

EMERGENCY ASSISTANCE FOR EMERGENCY VEHICLE

Bhagirathi Bai V ¹, Supravo Ghosh ², Abdullah Anis ³,

¹Department of Mechatronics Engineering, Acharya Institute of Technology, Bangalore, India

²Department of Mechatronics Engineering, Acharya Institute of Technology, Bangalore, India

³Department of Mechatronics Engineering, Acharya Institute of Technology, Bangalore, India

ABSTRACT

Designing and developing a smart adaptive network for helping Ambulances in emergency scenarios to clear the traffic and help them reach their destination as soon as possible.

Keywords- *Application based, Emergency, Network, Smart, Traffic, Trigger.*

I. INTRODUCTION

Ambulances are vehicles that help save lives every day, everywhere around us. Based on this statement alone it can be agreed upon that they require the utmost priority to go on their route with nothing in between to cause any delay. Unfortunately, though, that is not the reality. According to a statistic provided by Times of India “1.47 Lakh people died due to road accidents in India in the year 2017. Among which 30% died due to delayed ambulance”, that is about 44 thousand people. Apart from that, “Every second heart attack patient in India takes 400 minutes to reach the hospital. Along with this, another statistics by ICMR states that, at some places even 900 minutes are wasted, before the person gets admitted in the hospital. Whereas after 180 minutes heart muscles suffer irreversible damage due to lack of blood supply”. It comes with no argument that we require to do something about this issue, if the system we started to save lives is being blocked by a city we built, it our responsibility to do something about it. Precious lives are being lost or being dealt with severe damage in the regular traffic our cities are making up.

II. LITERATURE SURVEY

Surely, there have been awareness campaigns and people have been shown the importance of the matter time and again, but it has not made enough difference yet, not as much as required definitely. No system so far has been able to effectively clear the road and help ambulances in doing their job. To mention a few:

2.1 Siren

Providing the ambulances with siren, thus making everyone know about its presence nearby. This system does affect and lets people know about an approaching ambulance. But this system won't help much in the context of clearing away the traffic to a larger extent, as the system is localized it doesn't help in clearing away traffic

beforehand. It only helps in letting people know of its presence that are in proximity. People do not know that an ambulance needs to pass unless it comes till there.

2.2. Board

Having an emergency board with an eye-catching light over the vehicle. This system was used in New Zealand, but was not worthy enough on a smarter basis, and it was used by the individual private vehicles usually. It also comes with similar problems like with the siren, but only worst since people have to first notice the light, look towards it, then read and understand it to act on it. Even after a while when the city is accustomed to it, it is still inefficient.

2.3. Traffic Police

Taking the help of the traffic police in clearing out a road can also be only of little help since the police has to first spot the ambulance to come in effect. Even if they end up stopping all the other roads completely until the ambulance passes by, is it a wise solution to hold the entire cross road until one road is cleared, other people might have emergencies too. Another ambulances might be coming from the other side of the road as well.

2.4. Green Corridor

A solution that has been incorporated by Pune (AND FEW OTHER CITIES IN INDIA), in order to help with organ transplant, but it is sadly limited to that, not to mention it involves blocking the roads of the entire city to create a path for the ambulance.

III. SOLUTION

The major reason why a system works is by creating a network or an ecosystem. Our solution is to design 2 applications, interlinked with each other and working in coordination with the central city server that connects all the traffic signals and monitors them. The first app named Ambulanco has an embedded map and connectivity mechanism with the hospital and the respective ambulance. As soon as the ambulance starts its journey for the emergency case, a trigger signal gets to the central server and the traffic signals starts clearing traffic accordingly.

The second app is basically a smart city app, which consists of a functionality that can help in providing a smooth passage of the emergency vehicle through those places which are devoid of traffic signals through long stretches but delay in ambulance movement is caused due to traffic congestion. Our system creates a network among the smart app user and the emergency vehicle, then with the help of the app it notifies users, driving a few kilometres ahead in the set route of the emergency vehicle that a emergency vehicle is approaching them, the notification gets heightened as the emergency vehicle approaches closer. This mechanized network of interconnected systems helps in saving those lives effectively, which were getting lost due to traffic jam.

3.1 The Traffic Monitoring System

The traffic monitoring system controlled by the central city server, is a collection of all the traffic signals present throughout the city. In each of these traffic signals, the traffic lights are autonomously regulated in real-time, based on the density of traffic present on each road of the traffic signal

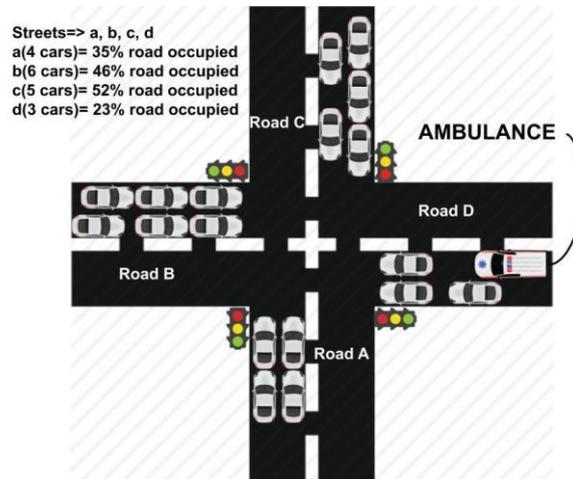


Fig. 1 Road occupancy in a traffic signal

Each and every road has a threshold limit, which is chosen based on the volume of traffic present on that road. The variables shown in the fig. 1, namely a,b,c and d are the road occupancy variable, generated by the CCTV cameras, based on the amount of vehicles present on the road.

Depending on these variables, each road is opened for a specific duration of time.

The time duration of opening a particular road in this scenario as per the figure would be: -

- Road C, with 52% road occupancy, would be opened for the longest time interval.
- Next, road B, with 46% road occupancy would be opened for a little less amount of time period.
- Next, road A, with 35% road occupancy would be opened for an even lesser amount of time interval.
- Last, road D, with 23% road occupancy would be open for the least amount of time period.

This procedure of opening and closing the road based on road occupancy level, is followed only in cases where no emergency vehicle is approaching from any side. As the central city server is notified of an oncoming emergency vehicle, a trigger system is injected into the respective traffic signals, which prioritizes the road through which the emergency vehicle is approaching.

3.2 The APP-Ambulanco

Ambulanco, this app is present with the ambulance driver containing two basic functionalities. First, the driver has to set the starting and ending destination of the journey, by clicking on the one tap link given by the server. Next, he has to give the OTP sent to his phone and connect with the onboard system of the ambulance. This app does the basic function of generating the trigger signal, based on which the traffic modulation starts. The trigger system is generated as the driver passes the verification procedure and presses the red START button on the app.

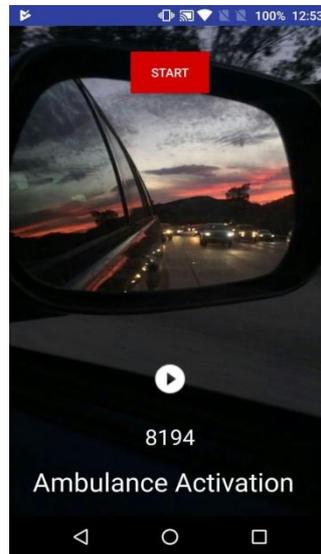


Fig. 2 opening page of Ambulance app



Fig. 3 Setting the location

3.3 The Smart City APP

This app would be present with the citizens of the city, who commute through the city traffic on a daily basis, in their own personal vehicle. Since its a Smart City app, it consists of various functionalities, one among which is our emergency management system. This system helps in clearing away traffic through long stretch of roads devoid of any traffic signal, and helping the person in need through the following features: -



Fig. 4 The Smart City App

- 3.3.1 While commuting through the traffic, each and every user in the route of the ambulance would receive a voice enabled notification, about the approach of the ambulance. The first notification would be provided when the ambulance is at a 5 minutes distance from the vehicle, 2nd notification when the ambulance is at a 2.5 minutes distance from the vehicle, and a 3rd amplified notification when the ambulance is 45 seconds away from the user. These notifications would help to provide a sleek corridor in the jammed road, through which the emergency vehicle can pass, while raging an amplified speed. Thus, reaching the person in need, in the shortest amount of time.
- 3.3.2 After hearing the notification, the user can verify the oncoming emergency vehicles location in real-time, if he/she goes into the respective window in the app. There, the real-time location of the ambulance, the distance of it from the user's vehicle, the time taken by it to reach the user, along with the path taken by it is displayed.



Fig. 5 Path taken by ambulance upto your vehicle

3.3.3 Another feature that this app provides is smart emergency call system. There have been cases reported, where a person in distressed situation are not able to reach out to the respective authorities, due to certain situations like,

3.3.3.1 He/She is in a chronic situation, and not in a situation to dial the respective authorities' number and reach out to the person.

3.3.3.2 He/She might be trying to reach out to the respective authorities, but the network might be busy, and the calls might not connect.

To help out a person in these situations, one can fire up our app, just swipe right once, you will get into the emergency section and click on the help you need. Be it health, fire, woman safety or police. If the person can, he may deliver a message along with it too, because verification call would be on its way, as the distressed call signal, along with your location reaches the central server and gets distributed to the respective authority. Just one swipe and one click, emergency assistance is on its way.



Fig. 6 The page that appears on one swipe to the right

3.4 The Trigger System

The trigger system is a function named trigger (), which is written within the main code for traffic signal modulation. As the driver of the emergency vehicle presses the START button on the app, after verifying himself through the safety measure procedure, the trigger system gets called in the traffic monitoring network, in the respective crosshead.

From Fig..1, let the road density in road A=a, B=b,C=c, D=d, and we are assuming the fact that an ambulance is approaching from the road D. Generally, in normal conditions, the pattern followed to clear the traffic is in sequential order, 1st road A is opened, then B, then C and then D, whereas in cases of emergency, the pattern followed is based on 2 cases: -

Case 1: -

If ($d < 40$), the pattern followed is: -

A → B → D,

C → A → D,

$B \rightarrow C \rightarrow D$,

again

$A \rightarrow B \rightarrow D$.

Case 2: -

If ($d \geq 40$), the pattern followed is: -

$A \rightarrow D$,

$B \rightarrow D$,

$C \rightarrow D$,

again

$A \rightarrow D$.

The limiting factor of the degree of occupancy d , 40% that is taken into consideration is based on the normal road occupancy level of that particular road and the threshold limit chosen for that particular road.

When the ambulance is about to approach a certain signal within the next 10 seconds, the trigger system is stopped, and the particular road is given full supremacy for the next 10 seconds until the emergency vehicle passes through the signal. Thereafter, the respective signal returns back into normal monitoring mode and immediately the trigger system would start acting in the next signal to come in the path of the ambulance. This system of road clearance would enable less traffic congestion on the path followed by the ambulance, at the same time make justice to the usual city traffic too, by not keeping them waiting for long, as is the case for green corridor.

3.5 Precautions against misuse

Since the emergency assistance for emergency vehicle is based on the functioning of 2 apps, one with the user, and another with the ambulance driver, there are chances that the system can be misused. Hence, to prevent the misuse of the system, we have taken some precautions mainly in the case of the Ambulanco app.

Before the trigger signal is generated from the Ambulanco app, the driver of the emergency vehicle, or his assistance would have to pass through two layers of security measures.

- i. As the hospital receives a distress signal, and its verified, it assigns a particular ambulance to move out immediately for the given location. At the same time an OTP is sent to the ambulance driver's phone, upon entering which, he would be provided with a link, that would set the map for the given destination.
- ii. Apart from that, according to Indian Judicial Law, an emergency vehicle is only allowed to use siren during time of emergency. Hence taking this into consideration we have devised a wireless connectivity mechanism between the Ambulanco app and the ambulance, such that, after the siren is turned on, the START button on the app will function, and the trigger system could be generated

Circuit network for AMBULANCES.

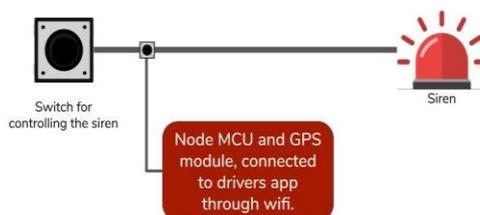


Fig. 7 System that provide connectivity between ambulance and mobile

iii. Along with this, as the location of the respective ambulance is under continuous check under the server, if the distance between the respective traffic signal and the ambulance does not change during a small-time window, the trigger system will automatically come to a halt, and normal traffic monitoring will continue.

The precautions taken in the Smart City app, are limited to a preliminary cross check by the respective authority. If some defaulters are found, their numbers are to be blocked by the authority, and they are required to be punished on the grounds that they are toying with the emergency systems of the city.

3.6 The Ecosystem developed

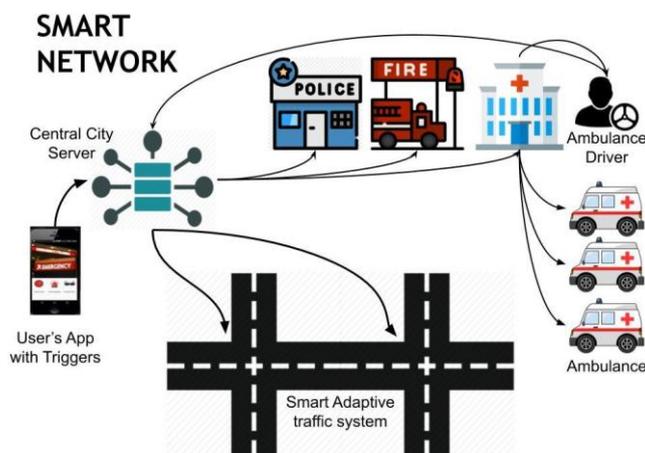


Fig. 8 The Smart Network for Emergency assistance to Emergency Vehicle

The network of interconnected systems developed, makes up a complete circle, that starts as the user issues a emergency signal. The signal is sent to the central city server. Depending on the type of the signal and the type of emergency condition, the signal is forwarded to the nearest emergency stations. If it's a health issue, the hospital verifies the information's, selects an available ambulance, and forwards the required information to the respective driver. Thereafter the driver sends an impulse to the server to generate the trigger signal. This helps in clearing away the city traffic and enables the ambulance to each the emergency situation as fast as possible.

The block diagram of the following network ecosystem is given below:

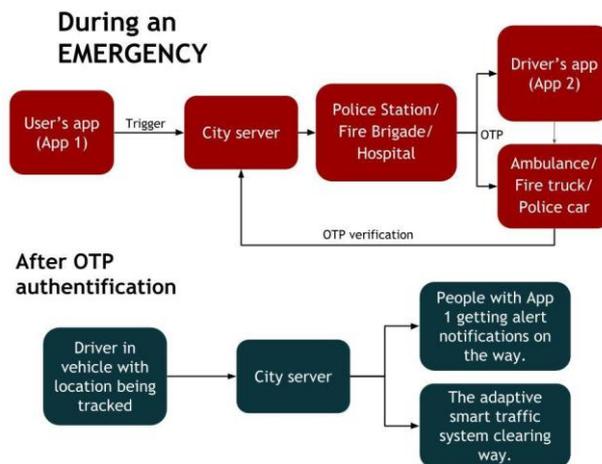


Fig. 9 Block diagram of the whole network

IV. APPLICATIONS

This smart city network has immense applications in a city and the most important one is that it will save many lives that are being lost due to poor communication and less awareness. Thankfully we have come up with a solution that can help us save lives in thousands all over India due to medical emergencies and more. The main advantage of this project is connecting people through a portal to access all emergency services. Also, the involvement of the normal crowd, that is us, to be able to help people and help save lives.

V. CONCLUSION

Looking at the number of lives being lost due to traffic jams and people not giving way to ambulances, it is very saddening, 30% from 1.47 lakh patients die in ambulances due to not reaching the hospital in time. Most of the deaths that occur due to delay caused during emergency situations, are those related to accidents and heart attacks. No one wishes for it to be like that, but the circumstances present themselves in random ways and the result is a lot of times, death. When it comes to life and death, people also wish to help but the information is not passed to them early enough. Our network tells every single individual on the route of the emergency vehicle. If all of us lend a helping hand together, we can save a lot of lives to be honest, yearly thousands. Apart from that, we can also manipulate the traffic signals to clear the way for the emergency vehicles. This way we could help the patients reach hospitals in time and save our brothers, sisters, parents and others, because we never know we might be the ones needing to reach a hospital in time someday. Together, by building a smart network like this, one step at a time we could change a lot. Smart traffic systems may take time to implement but the App system can be implemented faster.

This is a network for connecting people and providing them with help in each and every emergency and not just medical related ones.

We are trying to get advanced in every field using technology, but what good is it really if we cannot use it to save ourselves when we need it the most.

REFERENCES

- [1] Faisal A. Al- Nasser, HosamRowaihy Simulation of Dynamic Traffic control system based on Wireless sensor network, IEEE Symposium on Computers Informatics 2011, pp40-45.
- [2] Pratyush Parida¹, Sudeep Kumar Dhurua², P. Santhi Priya³ “An Intelligent Ambulance with Some Advance features of Telecommunication. IJECET, Volume 7, Issue 4, July-August 2016, pp. 48–53, Article ID: IJECET_07_04_006 .
- [3] Dr. A. Balamurugan¹, G. Navin Siva Kumar², S. Raj Thilak³, P. Selvakumar”Automated Emergency System in Ambulance to Control Traffic Signals using, IOT”. IJECS, ISSN:2319-7242 Volume 4 Issue 4 April 2015, Page No. 11533-11539
- [4] Xiaolin Lu, Develop Web GIS Base Intelligent Transportation Application System with Web Service Technology, I NSPEC, Accession Number: 9365116, DOI: 10.1109/ITST.2006.288823, IEEE