Automated Intimation to Ambulance for Emergency Medical Service and Traffic Clearance Using IoT

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Abstract -We have proposed a smart traffic light control and congestion avoidance system during emergencies for ambulances. The system consists of two parts: Smart traffic light control system and Smart traffic routing system. First part of the system controls the traffic light system smartly for emergency vehicles and the second part of the system tries to avoid congestion caused by traffic jams. The overall system is based on Atmega8. The Atmega8 used in the system is Atmega8 duemilanove at mega which is 328P family based. The system contains IR proximity sensor/distance sensor, Atmega8 and IOT pro which are mounted on both sides of roads and in emergency vehicles respectively. The IR system is activated whenever any vehicle passes on road between IR proximity sensor and IOT pro. Atmega8 controls the IR system and counts the number of vehicles passing on the road. Atmega8 also stores vehicles in its memory. Based on different vehicle counts, the Atmega8 takes decisions and updates the traffic light delays. The traffic light is situated at a certain distance from the IR system. Thus, based on vehicle count, Atmega8 defines different ranges for traffic light delays and updates can be monitored anywhere through mobile or PC using IOT.

Keywords—Traffic Clearance System, at mega 8, RF, LCD, Buzzer.

I. INTRODUCTION

Street crossing point to the executives is done through traffic lights. The wasteful traffic signal administration causes different issues, deferral of explorers, misuse of vitality and declining air quality. At times, it ought to conjointly add to transport mishaps. Proposed radio frequency as this technology uses only radio waves for its operation of identification of different objects. In another existing System ultrasonic sensor HCSR04 is used to calculate the distance for Smart Traffic system. According to all these papers, a convenient wireless communication between emergency vehicles and the traffic light is by using RF. The prototype of this project is using the radio frequency of 535 MHz compared to the range of about 15 kHz to 350 GHz of frequency which have been reserved for the RF theoretically Both existing System is not able to distinguish between normal vehicles and emergency vehicles. This problem should be overcome, emergency vehicles such as ambulance fire brigade vehicles can struck in traffic. One of the loop hole in the existing System is, if traffic is block for longer time, the punching machine is place very starting and hence driver has to leave the vehicle take the RFID and go there and at last punch, after this the drive has to come quickly because signal for emergency vehicles will closed after 45 second, if it is not succeeded then the above step has to repeat and it will take time which will create delay for them. So this way the existing system will not able to resolve the problem related to traffic jam.

II. LITERATURE SURVEY

[1], intelligent control system to pass emergency vehicles smoothly was proposed during which each emergency vehicle contains Zig Bee transmitter module and therefore the Zig Bee receiver implemented at the traffic junction. The buzzer is going to be switched ON when the vehicle is employed for emergency purpose. It'll make the traffic signal to vary to green. Once the ambulance passes through, the receiver not receives the Zig Bee signal and therefore the traffic signal is turned to red.
In [2] have proposed a system that manages the traffic on local and centralized servers by exploiting the concepts of IoT and Intelligent Image Processing. In proposed system for Indian urban settings, the important time video data is acquired is firstly. Then, it's divided into frames, then after binary conversion and noise removal, blob detection is performed and eventually the count is estimated using the proposed vehicle counting method.

AThoughtwasproposedforsavingapatient'slifeduringafasterwayinemergencies.The proposed model will not if the traffic light system or authorities as an advance alert, so chances of clearance of road before arrival of

ambulance is increased. Hence it reduces the time complexity and helps to supply faster transportation services for the ambulance. It uses Google map server PItodetectthespacebetweentheambulanceandthereforethetrafficlight.Finally, complete content and organizational editing before formatting. Please take note of the following items when proof reading spelling and grammar.

a) *SCOPE AND OBJECTIVES*

The main object of this project are ,Develop, deliver and support interoperable traffic infrastructure solutions for public safety for ambulance ,security,transitandtrafficmanagementthatincreasesafety,lowercosts,improveefficiencies and reduce environmental impact driver can select hospitals near accident area also monitor patients data.

Toprovideclearwaytotheambulancewheneveritentersintotherangeofsensor and to control the signals by measuring the density of traffic there by avoiding the wastage of time and saving the lives of human being.

III. SYSTEM ARCHITECTURE

a) *ARCHITECTURALDESIGN*

Architecturaldesignistheprocessofdefiningacollectionofhardwareandsoftware components and their interfaces to establish the framework for the development of a computer system. There are two architectural designs in the project:

- Architecture of Traffic Detection
- Architecture of Alerting Ambulance

b) *ARCHITECTURE OF TRAFFIC DETECTION*

How traffic congestion is detected. The ultrasonic sensors are placed at200m on the roadside at Ambulance. The ma n objective of this technique is toformitpossiblefortheambulancetosucceedinaspecificlocationwithouthavingit to prevent anywhere until the destination is reached. This paper proposesmonitoringoftrafficlightsanditscontrollingbythedrivingforceoftheambulance. Basic information of the patient is taken alongside the status of the patient like critical or non-critical. This information is further wont to send it to the hospital. Depending upon the emergency, the driving forces ends the direction towards which it wants to travel. Depending upon the command, that specific signal is formed green to supply thanks to the ambulance and simultaneously the others are changed to red. Using this method, way is provided to the ambulance resulting it to succeed in the destination in minimum time.

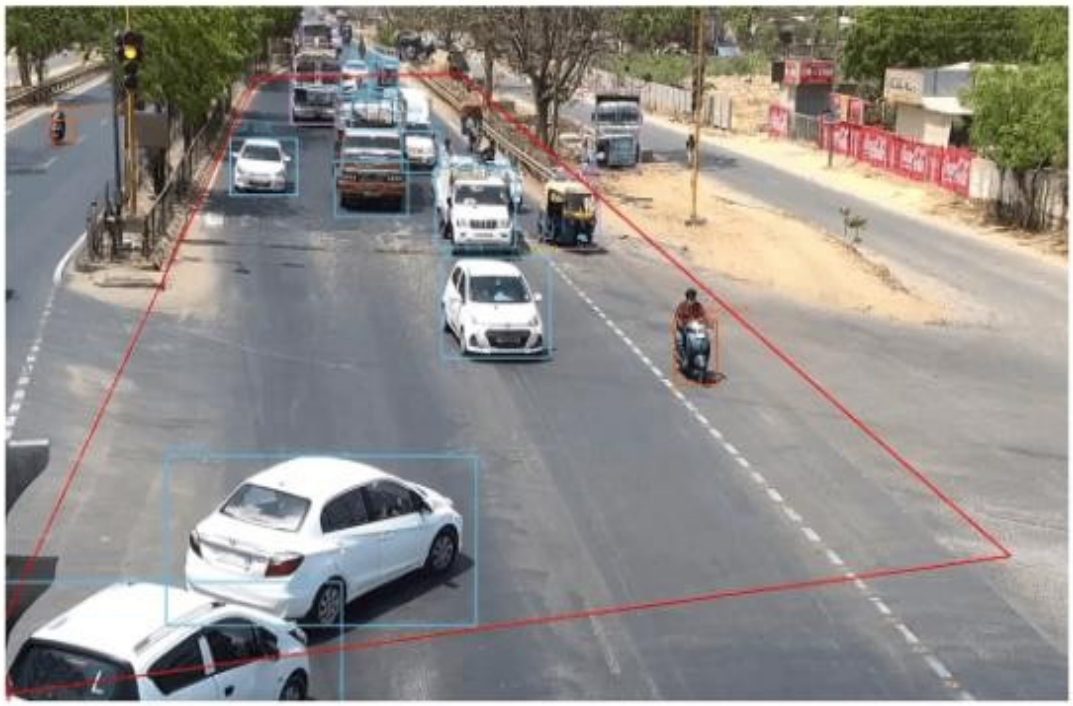

Fig1.Overview of Traffic Congestion Detection

c) ARCHITECTURE OF ALERTING AMBULANCE

Fig.1 explains how the alert message is sent to the android app of an ambulance driver. The GPS Neo 6m is connected to the ESP8266 Wi-Fi modulewhichisfixedinanambulance.ThecoordinatesfromGPSNeo6mofthemovingambulance are posted to the firebase database dynamically. The android app is developed is connected to the firebase database and used by the ambulance driver.Theambulancedriverlogintotheappusinghismobilenumber.Hepressesthe emergency button when there is a patient inside the ambulance. When the ambulance is 2kmaway.

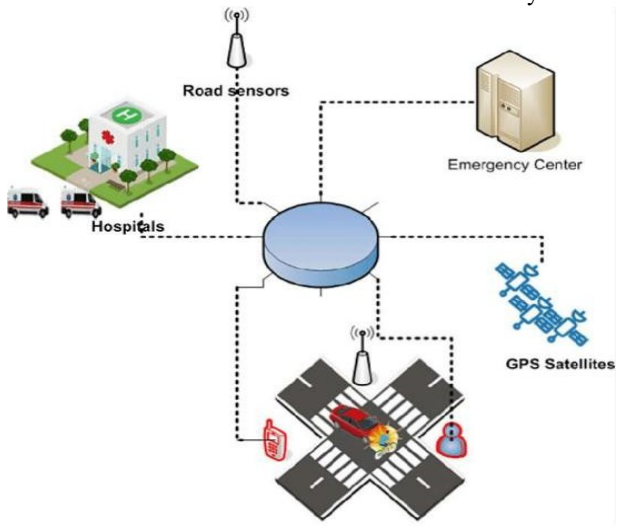

FIg2.Ambulance Alerting Architecture

d) EMERGENCY VECHILE PREEEMPTION

EVP systems are designed to give emergency response vehicles a green light on their approach to a signalized intersection while providing a red light to conflicting approaches. EVP allows fire trucks and ambulances to intervene in the normal operation of traffic control systems using wireless communications installed on traffic intersections and emergency vehicles .As the emergency vehicle approach esatrafficsignal,it is recognized by the traffic signal controller through light, radio waves, or sound. The normal green-yellow-and-red cycle can then be interrupted to change the light to green.

IV. PROPOSED SYSTEM

As we have mentioned to achieve the objectives of our work, Transmitter section will be in Ambulance vehicle with RF transmitter module activation. When the RF receiver signal receives the data then second section receive the data through RF receiver and turn traffic signals to green and remaining sides will turn red.

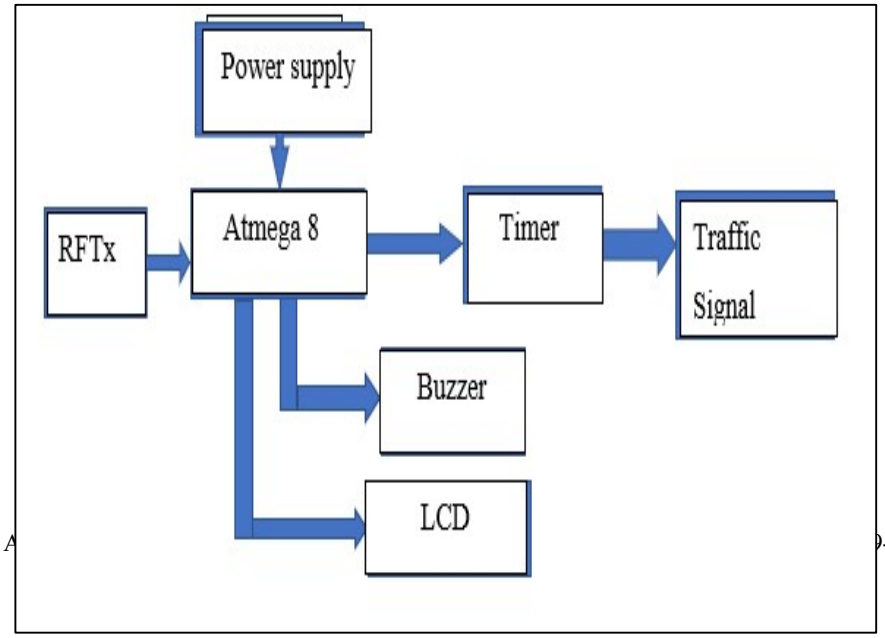

Fig3.Ambulance Alerting System

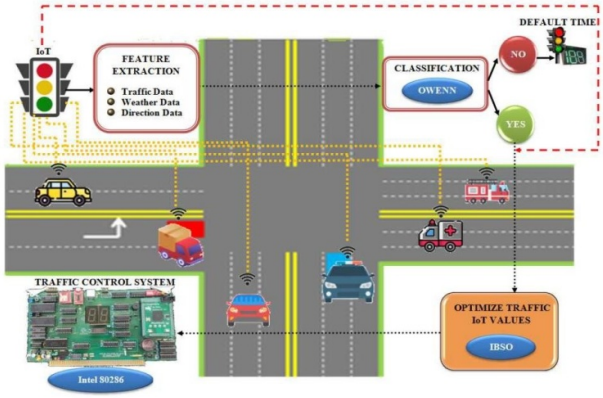

Fig4.Model Overview

In ambulance alerting system the alert message is sent to the android app of an ambulance driver. The GPS Neo 6m is connected to the ESP8266 Wi-Fi module which is fixed in an ambulance. The coordinates from GPS Neo 6m of the moving ambulance are posted to the firebase database dynamically. The android app is developed is connected to the firebase database and used by the ambulance driver. The ambulance driver login to the app using his mobile number. He presses the emergency button when there is a patient inside the ambulance. When the ambulance is 2km away.

a) ALERTING AMBULANCE

In this module, GPSneo6misconnectedtoESP8266whichisfixedinsideambulance. When the traffic congestion is detected, the road id of traffic lane is sent to firebase database. The coordinates of the ambulance are sent to firebasedatabasewhenitismovingifthereisemergency.Whenthedistancebetweentheambulancecoordinatesandcoordinatesofroadidretrievedfromfirebaseis2km, the alert notification is sent to ambulance android app.

b) AMBULANCE ANDROID APP

ThenameoftheandroidappdevelopedwhichisusedbytheambulancedriverisAmbulanceAlert.The app hast modules:
Register Module: The user registers with the app by giving his full name and valid phone number. The details will be stored in firebase. Anybody can register with the app but only the phone number of ambulance driver is given access to log in into the app.
Login Module: Theuserentersvalidphonenumberandclicksonthebuttontosendverification code to the entered phone number. If the permission to the entered phone number is given by the admin, the OTP is generated and sent which is then entered in verification code text box. If the entered OTP is correct, the verificationprocessissuccessfulandcanbeusedbytheambulancedriver.

c) BEHAVIOUR OF APPLICATIONDURING EMERGENCY

Afterthelogiinissuccessful,ascreenwithEmergencybuttonisopened.Ifthereispatientinsidetheambulanceorthereisemergency,theambulancedriverclicksonthatbutton.Ifthereistrafficcongestionin2kmradiusoftheambulance,alertnotificationissenttothatmobile.Onclickingthenotificationinnotificationbar, map is opened where it shows the red line on the traffic lane so that the ambulance driver would know about traffic congestion. If the permission is not granted to the entered phone number, a alert message popup saying Not a valid user! Until the admin grants permission to the phone number registered, it cannot be a valid user to use the app. If the entered phone number is not registered with the app for the first time, an alert message popup saying not registered!

d) PRIORITY CONTROL

A powerful platform for a gencyinter operability.
Onlysolutionthatallowsyoutoleverageexistinginfrastructureandintegrate multiple priority control technologies:
PS/radio
Infrared/light
A bletomanage, monitor andmaintainusageonareal-timebasistomaximizesystemperformanceandsecurity.

Proof positive past performance.

e) SYSTEM DESCRIPITION

The previously mentioned system has used a siren detection method to identify an ambulance and for health monitoring GSM modem is used to send apatient'shealthstatustothedoctorthroughatextSMS.Thelimitationwithsucha system is that there might occur any problem to detecting the ambulance siren if there is excessive noise on the road. Moreover, in some systems SMS is used to send patients' health conditions to the doctor so it cannot ensure continuoushealthmonitoringofthepatient.Intheproposedsystemforcontrollingthetrafficsignal, RFID technology is used.
These data are sent to a PC in the ambulance and then finally it is sent tothehospitalserverwiththehelpoftheinternet.TheSmartAmbulanceSystemisdivided into three parts shown in Figure 2.2. These areas are below: A. MobileApplication The mobile application will store the data of the user, patient, and hospital. The user will input the details such as name, address, gender, date of birth, blood group, contact number, health problem or symptoms of the patient, etc.
Users can register themselves as a patient also. Hospital details such as name, type of hospital, facilities given by the hospital, location, and emergency contact number will be stored in the application. Users can see hospital details from the app and based on the complication of the patient, the user can find or choose a hospital and can send a request for an ambulance from the application.

f) SMART AMBULANCE SYSTEM

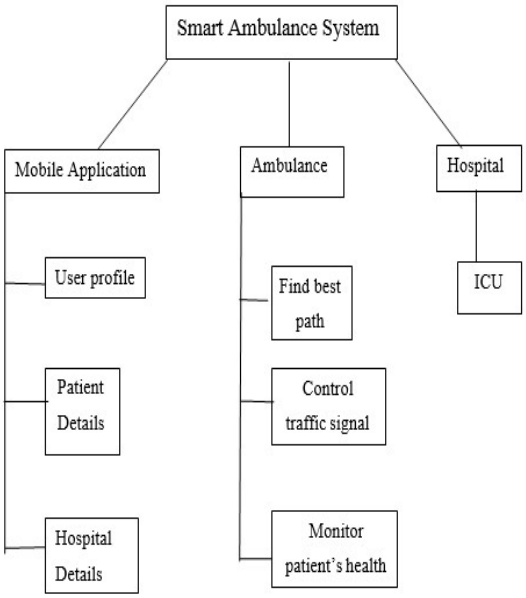

Fig5.Smart Ambulance System

g) AVAILABILITY OF AMBULANCE

After a user sends a request for an ambulance it will check the availability for an ambulance. If there is any available ambulance, then it will assign the ambulance to the user/patient. After the ambulance receives the patient, it will collect the data on the patients' health and will inform the doctors about the patients' condition. Then, based on the data hospital will prepare an ICU and the doctors will take the necessary steps for the treatment.

h) REDUCE TIME TO REACH HOSPITAL

The ambulance is the most important part of this system. Because it will perform several essential tasks at the same time. At first, when the ambulance receives a patient, it will find the best path using GPS so that it takes a minimumamountoftimetoreachthehospital.Theambulancecancontrolthetrafficsignal.Ifatrafficjamoccurs,thenitwil lautomaticallytransmitasignalthatcanchangetheredlighttothegreenlight.Itwillalsomonitorpatients'healthcondition sandtransmit the data to the hospital so that necessary arrangements can be taken before reaching the hospital.

i) TRAFFIC CONTROL SYSTEM

It is an intelligent traffic controlling system in which the ambulance cancontrol the traffic signal using Radio Frequency Identification technology. RFID is an acronym for Radio-Frequency Identification‖. It refers to a technologywhereby digital data encoded in RFID tags are captured by a reader via radio waves .A basic RFID system has mainly two parts. They are,
The actual Radio Frequency Identification component has two parts. For storing and processing information there is an integrated circuit and to receive and transmit a signal there is an antenna. The Radio Frequency Identification a has non-volatile memory storage that means it can store information when the power is off. A battery-assistive passive tag is used in the system that has a small board battery but is only activated when in the presence of an RFID reader. The ambulance will carry the Radio Frequency Identification tag for storing ambulance information and transmitting the signal.

j) RFID READE

The Radio Frequency Identification reader features a two-way radio transmitter-receiver which is also known as transceivers. Sometimes it is referred to as an interrogator. The transceiver passes a concealed radio signal to investigate the tag. The radio signal essentially triggers the tag. In turn, thetagtranspondermodifiestheradiosignalintousablepowerandrepliestothereader.In the proposed system the traffic signal unit will have the Radio Frequency Identification reader so that it can receive a Radio Frequency Identification tag from the ambulance. After receiving the Radio Frequency Identification tag them microcontroller will decode the Radio Frequency Identification signal and the traffic signal will be turned green. Thus, it will ensure the free pathway for the ambulance. For controlling traffic signals ATmega32P microcontroller has been used. The microcontroller will be at the receiver side will process the received commands by the Radio Frequency Identification reader and will switch the traffic light to a green signal immediately. The high-performance ATmega328Pis an 8-bit AVR RISC-based microcontroller that combines 32KB ISP flashmemory with read-while-write capabilities, 1024 EEPROM, 2KB SRAM, 23general purposes I/O lines, 32 general-purpose working registers, three flexible timer/counters with comparative modes, internal and external interrupts, serial programmable USART, 2-wire serial interface with a byte-oriented, SPI serial port, a 6- channel 10-bit A/D converter (8 channels in TQFP and QFN/MLF packages), programmable watch dog timer with internal oscillator ,and five software selectable power saving modes. The device operates from1.8-5.5volts. Because ATmega32P is reliable and can process a task very fast also the price is lower than other microcontroller ssoi tissue in the traffic control ling system.
In Fig.4, we can see that an ambulance is approaching the traffic signal. The ambulance is carrying an IR transmitter and Radio Frequency Identification tag and the traffic control unit contains Microcontroller, IR receiver, and Reader. We can also see that the current traffic signalized.

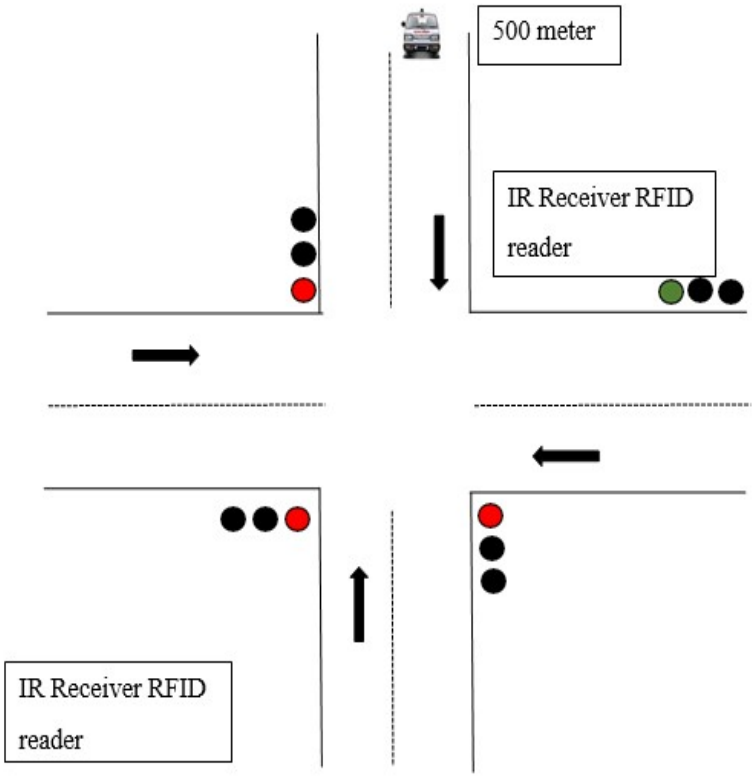

Fig6.Graphical View of controlling Traffic Signal-2

InFig.6.wecanseethatwhentheambulancepassesthetrafficsignalthecontrol unit again turns the green light to red light ensuring the safe and free path way for the ambulance. In this system, their transmitter and IR receiver are used to increase the duration of the green light. While crossing the traffic signal if the signal is green, the ambulance will send an IR signal to the control unit. Then the control unit will receive the IR signal through the IR receiver and will keep the green light for some time until the ambulance passes the traffic signal. This is how the traffic controlling system works in the system.

InFig.7wecanseethatwhentheambulancepassesthetrafficsignalthecontrol unit again turns the red light to green light ensuring the safe and free path way for the ambulance. In this system, the IR transmitter and IR receiver are used to increase the duration of the green light.

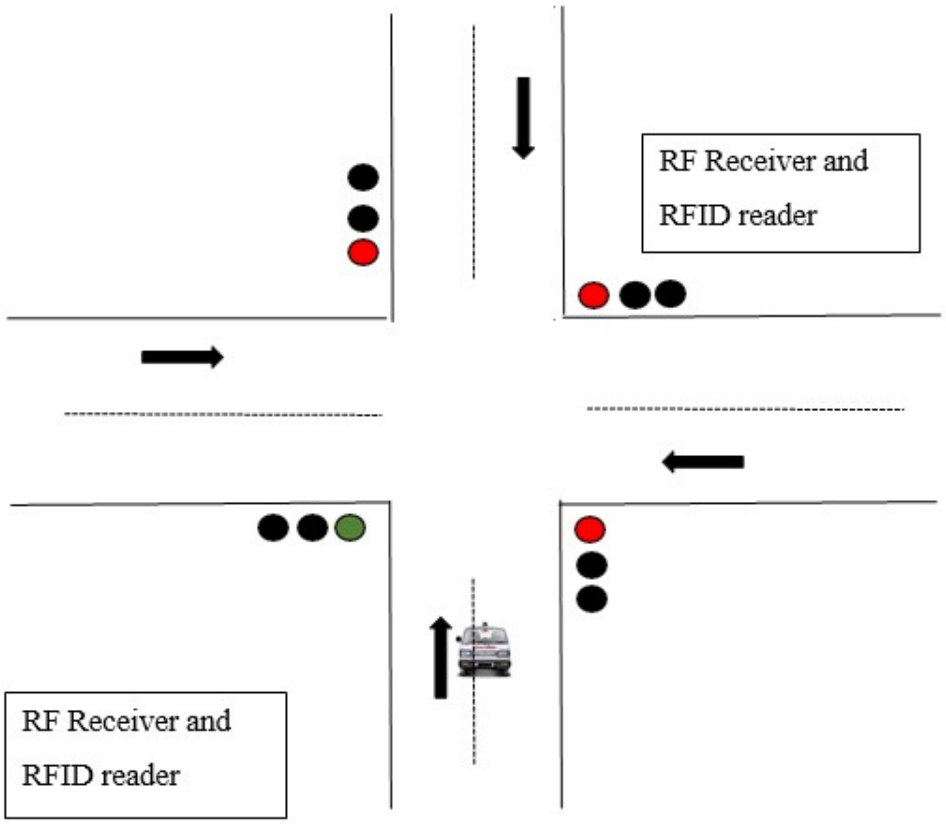

Fig7.Graphical view of controlling TrafficSignal-3

V. SMART AMBULANCE SYSTEM

Thesmartambulancesystem, the use wry creaaprofile in the mobile application with the necessary information .User scan the application, the user can send arequestforanambulance.Thenthehospitalserverwillcheckthatifthereisany available ambulance or not. If there is an available ambulance, the server will assign an ambulance for the user and will send the information of the ambulance other user.In the ambulance, there is GPS, ECG sensor, Heartbeat sensor, and Temperature sensor.

After receiving the patient, the ambulance will find the best path towards the hospital lusting GPS and it will monitor the patient's health using these sensors. Then it will send the data to the hospital server so that it canensure continuous monitoring of the patients 'health condition .Based on the data the hospital authority or the doctors can make necessary arrangements before the patient reaches the hospital. The ambulance can also control traffic signals using RFID technology. If traffic jam occurs and the ambulance reaches within the range of the RFID reader, then haem balance will send an RFID tag to the traffic control unit .The traffic control unit will receive the sign al using an RFID reader.

After receiving the signal, the microprocessor decodes the signal and turns there'd light to the greenlight.If the sign alisgreen when the ambulance reaches within the range of the RFID reader then the IR transmitter will transmit the IR signal from the ambulance. Then traffic control unit will receive the IR sign al using an IR receive and will tell the microcontroller to keep the green signal for some time .When the ambulance passes the traffic signal , the green light will automatically turn into red light. The system ensures an easy and free pathway for the ambulance. There is also a fingerprint sensor in the ambulance. If the ambulance receives any injured person whose identity is unknown then the fingerprint sensor can help to identify the persons' identity. After receiving the unknown injured person the fingerprint sensor will scan the fingerprint of the injured person and end the data to the hospital server .If the persons' information is tired in the server then the server will inform the injured persons' family members about the condition and the person will get proper treatment .As result, we can see that with the help of this smart ambulance system patients will get proper treatment in a minimum amount of time.

IoT Based Smart Ambulance System with Efficient Routing for Performance Environment In this concept of the

work, two different portions are going to be an analyzed for implementation together to facilitate efficiency and better advantage from the Ambulance service .As it can be seen that the aim for both of the portions is the same. Both are being as a system for the Internet of Things (IoT) which are sensor- based. An efficient Routing Protocol should be followed for better performance of the system where the ambulance can get to the destination or hospital in the smallest possible time Both the time and money will be saved by following an Efficient Routing Protocol on the system.

a) BLOCK DIAGRAM

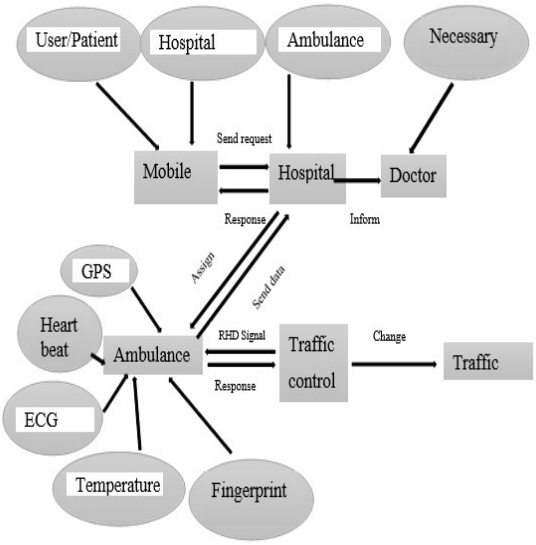

Fig8.Block diagram – Smart Ambulance System

b) Loading-IoT

The routing protocol is IoT sensor oriented named the Loading –IoT routing protocol.

Loading -IoT and Smart Ambulance System Overview:

The things which both the routing protocol of Loading-IoT and the Smart Ambulance System have been demonstrated in Table below.

SMART AMBULANCE	LOADng-IoT
Sensor-based system for authenticating and ambulance place detecting.	Sensor-oriented Efficient P2P reactive routing Protocol.
Traffic Lights turn green if it reaches a specific point of the road or path for a certain amount of time for the ambulance.	Routing Protocol that works on routing path discovery by sending the notification internally form the source to the destination.

Key Concern Of The Routing Protocol Loading- IoT: reactive routing system that works through point-to-point (P2P) system communication for data passage. [10] The routing is done ensuring the destination node discovery process of intercommunication of the network .The reason behind this routing should be implemented is that the system wants to have the shortest possible path finding routing protocol which would be best for the

ambulances' distance coverage. Also, it makes the traffic less congestion-free for the ambulance by the perfect and effective use of this efficient routing. The energy consumption and the amount of power dissipation are also less which makes this routing protocol quite sable for the smart ambulance system. Working Procedure of Loading-IoT in Smart Ambulance: When a smart ambulance wants to go to a specific destination the patient' targeted hospital. The Loading –IoT routing gives the best possible path to the hospital. Initially, it sends a notificationtothesensorinthedestinationnodewhichisthehospitalwillgettheRREQsignal from the place of the ambulance. Then the node in the hospital will be sending an RREP reply message to the ambulance or the source. As theconnectionisestablishedintheIoTsensornetworkthroughmessagepassing, an efficient path is calculated by the routing protocol for the sakeoftheambulance.Ifincaseanyerrorormiscommunicationoccursthedriverin the ambulance node will be notified by Loading –IoT 's RERR message .As this process will help all possible nodes in between the path of theambulance(source)andtheHospital(destination)thebestcoveringpathandthe fastest route to the hospital will be shown or become visible in all the intermediary sensor nodes of the path. Thus, the Loading-IoT routingprotocolhelpsthesmartambulancesystemtoavoidcongestionanddecreasethe path cost. The Efficient Route to the Destination: Let's assume the ambulance, the hospitals and all the possible path check points are the sensor nodes. Now the internet nodes and the simple nodes are different in the operations. The internet nodes in the network will help to pass the patient's condition through the internet to the targeted hospital. But the all possible routes will be compared by the Loading -IoT routing and direct the bestpossibleroutetothehospitalfromthepointofpickupofthepatient.Thusacongestion-free route to the hospital may be directed by the LOADng-IoTrouting.Theroutingsignalfromthesourcetodestinationwillbepassedandall the intermediary nodes will be aware of it. It can also help to get to the fastest way possible for the patient.

Thus the message passing and routing around the sensor networks through the internet and normal nodes will be less delay prone and the latency of both ends will be reduced by using this protocol. All it is needed to assign null the possible nodes (ambulance, patients, check points & hospitals) in the network. The short EST route will beneficial for this type flow network power service.

*Advantages of Using Loading -IoT***:** Loading –IoT is for low power network sin IoT so the energy consumption is less. Hence, it would be beneficial in terms of energy efficiency and cost-effectiveness. The routing may help the patient to reach the hospital faster as this routing protocol is less delay prone in a specific IoT network. The end-to-end latency in terms of communication nodes is very less. So, it can be faster to ensure P2P communication in this reactive routing system. The amount of communication data overhead will be less leading to a quality enhancement of efficiency for the service. As the ratio of delivery in Loading-IoT is less for its point-to-point communication and collision detection me chains in term so failure (by generating RERR), the throughput of the system will get increased by implementing the routing protocol in the system .The smart ambulance network would be implement able in both dense and sparse networks.

VI. COMPONENTS

a) HARDWARE COMPONENTS

- Power supply
- ATmega8microcontroller
- RF sensor
- Liquid crystal display
- IR Sensor

b) SOFTWARE REQUIREMENTS

- Platform-*AVRSTUDIO*
- In System Programmer –***ProgISP172***
- Compiler –Win AVR

c) APPLICATIONS

- Accident reporting
- Remote management

VII. RESULT AND DISCUSSION

Fig9.Working of Project

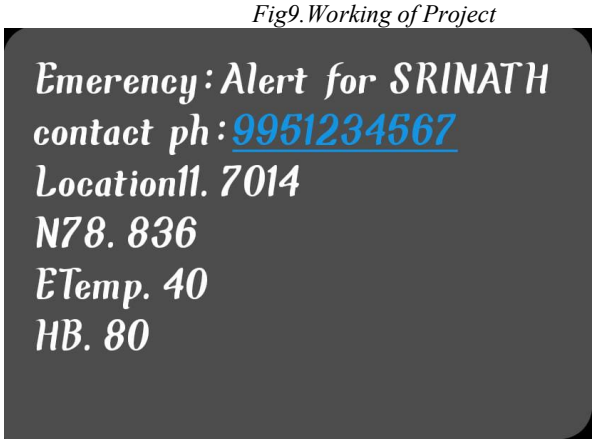

Fig10.Output of the Project

Hardware setup module of traffic clearance system. This is implemented by at mega 8 Module with having RF receiver antenna to control the traffic lights. This proposed hardware model is integrated input wireless module RF Receiver which operated 433MHz frequency and output modules LED Traffic signal board. All the input and output modules are integrated to Raspberry pi processor according to the predefined time the system will be function. We used 5v regulated power supply to power this hardware setup.

Powered on implemented output of the traffic system. This is implemented by at mega 8 Module with having RF receiver antenna to control the traffic lights. Normally we programmed that for every 10 sec the traffic signal change between RED to GREEN for to show the basic operation of the traffic system. When the RF receiver receive the data then any case of traffic signal should change to green indication to clear traffic for emergency vehicle called ambulance.

Transmitting section of RF system with four switches indicate that information for the traffic control signal by the ambulance. This RF transmitter is attached to emergency vehicle ambulance.

As a prototype we are demonstrating the four directions of NORTH, SOUTH, EAST and WEST we kept four switches. One of the switches in RF transmitter section indicated one traffic direction. If we press the first button data send to receiver then whichever the traffic signal is working don't care automatically traffic signals will indicate green signal corresponding direction.

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VII. CONCLUSION

The proposed smart ambulance system is designed based on a traffic control system and health monitoring system and relates it with the SDGs' achievable goals. Using this application, the ambulance will be able to reach the hospital without facing the trouble of traffic jams will help in optimization of the time taken by the ambulance. Moreover, with the help of Loading-IoT protocol in the health monitoring system, it is possible to send the current health status of the patient to the hospitals. So that the doctor can take necessary steps based on

the data before, the patient reaches the hospital. This smart ambulance system may lead to saving one precious life. Future work will focus on improving the existing systems' architecture. There are many high-priority vehicles on the road such as fire engines, police vehicles that requires to reach the destination in minimum delay. The traffic controlling system proposed in this report can be extended to these high-priority vehicles also. Another future work is to retrieve NID details by using the fingerprint sensor. So that it will be possible to collect the details of the injured person using a fingerprint if he/she is a citizen of this country

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