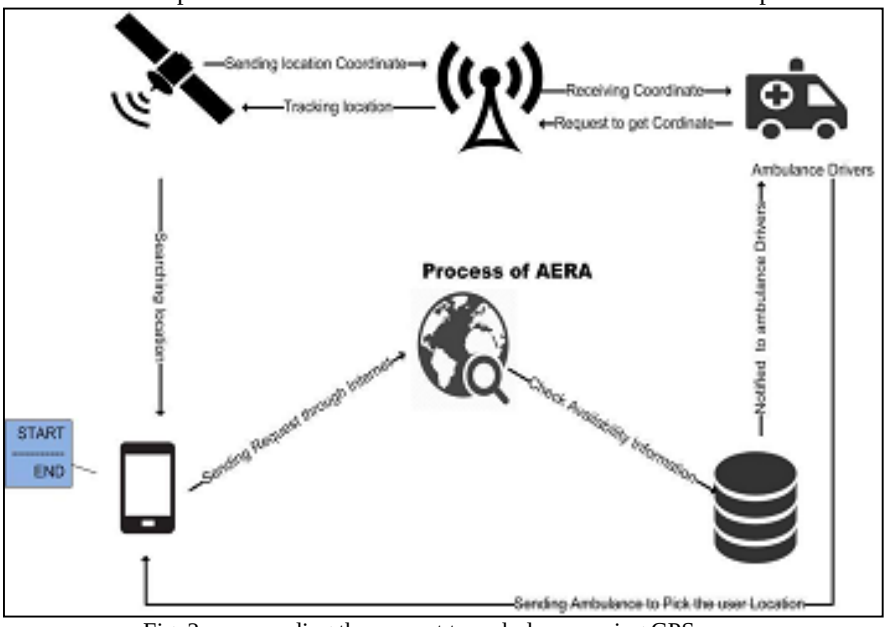

Fig. 2: user sending the request to ambulances using GPS map

The nodes' coordinates alone are sent to It calculates the distance between the accident spot and each ambulance. Then it compares all the distances calculate and select the nearest ambulance.

The health status of the wireless sensor networks is relatively opaque to the network administrators, and they are deployed to monitor the environment. This project provides detection of failure and symptom alerts also. The project is divided into 2 parts as, energy efficient protocol and distributed failure detector module. Energy efficient protocol is used for delivering state summaries. The failure detector is robust to packet loss and attempt the report of failure will not exceed a specific rate on negative side.

The current ambulance system is natively managed and activated by call. All current ambulance systems depend on user calls that provide information on any type of mischief. Most human operators use a traditional or computer-aided dispatch system to dispatch an ambulance. These types of systems can record.

Erroneous information of the caller, or incorrect data transfer and entry to the dispatch system. The user should call the ambulance service to verify the availability of ambulances in their area and make a request to deploy one to a designated location that has been designated by the user.

The proposed smart ambulance system aims to greatly reduce deaths from traffic accidents, ensure that the ambulance arrives on time by automatically reporting to the nearby hospital, and therefore to a smart ambulance that has the internet connection

provided by equipment laptop needed to transmit data to the doctor's administration page with IOT connectivity. Essentially, there are two modules in this intelligent ambulance system, that is, the vehicle module that is placed in the patient's vehicle with devices compatible with GSM and GPS and the receiver module that is a mobile phone to receive a short message. Accident location service at the nearest hospital for the ambulance service our project is based on the location provided by the GPS module, that is, the latitude and longitude of the position to be located. The Arduino Uno & GPS module are connected to the system. The Arduino Uno provides input to the GPS module and the GPS returns the latitude and longitude as an output to the arduino that displays it in the system's arduino software. A C programming code performs the above functions. The output of the Arduino software is converted into a text file using a software called CoolTerm.

To overcome the disadvantages of the existing system, we will implement the new system in which there is an automatic accident detection. A sensor, GPS, GSM installed in the vehicle detects the accident and sends the location of the accident to a main server unit which hosts the database of all nearby hospitals. An ambulance is brought to the scene of the accident which takes the patient to the hospital and simultaneously monitors vital parameters such as temperature and pulse and transports them to the hospital in question. Along with this, there would be control of the stop light signals on the way to the ambulance through RF communication to provide a clear path for the ambulance. This will minimize the time it takes for the ambulance to get to the hospital.

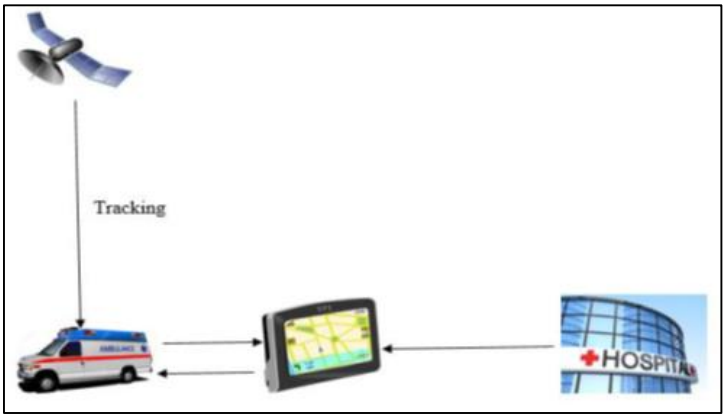

Fig. 3: System Architecture

The diagram above represents the architecture of the system. The GPS tracker is integrated into the ambulance, with the help of this hospital administration, you can track the ambulance at any time.

The output of our system will be the location of the ambulance that will be displayed on Google maps on the basis of which the hospital administration can redirect the ambulance to the location of the closest patient. In this way, the patient can be transported to the hospital as soon as possible since ambulances do not have to travel from the hospital under the current system. This could reduce critical patient deaths by taking them to the hospital in time, therefore, to perform the above functions, the server must have the following databases:

A. An Ambulance Database

Contains a list of ambulances that were free and busy at the time.

B. A Node Database

The main server assigns a unique identifier for each node and has a database that contains all the node identifiers, GSM numbers and their GPS coordinates.

A hospital database containing your locations (GPS coordinates) with your GSM numbers.

This system will help reduce accidents that often occur at traffic light intersections, as other vehicles must be grouped together to make way for ambulance services. The proposed system is useful for critically ill patients.

Easily find information. It provides information about the transport unit, as well as information about the patient's health, which is useful in continuing emergency treatment for doctors. The ambulance tracking system can help save many lives. You can also send the current position using the GPS system to the server database. The server turn send location and status information to the doctor.

V. AIM & OBJECTIVE

A. Aim

As in India, every minute a person dies because they cannot get to the hospital on time, so we are developing

1) An application that will reduce time. The main function of these projects will reduce the time between the ambulance driver and the patients and save someone's life. When the patient or user opens the user application on their smartphone and when

they click on the emergency button that appears in the application, they will send their position directly to the ambulance driver who is available near them. We will need two smartphones, one for the user and one for the ambulance driver.

2) Find out the nearest ambulance hospital to the accident site When a vehicle encounters an accident, it immediately give send its GPS position to the main server. The server maintains a database of available ambulances. The server selects the ambulance closest to the accident site using the database which contains details of the ambulances currently available and occupied. The server then analyzes the locations of the free ambulances in the database. Calculate the distance from the accident site to each ambulance. Then compare all the calculated distances and select the nearest ambulance.
3) Users will send the notification from their smartphone to the server, then send to the ambulance control center. The information sent consists of user details and the GPS position. The system administrator will check the available driver and assign the task accordingly. The administrator will also send the controller details to the user so that the user knows which controller will be looking for them. The driver will be responsible for driving the patient to the nearest hospital as soon as possible. For this project, the Android system will be used for development.
4) Information about the hospitals provided helps in getting the appropriate hospital which is suitable for the patient's treatment. Sending patient's health information to the hospitals helps the hospital staff to get things ready required for the treatment. Here the patient need not to wait in any case. Hospitals information is directly provided through maps and hence there is no need to visit the particular hospital's website for information. Live feeds will help for better medical procedures which helpin saving patient life in an effective way.NS2 simulator can finds shortest path between several nodes. Each area is considered to be a separate node.

B. Objectives

1) Easily find the shortest route between the accident site and the hospital.
2) Send a notification to the ambulance management system. The user can press the button and a notification will be sent to the ambulance.
3) Reduce waiting time. The user no longer needs to call and check the availability of the ambulance. The ambulance can track the user's position with the GPS. Notifications sent by the user will provide the user's GPS location and will also provide the user's prerecorded address. Safe and reliable.
4) It provides the user with all the information of the ambulance that the user agreed to collect: name of the ambulance, name of the driver, license plate of the ambulance and telephone number of the driver.

VI. CONCLUSION

The idea of E-Ambulance is proposed to control traffic lights in favor of ambulances during accidents. With this system, the ambulance can be transported without delay from the accident site to the hospital. AARS can be tested Effective in controlling not only the ambulance but also authorized vehicles. Therefore, the automatic ambulance rescue system finds the shortest route algorithm if implemented in countries with large populations such as INDIA can produce better results.

The most accurate without loss of time. But there may be a delay caused by GSM messages as it is a queue based technique which can be reduced by giving more priority to messages communicated through the server. We have developed our project and it works as planned, it will be a very successful project that will be useful in our daily life. And according to the smart city project, we can take a step forward in the health sector.

VII. APPLICATIONS

1) The hospital information provided helps to find the appropriate hospital that is suitable for the patient's treatment. Sending patient health information to hospitals helps hospital staff prepare for treatment. Here, the patient has no need to wait. Hospital information is provided directly through maps, so there is no need to visit the hospital website for information. Live broadcasts will help improve medical procedures and effectively save the patient's life.
2) The ambulance section has a biological sensor which can detect the victim's condition while the accident detects the hospital's working time. You can then send the victim status to the hospital LCD screen which is used to display the name of the nearest hospital and the specifications of the hospital. The RF transmitter is a traffic signal controlled up to a certain distance.
3) The database on the server as shown above contains the node and the distance between adjacent nodes to which it is connected. The crash site is taken as the source and the hospital as the destination. The knot should be followed next to the accident site and the knot on the way to the hospital. Thus, the accident node is taken as the origin and the hospital node is taken as the destination and the DIJKSTRA algorithm is applied for these nodes.
4) In our application, we offer the possibility to book an ambulance, like the way we book taxis. It will be a very important project for us from which we can reduce the time and deliver the patient on time. In our project, there will be two applications, one for the user / patient and one for the ambulance driver. Reduces the time consumed by a third person. In our project, the data will be saved securely and systematically, which will facilitate the maintenance of patient and driver records. In our project, we can easily locate the driver, as well as the user or the patient with precision, thanks to which the call time between them will be reduced.

REFERENCES

[1] Almadani, Basem & Bin-Yahya, Manaf & Shakshuki, Elhadi. (2015). E-AMBULANCE: Real-Time Integration Platform for Heterogeneous Medical Telemetry System. Procedia Computer Science. 63. 10.1016/j.procs.2015.08.359.
[2] K. Athavan, G. Balasubramanian, S. Jagadeeshwaran and N. Dinesh, "Automatic Ambulance Rescue System," 2012 Second International Conference on Advanced Computing & Communication Technologies, Rohtak, Haryana, 2012, pp. 190-195, doi: 10.1109/ACCT.2012.34.
[3] A. Tahat, A. Said, F. Jaouni and W. Qadamani, "Android-based universal vehicle diagnostic and tracking system," 2012 IEEE 16th International Symposium on Consumer Electronics, Harrisburg, PA, 2012, pp. 137-143, doi: 10.1109/ISCE.2012.6305105.
[4] Iyyappan, S. et al. "AUTOMATIC ACCIDENT DETECTION AND AMBULANCE RESCUE WITH INTELLIGENT TRAFFIC LIGHT SYSTEM." (2013).
[5] Al-Khedher, Mohammad A. "Hybrid GPS-GSM Localization of Automobile Tracking System." ArXiv abs/1201.2630 (2011): n. pag.
[6] Sarbpreet, S. Tripathy and J. Mathew, "Design and evaluation of an IoT enabled secure multi-service Ambulance Tracking System," 2016 IEEE Region 10 Conference (TENCON), Singapore, 2016, pp. 2209-2214, doi: 10.1109/TENCON.2016.7848420.
[7] Shekar, Smitha et al. "GPS Based Shortest Path for Ambulances using VANETs." .
[8] Varsha Shingade, Priyanka Talape, Torade Pallavi & Sayali Vetal. "Smart Phone Based Enhancement in Health Services using GPS." Imperial Journal of Interdisciplinary Research (IJIR) 2.3 (2016): 433-435.
[9] Jose Anand and T. G. Arul Flora , " Emergency Traffic Management for Ambulance using Wireless Communication " , IPASJ International Journal of Electronics & Communication (IIJEC), Volume 2, Issue 7, July 2014 , pp. 001-004 , ISSN 2321-5984.
[10] Kumar, S. & Akash, D. & Murali, K. & Shriram, R. (2016). Call ambulance smart elderly monitoring system with nearest ambulance detection using Android and Bluetooth. 89-92. 10.1109/ICONSTEM.2016.7560929.
[11] Wei Yan, Ma Zhigang and Qiu Sihai, "System of medical emergency ambulance for community based on Zigbee," The 2nd International Conference on Information Science and Engineering, Hangzhou, 2010, pp. 6983-6985, doi: 10.1109/ICISE.2010.5691808.
[12] R. Zhang, D. Yuan and Y. Wang, "A Health Monitoring System for Wireless Sensor Networks," 2007 2nd IEEE Conference on Industrial Electronics and Applications, Harbin, 2007, pp. 1648-1652, doi: 10.1109/ICIEA.2007.4318689.
[13] J. Whipple, W. Arensman and M. S. Boler, "A public safety application of GPS-enabled smartphones and the android operating system," 2009 IEEE International Conference on Systems, Man and Cybernetics, San Antonio, TX, 2009, pp. 2059-2061, doi: 10.1109/ICSMC.2009.5346390.
[14] M. A. Fera, R. Aswini, M. Santhiya, K. R. G. Deepa and M. Thangaprabha, "HEAL-health monitoring in emergency vehicles with their authentication by RFID and location tracking by GPS," 2015 Seventh International Conference on Advanced Computing (ICoAC), Chennai, 2015, pp. 1-6, doi: 10.1109/ICoAC.2015.7562791.
[15] K. Aziz, S. Tarapiah, S. H. Ismail and S. Atalla, "Smart real-time healthcare monitoring and tracking system using GSM/GPS technologies," 2016 3rd MEC International Conference on Big Data and Smart City (ICBDSC), Muscat, 2016, pp. 1-7, doi: 10.1109/ICBDSC.2016.7460394.
[16] Arunmozhi, P and Puech William. "Automatic Ambulance Rescue System Using Shortest Path Finding Algorithm." (2014).