

Tracking and Health Monitoring System in Ambulance

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Abstract - The rapid climb of technology and infrastructure has made our lives easier. The advent of technology has also increased the traffic hazards and therefore the road accidents happen frequently which cause loss of life due to poor emergency facilities. Our system will link all the hospitals in a particular locality. It will provide the current status of the blood banks, ICUs, ventilators and casualty services of all hospitals. We can know whether a bed is available in an ICU or not. If an accident occurs in a particular area one can take a photograph and can inform the hospitals about the condition of the patient such that the hospitals can take immediate actions. Through the emergency button available in the system, the users can inform authorities on accidents that have occurred. The system helps the public to find the hospital near to them and any one can find the current facility of all hospitals. To update the Realtime status of the hospital, a dedicated team who represents certain hospitals is present in order to manage the portal. In an emergency situation any one can find a hospital and communicate with the staff and can book the required service. Through the system we can alert the doctors of the hospital to attend to the patient. The ambulances which are registered to the web portal must need some functionalities, that is the ambulance needs an IoT device attached to it. This IoT device helps to monitor the patient's health parameters like temperature, blood pressure and updates the information to the concerned hospital via a Wi-fi module and the hospital can access the portal to view the details.

Index Terms – HMS, IoT, Arduino, Sensors, Wireless Modules.

I.INTRODUCTION

India being one among the foremost populated countries within the world, road traffic jams and delayed provision of medical attention are critical problems. Adding on to the present precious time wasted in unavoidable traffic jams, the ambulance tends to reach the hospital late and further time is wasted in fulfilling hospital formalities. To overcome this our system can be beneficial. Patients like accident

victims, deserve immediate medical attention. When an accident occurs in an area, a person can use our website to take a photograph of the accident and with a single tap on the emergency button we can inform the ambulance service, the nearest facilitated hospital and the police about the accident as well as the location of the accident. After the patient is admitted inside the ambulance there is a need for the hospital authorities to be aware of the patient's biomedical conditions, so that relevant and timely treatment can be provided to the patient. This means that there should be a wireless communication between the hospital authorities and the ambulance. This requirement is met by our IoT device which is present inside the ambulance. It consists of various sensors integrated with the Arduino Mega microcontroller. Further procedures that takes place are:

1. Mode Selection: An appropriate mode is chosen with the help of a keypad to point to the patient's current medical scenario.
2. Display: The above selected mode is displayed along with other essential details regarding the biomedical condition of the patient.
3. Extracting the Patient Details: Upon being brought into the ambulance the patient's fingerprint is scanned and their basic information like name, age, blood group, contact number etc., are extracted from previously created medical databases.
4. Sending the information: The above mentioned three processes are buffered and sent to the hospital with the help of the website.

On completion of the above-mentioned procedure the patient's information is made available to the hospital prior to the ambulance reaching the hospital and suitable doctors can be appointed according to their availability and patient's medical condition. For this system to be functional the following components have been used, Arduino Mega, Fingerprint sensor, LCD display, pulse sensor, 4x4 matrix keypad, Body Temperature sensor, Wi-Fi Module and RGB LED.

II LITERATURE SURVEY

In this article [1], a system is proposed such that the patient details as sensed by the sensors will be displayed on the OLED screen, meanwhile all this information is stored in NODE MCU memory and is sent in the form of a mail. The OLED shows a message when a fingerprint match is found. Also, the 4 different emergency modes are displayed on it. Upon selection of one of the modes all the above details are sent to the respective hospital in the form of a mail. This remote patient health monitoring will diminish the time devoured in gathering the patient's information.

The work in [2] proposes a system where in the input side there are three sensors (temperature, pulse and MEMS) and at the output side there is Bluetooth module, GPRS modem and LCD.ARM7 controller acts as interface between input and output. These sensors are attached to the patient's body and the sensor's data is sent to the ARM7 controller and from that controller the sensor's data is transmitted to Smartphone application with the help of Bluetooth module and to cloud with the help of GPRS module.

In [3] it is proposed to use a GPS module to track the ambulance and sound sensor to detect the frequency of the siren. With these modules accessed via Node MCU, traffic signals are adjusted and controlled for the ambulance to pass through the traffic. PS module sends the location to track the position of the vehicle in real time. It is used to provide the best cost-efficient solution. Sound Sensor is used to detect the frequency of the siren from the ambulance.

The work in [4] is about a system that is microcontroller based which consists of a global positioning system (GPS) and global system for mobile communication (GSM). This project uses only one GPS device and a two-way communication process is achieved using a GSM modem. This system is user friendly, easily installable, easily accessible and can be used for various other purposes. After installation the system will locate targets by the use of a Web application (HTML based application) in Google map. The system allows to track the target anytime and anywhere in any weather conditions.

In this paper [5], Raspberry Pi is used not just as a sensor node but also as a controller. The paper proposes a generic health monitoring system as a step forward to the progress made in this department till now. The heart rate of the patient can be monitored by

the doctor or by the guardian without actually visiting the patient. Taking this into consideration, they have developed a prototype for a bracelet that is a portable, wearable remote heart rate monitoring device.

The proposed system in [6] mainly talks about features such as pill reminders that will help the user to take the medicine on time without fail. The health record module will store all the health records of the user and when the user wants to view the past history of the health record the data will be displayed on a single click. Using the application the time that is required for the ambulance to reach the patients can be reduced and suitable treatment can be given to them.

A. PROBLEM STATEMENT

As compared to other countries with proper emergency systems, there is no single emergency system which could play a major role in managing medical emergencies in India. There is a system in place to attend emergencies in the country, 108 is the emergency telephone number for ambulance services in parts of India. A typical problem such a system faces is to get the location of the victim to send the help needed. Currently there is no way to find the nearest hospital with an available facility if any emergency occurs. We all have heard about the refusal on the part of private hospitals in Kollam and Trivandrum to admit an accident victim that resulted in his tragic death, almost 7 hours after the accident. Our project will provide an optimum solution to the drawback.

III PROPOSED SYSTEM

Our proposed system provides an easy way to find the facilities available in the nearby hospital in case of any emergency. With the help of this system the hospital management can easily assign a group of doctors to attend to the patient who is in an emergency condition. If an accident occurs in a particular area anybody can take a photograph and can inform the hospitals about the condition of the patient using our system making sure that the hospitals take the corresponding actions. At the same time the information is automatically sent to the nearest police aid. The police will get the geographical details of the incident. In our system we can easily connect with the nearest available ambulance service if it is needed. Without dealing with the phone pad we can call an ambulance. In our system the ambulances are connected with an IoT device. This

device helps to fetch patient status and send it to hospital via web portal.

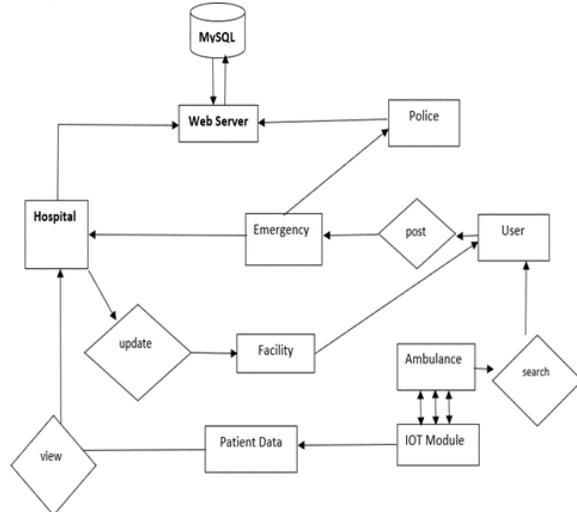


Fig.1. Architecture Diagram

A. ADVANTAGES

- With the help of our system any one can easily save the lives of people in an emergency situation.
- From any location anyone can find the nearest hospital and can find the facilities available with them.
- The portal helps to communicate with hospitals before reaching there.
- Emergency team can prepare fast when they know about the case that comes to their hospital.
- We can send incident details to hospital and police aid simultaneously by using the web application.
- IoT enabled ambulances to collect patient details and send them to the hospital portal through the website.

IV.HARDWARE REQUIREMENTS

A.Arduino Mega Board

Our system uses an Arduino Mega 2560 microcontroller board. The Fingerprint sensor is connected to Digital input/output pins of the board. The various other sensors like the pulse sensor and body temperature sensor are also connected to the digital i/o pins.

B.ESP8266 Wi-Fi Module

The ESP8266 is an open source platform, which allows us to edit, modify, build programs and

algorithms. TheESP8266 is connected to the Arduino, to make provision for sending the information.

C.Pulse Sensor

The pulse sensor is an attachable heart rate sensor customized for the Arduino. This sensor which is placed on the Arduino board can be clipped to the patient's finger or earlobe and the heart rate can be detected.

D. Body Temperature Sensor

It is a waterproof temperature sensor intended to quantify human body temperature. This equipment can automatically sense temperature. Regular checking of body temperature is significant for individuals particularly in the events that involve hypertension.

E.Fingerprint Sensor

In the IoT device the fingerprint sensor scans the on boarded patient's fingerprint and extracts the preexisting basic information of the patient by matching the fingerprint. Once this procedure is completed the information will be sent to the respective hospital.

F.LCD

The LCD is used to display the images, exhibit the texts and patterns for which it has been programmed. The IoT device makes use of the LCD to display the selected modes of the 4x4 matrix keypad according to the patient's health condition.

G.4x4 Matrix Keypad

This keypad has 4-buttons and it can be interfaced easily with any available micro controller. The IoT device uses this keypad to showcase the different modes available. The mode which is chosen is displayed on the LCD screen.

V.SOFTWARE COMPONENTS

A.HTML

The HyperText terminology, or HTML is the standard terminology for documents designed to be displayed during a browser . It can be assisted by technologies such as Cascading Style Sheets(CSS) and scripting languages such as JavaScript.

B.CSS

Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written during a terminology like HTML. CSS is one of the cornerstone technologies of the World Wide Web, alongside HTML and JavaScript. CSS is meant to enable the separation of presentation and content, including layout, colors, and fonts.

C.Bootstrap

Bootstrap is a free and open source CSS framework directed at responsive, mobile-first front end web development. It contains CSS and Javascript based design templates for typography, forms, buttons, navigation and other interface components.

D.JavaScript

JavaScript is high-level, often just-in-time compiled, and multi-paradigm. It has curly-bracket syntax, dynamic typing, prototype-based object-orientation, and first-class functions. JavaScript is one among the core technologies of the World Wide Web.

E.PHP

PHP is a general-purpose scripting language especially suited to web development. PHP code is typically processed on an internet server by a PHP interpreter implemented as a module. PHP performs system functions, i.e. from files on a system it can create, open, read, write, and close them. PHP can handle forms, i.e. gather data from files, save data to a file, through email you can send data, return data to the user.

F.MySQL

MySQL is an open-source relational database management system (RDBMS). MySQL works with an OS to implement a relational database during a computer's storage system, manages users, allows for network access and facilitates testing database integrity and creation of backups.

G.Apache

The Apache HTTP Server, colloquially called Apache, is a free and open-source cross-platform web server software. Apache supports a spread of features, many implemented as compiled modules which extend the core functionality. These can range from authentication schemes to supporting server-side programming languages like Perl, Python, Tcl and PHP.

H.Netbeans

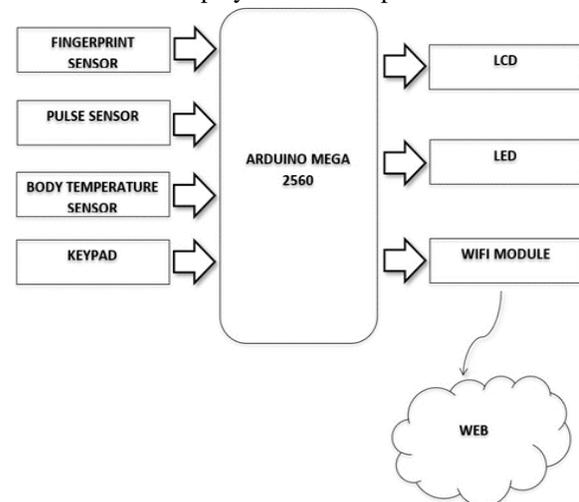
NetBeans is an integrated development environment (IDE) for Java. NetBeans allows applications to be developed from a group of modular software components called modules. NetBeans runs on Windows, macOS, Linux and Solaris. In addition to Java development, it's extensions for other languages like PHP, C, C++, HTML5, and JavaScript.

I.Xampp Server

XAMPP is a free and open-source cross-platform web server solution stack package. Once XAMPP is installed, it's possible to treat a localhost like a remote host by connecting using an FTP client. Since most actual web server deployments use the same components as XAMPP, it makes transitioning from a local test server to a live server possible very efficiently.

VI. BLOCK DIAGRAM

The IoT device is connected with the ambulance. It fetches the patient's health status and sends it to a web server via Wi-Fi module. The information from the web server is accessed by the selected hospital. The information from the IoT device is stored in the backend application. We are using MySQL as the backend part of our project. From the database updated information is displayed to the hospitals.



VII.EXPERIMENTAL RESULT

When an accident occurs in a particular area the user can take a photograph and using the emergency button

available in the system, the user can inform authorities about the accident.

With the help of the IoT device shown in Fig.2, we will be able to monitor the various health parameters of the patient. These parameters are temperature and pulse rate. A keypad interface is used to inform the hospital authority of the patient's condition. Fingerprint sensor helps to collect all information about the patient. The values of all the sensors are sent to the server and it will also be available to Doctor's mobile.

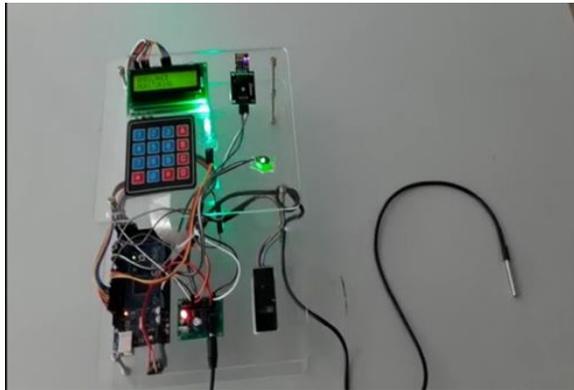


Fig.2. IoT device

Sensor Readings	
Pulse	Body Temperature
88	36.6
78	37.2
84	37.1
75	36.9

A page for hospital registration and for viewing the different hospitals that are registered to our database. A separate tab is also listed in our webpage that features the facilities that will be available in a hospital at that time. When an accident/emergency occurs a user requests for the nearest hospital details. Based on the user location the system sorts out the hospitals and displays. From here a user can easily find the facilities available in the listed hospitals.

Users can also search ambulances using latitude and longitude selected from the map. Google map service API is integrated with the project to get geographical location from map. When a user clicks on the map the system automatically finds the latitude and longitude of the current location. Based on the location we can search available ambulances.

VIII.FUTURE WORK

Existing practice is that we are capturing the photo of the accident and sending it across to the concerned authorities. Future enhancement is that along with the application we can connect IoT devices to the vehicle on the road, and the same can be integrated to the web portal. So when an accident occurs, at the same time the information can be passed on from the vehicle directly to the portal which can be forwarded directly to hospitals, ambulance authorities and police also. The system can send details to the relatives of the victims in the case of any road accident. Here signals received from the device can be integrated using our portal. Also additional two modules can be added to the portal, blood banks and First Aid Centres. The information and location of all the medical stores and first aid centres in each locality can be added to the portal which helps the user to search and filter out the medical stores and first aid centre near to them in case of emergency.

IX.CONCLUSION

Health care system is one of the major issues for developing countries and thus information technology is becoming progressively more important nowadays. Health is one of the most important and valuable things in human life. With the immense use of vehicles in day to day life accidental death has shown a tremendous growth rate. Due to these accidents, in most of the cases, people lose their lives. The main reason for this lies in the delay in medical facilities. With this project, we were able to develop a Medical crisis management and support system which is a one-point access to all the information about an accident and its following procedures. As login or registration is not required for the general public they can save time and can easily update any accident details into the portal effectively. In a nutshell, it can be summarized that our proposed system is certainly way more efficient and effective than the existing system when viewed from a user's point of view.

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