Geo-fencing response system as a life saver

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Abstract - In order to build virtual geographic boundaries or perimeters around a particular site, such as a business, event venue, or specified region, geofencing is a technique that uses GPS technology. A pre-planned action, such as sending a push notification, showing an advertising, or turning on a device feature, is triggered when a user's device enters or leaves the geofenced region. Businesses frequently utilize geofencing for marketing and advertising, but it also has uses in fleet management, security, and location-based services. A project called the Geofencing Response System is created to make it convince for emergency vehicles like ambulances and fire engines to maneuver through crowded urban areas' high traffic. The system ensures that emergency vehicles may pass through traffic more swiftly and combination of Raspberry Pi, Arduino boards, geofencing, and cloud-based communication technologies. This paper addresses the Geofencing Response System's possible uses in emergency scenarios as well as its design, development, and testing.

Index Terms - Geofencing, Traffic management, Raspberry Pi, Arduino, Cloud-based communication.

I. INTRODUCTION

The way we manage our fleets and respond to crises has been completely transformed by vehicle tracking technology. These systems offer real-time information on vehicle locations and movements by fusing software with automated vehicle locating technologies. Other automated vehicle location technologies can be employed in addition to GPS, which are often utilized in contemporary tracking systems. Metropolitan public transit agencies have embraced car monitoring systems more often, but many businesses and developers still struggle with the expense of putting such systems in place.

With the introduction of transportation-related data systems on all Indian roads and certain interstates, modernization of interstates and road infrastructure is fast expanding in India. The city's infrastructure, on the other hand, has not kept up with this trend, and telematics technology and traffic signal control are often antiquated. As a result, telematics systems cannot be integrated in cities. Without a method to handle city traffic centers, traffic control in cities is restricted to nearby junctions. For effective service delivery, emergency vehicles need contemporary technology and an information infrastructure. The technologies that are already in place can be modified and put into practice for mobile traffic signal management for emergency vehicles.

Geofencing and GPS-based vehicle monitoring systems can offer real-time information about the position and anticipated time of arrival of ambulance, minimizing the discomfort caused to patient by common issues including traffic congestion, unanticipated delays, and irrational passenger demand. Comparing it to the earlier techniques mentioned above, this system is often more effective.

Applications for geo-fencing that use Google Earth frequently let administrators set limits on top of a satellite picture of a particular geographic region. The management of fleets and emergency response have both been shown to benefit from vehicle tracking systems. Yet, many businesses and developers still struggle with the cost of putting such systems into place, especially in urban areas. Yet as contemporary infrastructure and technology advance, it is becoming more and more practical to integrate telematics systems in cities and mobile traffic signal management for emergency vehicles.

II. LITERATURE SURVEY

M. Abirami, G. Archana, R. S. Dheepika, M. Keerthana has proposed in the paper [1] that the system suggests automating stop light control using a mobile app that includes a crisis pushbutton. Once engaged, the app locates the closest stop light and asks the area in charge to temporarily pause the signal until the car passes. The app determines the distance to the signal if it is red and then asks for the control range to clear the path. This eases traffic flow for emergency vehicles.

Amrutkar Namrata Ravindra, Nikam Jayashri, Rumane Mohini, Patil Mohini has proposed in the paper [2] that the study suggests a bus position tracking system that incorporates geofencing into a transport radio detecting and ranging system. Administrators may set up geofences on the system, which makes use of GSM technology, to get warnings whenever a bus enters or leaves a certain border. Passengers can use this independent system to help them decide whether to wait for the bus or take a different route.

Prof. Deepali Ahir, Saurabh Bharade, Pradnya Botre, Sayali Nagane, Mihir Shah has proposed in the paper [3] that the study suggests an ITCS (Intelligent Traffic Control System) for emergency vehicles that disperses traffic jams by turning all traffic signals green in its path. The technology makes use of a robot programmed that logs emergency requests and sends a signal to turn the nearest signal green depending on the vehicle's current GPS location. By controlling the traffic lights during emergencies, this system saves time and functions as a forgiveness project.

Abhishek Singh, Ankit Pal, Divyansh Garg, Dolly Yadav has proposed in the paper [4] that software programs can be built with a feature called geo-fencing that uses GPS or RFID to define geographic limits. Many other things may be done with it, including electronic toll collecting, tourist information systems, and targeted advertising. The study investigates how effective demand and trade views might be increased by employing location data to enhance billing procedures for customers. Targeted advertising on cell phones may be executed inexpensively and precisely utilizing geofencing in place of pricey billboards.

D. Suganthi, S. Paul Raj John, Shamil J. S, Dhruva G. Patel has proposed in the paper [5] that using a virtual fence, geofencing enables remote monitoring of geographic regions and may send out warnings when tracked items enter or leave these zones. A border can be configured to restrict movement and notify the owner if a vehicle violates the boundary in applications like bus tracking and taxi management. Employers can simply track employee arrival and leave times using GPS tracking and geofence notifications, improving the efficiency of timekeeping and attendance management.

III. METHODOLOGY

The temperature and heart rate sensor are used to determine a patient's level of criticality, and an ambulance is permitted to carry no other vehicles owing to a medical emergency. Without GRS, ambulances, fire trucks and other emergency vehicles arrive at medical facilities later than planned, decreasing the chance of saving the patient's life. Additionally, there is no way to continuously monitor the patient's condition. Ambulances, fire trucks, and other emergency vehicles equipped with these methods arrive at medical facilities more precisely on time, continuously monitor the patient's condition.

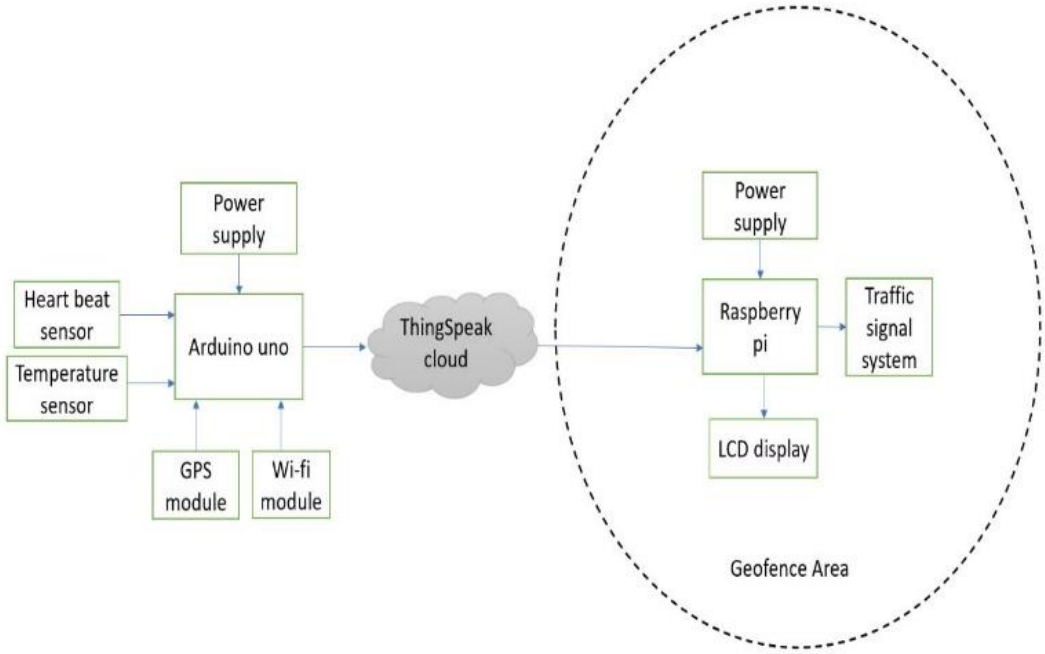

Fig.1 Block diagram of geofencing response system

The hardware and software parts made up the system design. Raspberry Pi, a GPS unit, and a Wi-Fi receiver made up the hardware. The admin utilised the IoT cloud software components to construct geo-fencing in order to track the whereabouts of the ambulance. The admin was also given a platform by the IoT cloud to view information and save data on. The GPS signal from the Raspberry Pi was used to communicate the data gathered by the GPS to this platform. Then, using an "API Token" that was included into the source code, the Raspberry Pi transmitted a signal to the cloud that contained the latitude and longitude format. The map widget to see the location that interfaced with Google Maps was given by the API. The device's latitude and longitude were shown on the API platform. Following that, geofencing was put into use on Google Maps by marking the borders of the particular region where the ambulance would be monitored. The geo-fence area's boundaries are typically defined by the administrator or developer. As a result, if an ambulance was inside this geo-fence, the system considered it to be at that place. The virtual ambulance was created using an Arduino and sensors for temperature, GPS, and heart rate. In order to determine the patient's health status, a temperature sensor and a heart rate sensor are connected to an Arduino board. The information is then transferred to a Raspberry Pi using an ESP8266 Wi-Fi module. In order to track a vehicle's location and send information to the Raspberry Pi using ESP8266 to track GPS location for fence detection, GPS modules are interfaced with Arduino.

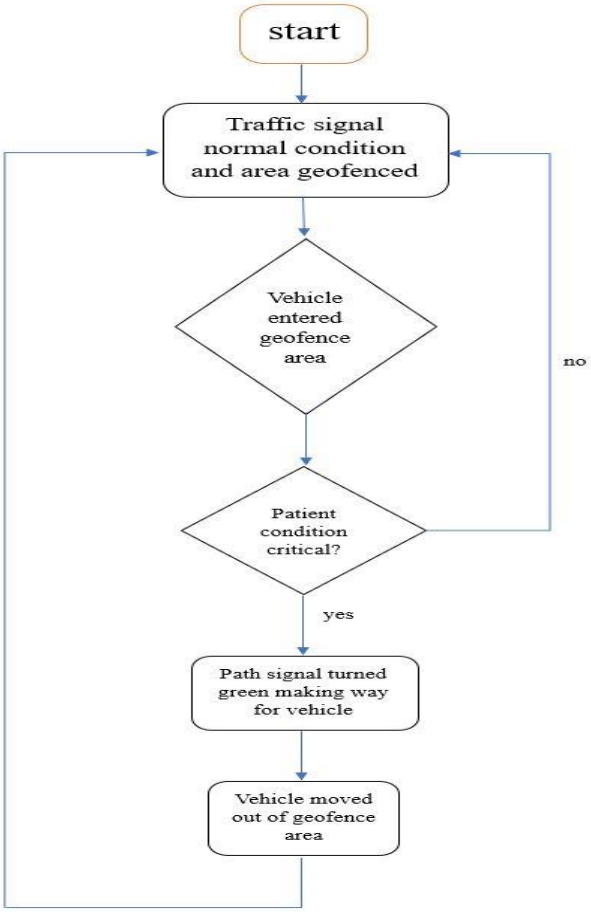

Fig.2 Flow chart

The latitude and longitude are read to the cloud by GPS module and along with patient's heart rate and temperature data these location details also transferred to raspberry pi. Raspberry pi analyses these conditions and makes decisions whether to provide zero traffic or not. If the patient's condition is very critical the traffic signal of particular path is turned to green and after ambulance passes the particular traffic system the system comes back to normal state.

IV. RESULT

With the aid of a test ambulance outfitted with the necessary hardware components, the geofencing response system is subjected to the test in a mock emergency. The technology successfully locates the ambulance and established a geofence around the traffic signal. The Raspberry Pi board, which can display data in real-time, receives the temperature and heartbeat data that the Arduino board had gathered. The technology immediately turns on the traffic signal to green and lets the ambulance through when it enters the geofenced region.

V. Conclusion

The Geo-fencing Response System is an innovative technology with the potential to completely change emergency response procedures. Ambulances and fire trucks may travel through congested metropolitan areas more swiftly and securely by integrating geo-fencing technology with intelligent traffic management systems. The system is dependable, easy to use, and reasonably priced thanks to the utilization of hardware elements like Arduino Uno and Raspberry Pi computer boards, temperature, and heartbeat sensors, as well as cloud-based communication platforms like ThingSpeak and sensors like these. The Geofencing Response System has the potential to save lives and lessen the detrimental impacts of traffic jams on situations of emergencies if it is developed further and applied on a bigger scale.

VI. Reference

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