



Advance Alert for Ambulance Pass by using IOT for Smart City

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Abstract:

The ideology of this research is to develop advance alert mechanism for ambulance pass by (A²FAP) for Indian scenarios. This research basically uses the existing technologies along with the concept called internet of things (IoT). The work is motivated by the fact that India is facing the problems of ambulance delays because of traffic, which leads to the deaths of more than 20% of patients, who require emergency treatment but cannot get to hospital in time. The proposed idea aims at providing a solution to the aforementioned problem by advance alert before the ambulance reaches the traffic signal ahead. It is believed that such a smart system will not only drop the patient on time but also give increased time to the doctor to diagnose and treat the emergency case thereby bringing a significant change in the Healthcare and Hospitality Sector of India.

Keywords: Internet of Things, Mobile Technology, Google Map Server API, Raspberry Pi Location Tracker, JSON, Application Domains.

1. INTRODUCTION:

IoT refers to advancement in automation and analytical systems which exploits networking, sensing, tracking and artificial intelligence to deliver efficient system for product or services. IoT systems provide greater transparency, control and performance and the applications from these are more unique, flexible and suitable in any environment. In simple terms, the concept can be explained as connecting any device over the internet. These devices can be phone, washing machines, music systems or any electronic gadgets etc. Gartner elaborated that by 2020, from the overall population 26 Billion devices will be connected over IoT concept making it a giant network of connected "things". [4] The Key Features of IoT consist of the following: [8]

AI – IoT virtually makes anything "smart", meaning it advances every phase of life with the power of data collection, algorithms, and networks. For example a refrigerator can act as a smart refrigerator by keeping track of the cabinets inside and even ordering the products to the grocery shop that runs low.

Connectivity - New technologies for networking are specifically IoT networking, means networks can exist on a much cheaper and smaller scale while still implementing practically. IoT creates these internal small networks between the system devices.

Sensors - IoT works significantly on sensors. It is an act of defining instruments which transform from a standard passive network of devices to an active system flexible in real-world that is integrated.

Active Engagement – Rise in the interaction technology is done with passive engagements, by integrating IoT concept a new model or pattern for active products, contents and service engagement can be introduced.

Small Devices – In today's world devices have reduced in size, cheaper and more rigid over time. IoT exploits these small devices as it provides more scalability and are versatile in

nature. The application of IoT has been divided into four categories [7] i.e.:

- (i) Transportation domain
- (ii) Healthcare domain
- (iii) Smart environment (home, office, plant) domain
- (iv) Personal and social domain.

The current proposal focuses on developing A²FAP which outlines a framework for mobile based portable advance alert services for smart city scenario in India. This paper is structured as follows:-

Section 2: Overview of relevant literature and advancement in this field

Section 3: Proposed framework

Section 4: Conclusion

Section 5: Future scope

2. RELATED WORK

Google has developed API for user's ease. Google Maps gives information about hospitals and traffic signal junctions nearby, with its rating and distance from user's current location. The major part of tracking and sending notification to the nearest traffic signal officer can be done using the mobile technology on app and chip integrated in the ambulance. The designed chip and the protocol (Raspberry Pi Location Tracker) will give information efficiently about the latitude and longitude of the ambulance by embedding the mechanism to calculate the time to reach the traffic signal ahead. It will use basically the API of Google map from the server and also help in finding the nearby hospital via the maps API. The project has a goal to decrease the number of deaths caused due to traffic signals. Henceforth it will lead to faster movement on the smart city scenario. [2] The hardware required for the tracking purpose on the basic level is as follows: A sim with data connection, memory card to install OS, 3G/4G USB dongle supporting plug and play on Ubuntu/Raspberry Pi, Optionally Wi-Fi USB dongle, Raspberry Pi, USB power bank, 5V /1A power point from a running vehicle. The Software required for the tracking purpose on the basic level is as follows: Raspbian or any other

supported OS installed on Raspberry Pi, Google Maps Geolocation API private key, Private Key to upload coordinates on data.sparkfun.com or any other online storage, Basic knowledge of computer programming to understand Python, JavaScript and HTML code, Optionally a weaved.com account to control Raspberry Pi over internet. It is a fact that in a severe accidental case, a patient transported to the nearest healthcare facility within 15-20 minutes, has exponentially high survival chance. INDIA has the highest no. of deaths due to Ambulance Delay.[2] Ideally, the chances of survival rate from a heart attack or a life threatening injury reduces from 70% to 7% in just 4 min due to delay in first EMS response. Sadly, practices like “Right of way” are not followed by the citizens here. The 'Golden Hour' theory states that a patient of road mishap has to be brought to a hospital within an hour, which increases chances of survival. The 'Golden Hour' theory has been specified by WHO (World Health Organization), that is been followed by the whole world. As per the theory if a patient of road mishap or a heart patient is taken to a hospital within an hour, his possibility of survival go up by 70 to 80 per cent.[5].

3. ABOUT A²FAP:

3.1 Overview:

From literature review, it is evident that IoT has many possibilities of innovative applications to help improve human life. Among the four main categories of IoT applications listed above, transportation and healthcare domain are the most beneficial for common people, especially in India. In India due to the large population and increasing demands of the vehicles and amount of increasing traffic have led to more number of death scenarios that occurs in metropolitan cities due to engaged traffic and blocked roads. Analysis says that on an average it takes 4-5 mins to clear a traffic jam. The proposed model will notify the traffic signal system or authorities as an advance alert, so chances of clearance of road before arrival of ambulance is increased. By using the existing technologies the module can reduce death caused by traffic jams by at least 20%. And the proposed model will be a helpful initiative in the development of Smart City resounding with the Indian government’s ideology of developing smarter and safer city infrastructure.

3.2 Architecture

We’ve tried to keep the architecture of the system as simple as possible. As there won’t be need of any security model the architecture complexity is automatically reduced. Following diagram states working of one part of module. Fig. 1 suggests user sends requested to server regarding the required service i.e. either ambulance in the ward or any private hospitals ambulance service.

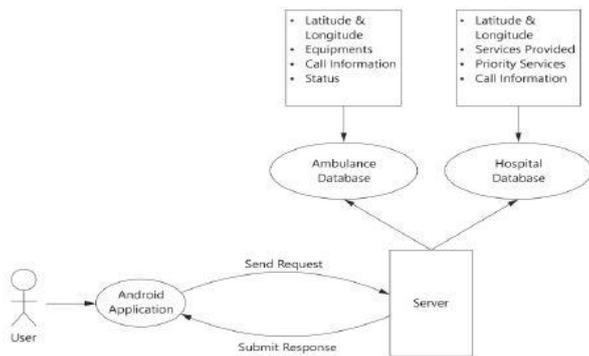


Figure.1. Architecture

Further if any ways in any ward if the ambulance services are restricted apparently. For example emergency cases occurred is 6 and available ambulance is 4 so in such scenario the revised module can be used in which the owners private car can act as the ambulance for sending the advance alert. The question arises is how is this possible? The revised module of the above will have a chip embedded with can be connect with cars battery or with the car owner’s mobile phone (the module registration is mandatory). After that using the GPS of mobile technology the request can be send apparently and by this the car can be turned into ambulance resulting and can take initiative of saving the life. This can be illustrated as follows in following diagram below Fig 2:

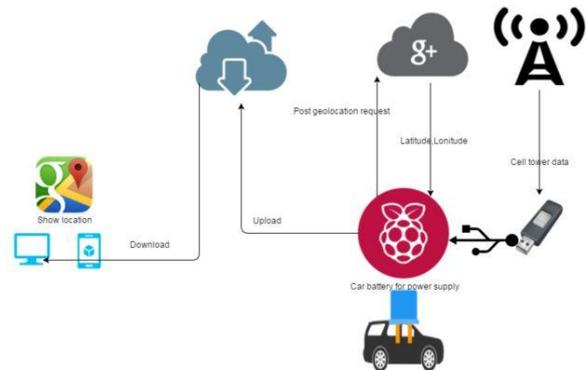


Figure.2. diagram

Ahead the server will be sending the location of the ambulance using the google map server API. It will be connected via a receiver or any android device via an app and notifications which will be triggered apparently with the estimated time the ambulance will take to reach the number of signals. which can demonstrated as in following Fig-3:

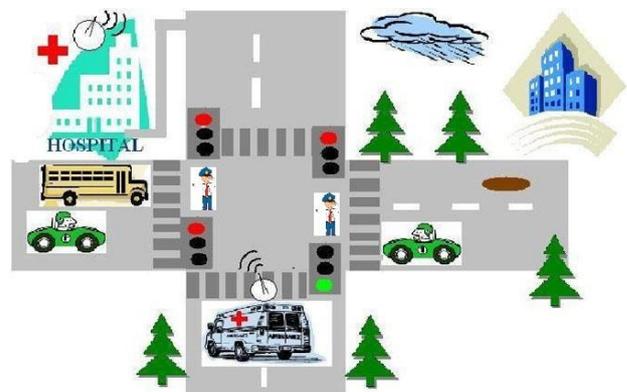


Figure.3. demonstrated

3.3 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 respond by processing them.

3.3.1 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 [2]. 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 [1]. Smartphone app will read the data from response and plot the coordinates or information according to the user's request.

3.3.2 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. [1].

JSON is a data interchanging format and is self describing. It is a rift of the JavaScript programming language. JSON acts as a syntax directed translators. With the help of high level grammar leaning operations, it helps to understand significant parts of the application JSON acts as a very important aspect considering sending and retrieving information. Using JSON, we can store information or data in and organized manner. It helps in transmitting data between the server and web application and vice versa. It is in text format and this helps in computing language independency. Hence, it works as an ideal tool. It has 2 basic same parts namely:

- i. Key
- ii. Value

Where they both together are used as a pair In JSON, the key denotes a string which needs to be enclosed between quotation marks, whereas value can be anything such as string, numbers, Boolean expression, and array or can also be an object.

Ahead the question arises Why use JSON over XML?

i. Simplicity: JSON is simpler to understand than XML. Since JSON has smaller grammar, it has more capability than XML for mapping onto the data structure

ii. Extensibility: JSON needs not to be extensible. Since it does not require defining new tags or attributes to represent the data. While in XML, the case is opposite. Comparatively, JSON has a better and simpler structure compared to XML and is more easy and faster to process. Even though software is available for the programmer to handle XML, some additional software or code is required. While in JSON, less specialized software can also be used. JSON notations features which are simpler and no additional software's are required. Access rate of JSON is faster than XML as it uses fewer words compared to XML.[1]

4. 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 private hospitals ambulance provided helps in getting the appropriate hospital which is suitable for the patient's treatment. Advance Alert on the traffic signal nodes that will be helpful to the traffic signal officer in getting the emergency request service in advanced helping him to clear the traffic in a specified interval of time.

Limitation:

The System is majorly very complex, as various technologies whose architecture are different from one and another makes the IoT network very complex system. With this fact, if failure occurs in the system it will require skilled workers with good knowledge of multiple technologies.

Future Enhancement:

This proposed framework can be taken to next level by providing appropriate cryptography mechanisms. These Mechanisms just not only protect the data but also ensure the 24X7 accessibility and working of the proposed system

5. CONCLUSION:

In this paper, an idea is proposed for saving a patient's life in a faster way in emergencies. With this Application, advance alert can be sent to traffic signals. Hence it reduces the time complexity and helps to provide faster transportation services for the ambulance. In order to save lives there are many other factors which can be taken into consideration. Traffic is one of the most serious issue faced in day Hence the above ideology can be easily implemented using existing technology and an expert solution to traffic system of advance alert helping in the emergency cases to reach hospital on time. The proposal would act as an aid to transportation domain and would also contribute towards Digital India smart city initiative.

6. REFERENCES:

- [1]. Smart Ambulance System International Journal of Computer Applications (0975 – 8887) National Conference on Advances in Computing, Communication and Networking (ACNet – 2016)
- [2]. Internet of Things: An Overview IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661,p-ISSN: 2278-8727, Volume 18, Issue 4, Ver. V (Jul.-Aug. 2016), PP 117-121
- [3]. Internet of Things Applications in Smart Cities IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) e-ISSN: 2278-1676,p-ISSN: 2320-3331 PP 28-33
- [4].<https://www.forbes.com/sites/jacobmorgan/2014/05/13/simple-explanation-internet-things-that-anyone-can-understand/#2d3450f11d09>
- [5].http://www.activism.com/en_IN/petition/vip-movement-for-ambulances-save-life/63828
- [6].<http://timesofindia.indiatimes.com/city/raipur/Choking-life-12-on-way-to-hospitals-die-in-traffic-jams/articleshow/54910538.cms>
- [7].<http://www.instructables.com/id/Raspberry-Pi-Location-Tracker/>
- [8]. https://www.tutorialspoint.com/internet_of_things/internet_of_things_overview.htm