

Smart Band Ambulance System

Shubhanshu Singh Patwal¹, Rohit Kumar², Rishabh Mishra³

^{1,2}B.tech. (CSE), DSITM, Ghaziabad

³Assistant Professor, Dept. of CSE, DSITM, Ghaziabad

Abstract- In today's time diseases are spreading at a rapid growth especially in densely populated regions, and an easy example is of cardiac arrest which targets specially the elderly people and is more dangerous when they are living alone. To address the issue, we are introducing a smart band ambulance system. It would take India to competitive position in emergency services around the globe. In recent times, there has been a revolutionary development in the field of Internet of Things (IoT). It can be used seamlessly to strengthen the emergency medical response via smart band ambulance system, as IoT can also be used widely in large number of end system where large amounts of data can be accessed and processed easily and powerfully. IoT and smart devices helps in building a platform which serves every smart device user where a smart band will continually focus on monitoring heart beats of a person wearing this band. This data will be collected through an application and send to a centralized database, where it will get filtered for any irregularities, and if found any then that person will be informed and if needed an ambulance will be dispatched to their whereabouts. User can see the location of dispatched ambulance with the help of Global Positioning System (GPS) and google maps API on their smartphones.

Keywords: IoT, Smart Band, Smart Ambulance, JASON, GPS, Google Maps API.

I. Introduction

In today's era, every city is working on trying to transform themselves to become a smart city. If the city is going to be called as Smart City, then it should have all possible advancements in the sector

of smart technology. Improving efficiency in healthcare sector is one of the difficult and most challenging jobs. That includes various aspects such as getting ambulance within minimum amount of time, providing proper treatment to the patient so that the chance of surviving increases in critical condition. Traffic congestion is one of the major problems in urban areas, which have caused many hitches for the ambulance. Moreover, road accidents in the city have been increased and to bar the loss of life due to the accidents is even more crucial. We can overcome these limitations by using upcoming technology like IoT i.e., Internet of Things. Various hardware devices can be connected with each other via wired and wireless networking tools and software implementations. Use of various APIs can help to communicate between the server and client end which is implemented in this project. APIs are designed in such a way that time complexity will be minimized extensively. This is achieved by exchanging only the required data with server in order to minimize the traffic and loss of data packets in the process of transaction. With the help of cutting edge technology and keeping the goal in mind we've developed this project. It is also an attempt to participate actively in the process of transforming into smart city and make required services more accessible.

II. Internet of Things

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. A thing, in the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire

pressure is low -- or any other natural or man-made object that can be assigned an IP address and provided with the ability to transfer data over a network.

Although the concept wasn't named until 1999, the Internet of Things has been in development for decades. The first internet appliance, for example, was a Coke machine at Carnegie Melon University in the early 1980s. The programmers could connect to the machine over the internet, check the status of the machine and determine whether or not there would be a cold drink awaiting them, should they decide to make the trip down to the machine.

Practical applications of IoT technology can be found in many industries today, including precision agriculture, building management, healthcare, energy and transportation. Connectivity options for electronics engineers and application developers working on products and systems for the Internet of Things.

III. Related work

To take care for the elderly person a smart band will be introduced which will monitor all the health issues such as pulse, blood pressure and mainly it will monitor the heart beats of the person. This smart band can be easily wearable on the wrist of our hand and it will be connected to smartphones all the time. The data collected from this band will be easily transferred with the help of provided application with the help of smartphones. Smart band will monitor the person 24X7 and will keep on sending the data. This large amount of data will be send to a centralized database, where large amount of data will get collected in a systematic way. All the process will take place automatically with the help of IoT i.e., Internet of Things.

This collected data will get filtered to check for any irregularities, this will be done by checking the readings collected from the smart band i.e. if the readings are below or above the average health limits then the person will be informed or prompted with the prescribed medicine by the doctor on their smartphone with the help of the application.

There are times in which matter can get serious if a person is about to get a cardiac arrest. In those times our service will play a crucial role by prompting that person's family member which will be already provided by the smart band user through application to the database and an emergency ambulance service will get dispatched carrying all the emergency equipment.

The dispatched ambulance will be aware of the location of the person with the help of smart band or the smartphone application. The user or the caretaker of that person will be able to track the location of the dispatched ambulance on their smartphones with the help of Global Positioning System (GPS) and Google maps APIs on this application.

The most precious time in these kind of emergencies is when the patient enters the ambulance to the point of reaching the hospital and to get hospital staffs to get ready for the emergency case. To deal with these kinds of situations our project will provide live readings of the patient to the hospital so that hospital staff can get ready for treating the casualty. It is said that treatment given while taking patient from source place till hospital is most crucial in case of any heart related problem and emergency. Thus, Hospital administrative person can guide which actions should be taken until patient it reaches hospital. This will make emergency medical facility more responsive and time saving.

IV. Smart Ambulance System

A. Overview

Our system is divided into two parts depending upon its behavioral and functional implementations. Both module works mainly on the principle of Internet of Things (IoT).

B. Architecture

To make our project simple and easily understandable we divided it into two modules:

In module first i.e., in figure 1 a smart band will be introduced which will monitor all the health issues such as pulse, blood pressure and mainly it will monitor the heart beats of the person. This smart band can be easily wearable on the wrist of our hand and it will be connected to smartphones all the time. The data collected from this band will be easily transferred with the help of provided application with the help of smartphones. Smart band will monitor the person 24X7 and will keep on sending the data. This large amount of data will be send to a centralized database, where large amount of data will get collected in a systematic way. All the process will take place automatically with the help of IoT i.e., Internet of Things.

This collected data will get filtered to check for any irregularities, this will be done by checking the readings collected from the smart band i.e. if the readings are below or above the average health limits then the person will be informed or prompted with the prescribed medicine by the doctor on their smartphone with the help of the application.

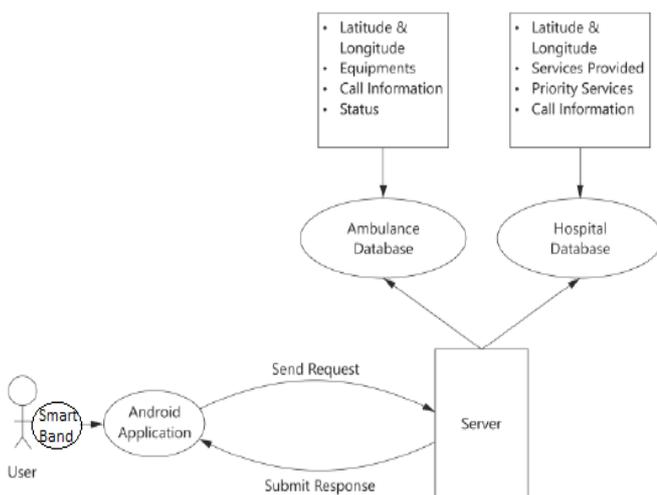


Figure 1: data collect from smart band via App

In module second i.e., in figure 2 our project will provide live readings of the patient to the hospital so that hospital staff can get ready for treating the casualty. It is said that treatment given while taking patient from source place till hospital is most crucial in case of any heart related problem and emergency. Thus, Hospital administrative person can guide which actions should be taken until patient it

reaches hospital. This will make emergency medical facility more responsive and time saving.

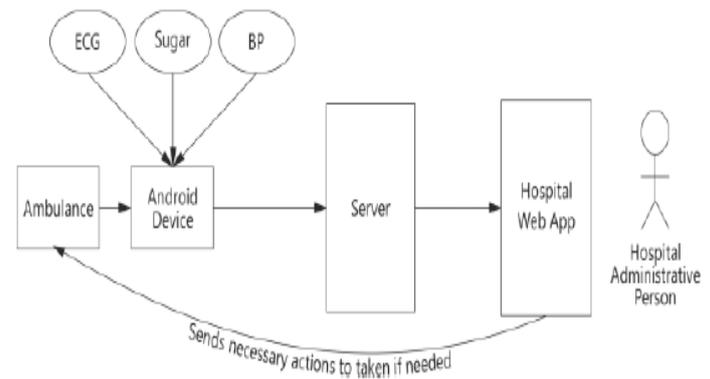


Figure 2: live data is shared between ambulance and hospital

C. Design and implementation

The implementation of this system is divided into server client architecture in order to make small size application and keep all the data available centrally. Thus, client is nothing but a smartphone having the application and the server side used for handling user requests and responds by processing them.

User application

This application will initially be based on Android & iOS. On launching the app first device will automatically detect the location of user using the GPS devices. Later depending on the user's requirement/need user will choose option of finding nearby ambulances or hospitals or just view services provided by hospitals. This query is sent in the JSON format to the server. Server will process on it and respond accordingly. The response from server will also be in JSON format. Smartphone app will read the data from response and plot the coordinates or information according to the user's request.

Server end

Server end is designed keeping ease of work in mind. It is designed using PHP. When server will receive a request from device, it will parse the data and extract result from the database. This result will be placed in the JSON format and will be returned to the device which made that same request. Every JSON request will send data depending on request

URL type. Every request will be in the form of POST/GET query.

D. Mathematical Model

Let set H be the set of numbers of hospitals:

$$H = \{h_1, h_2, h_3, \dots, h_n\}$$

Let set A be the set of numbers of ambulances:

$$A = \{a_1, a_2, a_3, \dots, a_n\}$$

Let set U be the set of numbers of Users:

$$U = \{u_1, u_2, u_3, \dots, u_n\}$$

Let set S be the set of numbers of Services:

$$S = \{s_1, s_2, s_3, \dots, s_n\}$$

Let Result for search of Hospital queries be Rh:

$$Rh = u_1 \cap h_1$$

Let Result for search of Ambulance queries be Ra:

$$Ra = u_1 \cap a_1$$

V. Advantages

It's beneficial for the users in case of emergencies as it saves time which gets consumed in searching for the ambulance by other means.

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 a medical procedure which helps in saving patient's life in an effective way.

VI. Conclusion

In this paper, an idea is proposed for saving a patient's life in a faster way possible. It is beneficial for users in case of emergencies as it saves time. With this Application, the ambulance can reach the patients as location is given through the app and can provide necessary equipment required for the patient's health.

Information about the hospitals provided helps in getting the appropriate hospital which is suitable for the patient's treatment. The live feed data sent through the ambulance to the hospital helps in keeping track of patient's health details and reach the hospital without any time lag. Sending patient's health information to the hospitals helps the hospital staff to get the necessary pre-requisites regarding the patient's treatment.

Hence it reduces the time complexity and helps to provide faster medical services.

VII. References

1. Internet of things for Smart Cities. Andrea Zanella, Senior Member, IEEE, Nicola Bui, Angelo Castellani, Lorenzo Vangelista, Senior Member, IEEE, and Michele Zorzi, Fellow, IEEE. IEEE INTERNET OF THINGS JOURNAL, VOL. 1, NO. 1, FEBRUARY 2014.
2. Emergency Management System Using Android Application RehkaJadhav, Jwalant Patel, Darshan Jain, Suyash Phadhtare Department of Information Technology G. H. Rasoni Collage of Engineering & Technology, University of Pune, Pune
3. An IoT-Aware Architecture for Smart Healthcare Systems. Luca Catarinucci, Danilo de Donno, Luca Mainetti, Luca Palano, Luigi Patrono, Maria Laura Stefanizzi, and Luciano Tarricone, IEEE INTERNET OF THINGS JOURNAL, VOL. 2, NO. 6, DECEMBER 2015.
4. Smart Ambulance System, International Journal of Computer Applications (0975 – 8887) National Conference on Advances in Computing,

- Communication and Networking (ACCNNet – 2016).
5. Allwinkle, S. & Cruickshank, P. (2011) Creating smart-er cities: An overview, *Journal of Urban Technology*, 18(2), 1-16.
 6. https://en.wikipedia.org/wiki/Internet_of_Things , Jun 25 (2016).
 7. <http://blogs.wsj.com/cio/2015/06/02/internet-of-things-market-to-reach-1-7-trillion-by-2020- idc/>, Jun 2 (2015).
 8. Gauer, A.: Smart city Architecture and its applications based on IoT, *Procedia computer science*, (2015), Vol.52, pp.1089-1094.
 9. Rajat & Nirbhay Kumar (2007) “RFID Resolution: Your cars will be tagged”, *The Economics Times*, 25 September.
 10. Ateeth Kumar Thirukkovulur1, Harikrishna Nandagopal, Vigneesh Parivallal,” Intelligent Vehicle Control Based On Identification Of Road And Traffic Signal Operated RFID Transponders, *International Conference On Advances In Electrical and Electronics Engineering (ICAEE'2012)* Penang, Malaysia.

VIII. About Authors

Shubhanshu Singh Patwal: Final Year Student of B.tech. Computer Science and Engineering, pursuing from DSITM, Ghaziabad, UP

Rohit Kumar: Final Year Student of B.tech. Computer Science and Engineering, pursuing from DSITM, Ghaziabad, UP

Rishabh Mishra: Assistant Professor in Computer Science and Engineering Department in DSITM, Ghaziabad, UP