Smart Traffic Signal System for Ambulance using IoT

Abhishek P[1], Hemanth Kumar[2] and Rabinandan J[3]

Student, Department of MCA, JNN College of Engineering, Shivamogga, India[1]

Associate Professor, Department of MCA, JNN College Engineering, Shivamogga, India[2]

Assistant Professor, Department of Civil Engineering, JNN College of Engineering, Shivamogga, India[3]

Abstract: In today's world, traffic jams happen cause there's just too many vehicles on the road, which means ambulances and other emergency vehicles get delayed, and that's a real risk to people's lives. our smart traffic signal system for ambulances using IoT will give priority to ambulances at traffic lights. when ambulances get close, the system spots them with RFID and switches the lights to green, while the rest stay red. Ambulances can pass through traffic lights without jams. In addition, we have developed an android application that ambulance driver can select the patient's disease type and enter the hospital code which is sent in real time to the hospital dashboard. The app also displays a map with quickest path from the present site to the hospital that will help the driver reach the destination easily.

Keywords: IoT, Ambulance, RFID, Mobile App.

I. INTRODUCTION

In the current year, the quantity of vehicles on the road has increased. 10 years ago, this issue was not big because people use to travel by public transport. Many people started moving from village to towns like Hyderabad and Bangalore for better job, education and better facilities so these cities became more crowded. At the same time, more people began using their own vehicles alternate to public transport. Now the situation became more worst that the streets are always full of private vehicles that cause traffic congestion. Bangalore is identified as 3rd highly congested city in the world. Sometimes a vehicle can take 2 to 3 traffic lights just to cross a single kilometre. Thus, it will take more time to reach destination. This is serious problem especially for emergency vehicles such as ambulances, fire trucks. This is the reason why some emergency patients cannot reach the hospitals on time and it will lead to death. In emergency situation, accident patients need quick treatment and have to be admitted in hospital as soon as possible.

To overcome around these problems, we have used an RFID tag that will be placed in ambulances, RFID reader installed earlier to traffic signal. When the ambulance is on the road, the RFID reader will detect it from a distance of 500 meters before the traffic signals, it changes the green light to clear the way for ambulance. And also, we have developed an android app that consists of some diseases like heart attack, fever, stroke and other emergency diseases. we have stored some real time hospitals in the database and also, we have added their longitude and latitudes. When ambulance driver selects the patient's disease, enter the hospital code and sends the disease to particular hospital and also shows map that have shortest route from the current location to the hospital.

II. LITERATURE SURVEY

The work by M. Girish et al. developed an IoT model to help ambulances reach hospital faster [1]. They have used GPS and sensors to track ambulances and control Traffic signals. Authors P. Chitra et al. developed a model that gives ambulances to green traffic light when ambulances near to the signal [2]. The system uses Arduino and LED lights to control traffic signals in real time. Shubhankar Vishwas Bhate et al. in [3] developed a model that detects emergency vehicles such as ambulances and fire trucks using RFID and it will change traffic lights automatically red to green. They used NodeMCU for send data from signals and Raspberry Pi to communicate between vehicles and signal. Neelam Dahiya et al. developed a model to reduce traffic and helps ambulances to reach hospitals on time [4]. They introduced different technologies like GPS, Arduino, RFID and cloud used to track ambulances, controls the traffic signals and store patient data. Manjiri M. Kokate et al. developed traffic control system model [5]. It includes GPS, and RFID for ambulances tracking, and health card portal stores a patient's details. In [6], the authors Nandhana PK et al. developed a model that monitors patient health in real time and helps ambulances reach faster by sharing the ambulance route to the nearest traffic police. Besides utilizing the sensors to check the vital signs of patients and send them to hospitals, they also informed the local traffic police to give them a clear passage. Model of the Internet of Things developed by Rishabh Madani enables the ambulance to reach its destination fast by detecting sirens and reconfiguration of the light signal [7].

To detect the presence of the ambulances and control traffic lights, the author integrated GPS, sound sensors, and one-way directional sirens. A model has been designed by RFID Suren Krishnan et al. which activates the traffic lights automatically whenever an ambulance is passing by [8]. The system built by authors in [9] will detect the appearance of an ambulance by using the IR sensors and automatically change the traffic light green, with sending an SMS as a consequence to the hospitals in order to reservate a bed. In [10] an intelligent ambulances system was proposed to combine the IoT Technology and GPS Technology application to monitor ambulances and patient information as well as to avoid ambulance to be late. The work sends present information to hospitals and traffic managing. This equipment would need to be tethered to a network to send data and location as it modified its motion. Manjunath HR et al. developed a model that uses IR sensors like IR transmitter and IR receiver to detect ambulances and reduce traffic congestion by changing the traffic lights [11]. Also, authors used photoelectric sensors to count the number of cars gives priority to more vehicles are waiting at the signals. But they face challenges like sensor limitations. The authors Roopashree. V et al. developed a model that detects the traffic jams [12]. The authors used android app to sends the ambulance location to the cloud using GPS, ultrasonic sensors for measuring the number of vehicles on road, it will detect and sent the lane ID to the cloud. If the lane has too many vehicles a road line appears on the map so the ambulance driver takes a different route. Avantika Sutar et al. developed a model using Arduino, GPS and GSM modules to track ambulance location and automatically control traffic lights [13]. The system sends the ambulance location Traffic control room to hospital by using text message, so in advance helping to clear the traffic. In [14] B. Janani Saradha et al. developed a model for ambulances to solve road traffic jams in cities. They established a way in which the ambulance could access the hospitals within a shorter time with fewer traffic bottlenecks. They have applied microcontroller-based RFID to switch the traffic lights. The authors in [15] introduced a model that applies to control traffic lights and increase priority the emergency vehicles such as ambulances. They have applied Arduino, IR sensors, WIFI modules to operate traffic lights, and they have faced the problem of sensors failure.

III. METHODOLOGY

The IoT or Internet Things is a network of physical things which are fitted with sensory devices, programmes and other components of systems that have the capacity to gather, share and process such information online. They can be as simple as a domestic appliance and as complicated as industry equipment and municipals. To make devices smarter and open to suggestions, the first justification of embracing the IoT is to do tasks without the human being poking at their devices constantly. The IoT systems have some relatively simple elements on which they are based. The sensors or devices identify the physical information, the connectivity features enable information transfer and it is analysed locally or on the cloud. These devices are being used by the users presenting them familiarized through either a mobile application by accessing either the mobile devices, web dashboards, voice interfaces to calculate the performance, add notifications, or because they can operate remotely. IoT has numerous and extensive applications. Health industry monitors their patients with the help of the wearable devices to keep track of the vital signs as well. IoT sensors will benefit the agriculture industry, by scanning the soil directly and automatically irrigate and smart cities make use of IOT to control traffic on the road, street lights and waste management.

Maps are a visual representation of the physical space, and are made to indicate geographical features like places and routes, topography, boundaries, and other spatial detail. History maps were static, printed maps in our digital world that could now be dynamic and combined with the most current information. There are also the spatial relations we use in the process of using maps to navigate, comprehend, and plan. The various kinds of maps can and do serve different purposes. Physical maps are maps that are used to show NATURAL gestures of a place (mountains, lakes, rivers etc) Political maps show man-made features such as boundaries, cities, and countries. Topographic maps show the shape of the ground and the height with contour lines. Another example is overlay (merge) live data with digital and interactive map hosting being provided to us via most users at Houzz with GIS (Geographic Information Systems) access, so we can perform and overlay for more complex analysis and visualizations.
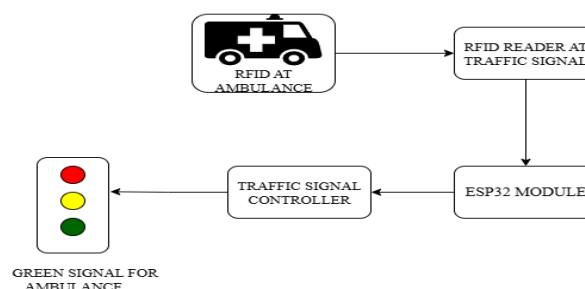
System design:

Fig-1 System Architecture of the model

Fig-1 describes the design of smart tracking signal system for ambulance using Internet of Things the ambulance has installed RFID tag and RFID reader will be placed near traffic signal at a distance of 500m. When ambulance comes near the traffic signal the RFID reader scans the ambulance location and sends data to ESP32 module. The ESP32 is dual core micro controller. It verifies and sends a command to the traffic signal controller. The controller changes the traffic light red to green.
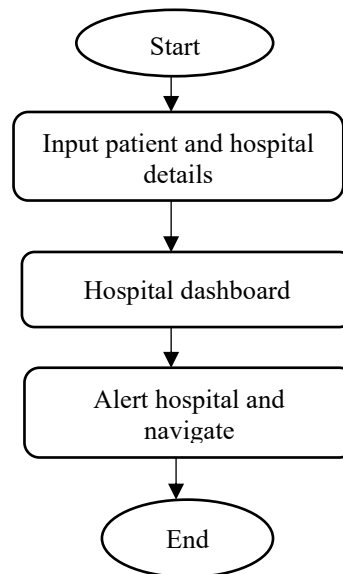
FLOW CHART:

Fig-2 Flow diagram of Android app

Fig-2 describes the flow of android application. In an emergency situation ambulance driver selects the patient's disease and enters the particular hospital code this will be sent to that hospital and also displays map with route from current location to the hospital. In Hospital dashboard for ambulance driver, there is provision to track the live location.
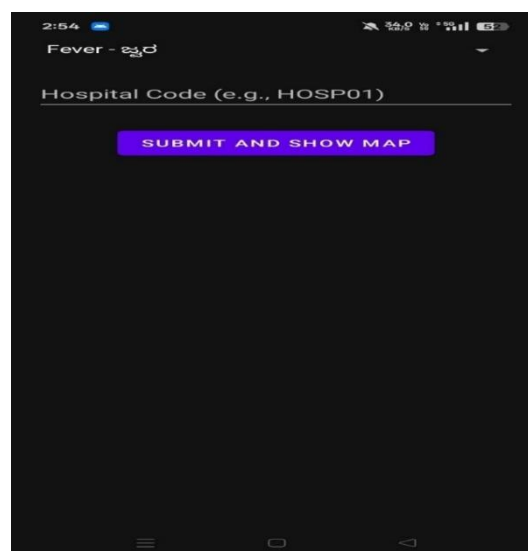
IV. RESULTS

Fig-3 Hospital code and display map

Fig-3 shows the list of diseases on the top. Here the ambulance driver selects the diseases and enter the hospital code starting with HOSP01 up to HOSP10 and click on submit and show map button.
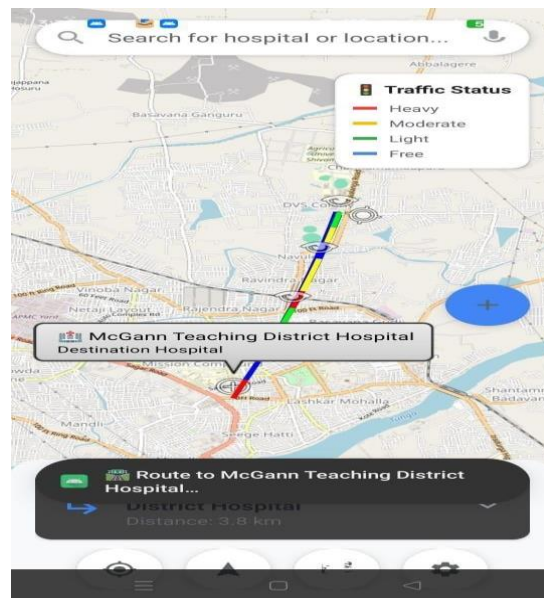
Fig-4 Map with route indication

Fig-4 displays the map and shows the route from current location to hospital and also calculate the distance from current location to the hospital.
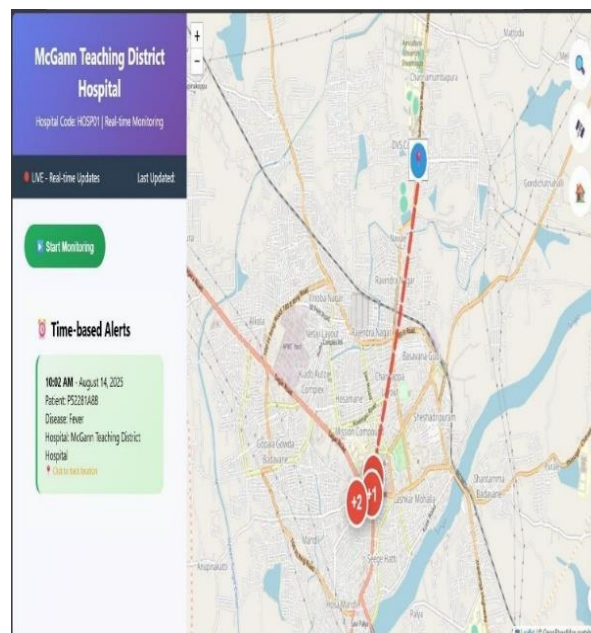

Fig-5 Hospital dashboard

Fig-5 shows map in the hospital dashboard of McGann hospital. It has time-based alerts messages that sent by the ambulance driver, the messages like patient id, disease, hospital name that will be displayed in the dashboard. It also shows the current location of the ambulance driver.

Fig-6 shows the IoT based traffic signal system which is made with microcontroller, RFID reader, LEDs and LCD display. The LCD panel shows the present signal status (RED -> YELLOW) with a countdown clock, and the LEDs are used to show the real-time traffic light changes to priorities emergency vehicles.

Fig-6 Implementation of traffic signal

V. CONCLUSION

The project works well with an IoT system that controls traffic lights to help ambulances go faster, which saves time and helps emergency services respond quicker. It uses RFID to find when an ambulance is coming, then makes the traffic lights turn green for the ambulance's path and stops other traffic so the ambulance can pass through smoothly. There is also an Android app that helps hospitals get ready by sending important patient information and giving the ambulance driver the fastest route to the hospital. All these things help save valuable time and can even save lives in urgent situations.

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BIOGRAPHY

Abhishek P is a student of the Master of Computer Applications (MCA) at Jawaharlal Nehru New College of Engineering (JNNCE), Shivamogga. I have recently completed my research work titled "Smart Traffic Signal System for Ambulance using IoT", which focused on developing an intelligent traffic management system to clear the way for emergency vehicles and includes an app and website to share patient details with hospitals in real time for better healthcare support.

Dr. Hemanth Kumar is an Associate Professor in the Department of Master of Computer Applications (MCA), Jawaharlal Nehru New College of Engineering (JNNCE), Shivamogga. He has published articles in international journals and has presented papers in international conferences. His area of interest is Wireless Sensor Networks, IoT and Machine Learning.

Rabinandan J is working as Assistant Professor in the Department of Civil Engineering, Jawaharlal Nehru New College of Engineering, Shivamogga. He has completed his M.Tech from NIT Surathkal, Karnataka in the area of RS & GIS. His research area is Remote Sensing and Transporting Engineering.