International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 10 Issue: 09| Sep 2023 www.irjet.net p-ISSN: 2395-0072

Automatic Ambulance Detection System in Traffic Signals Using IOT

Varun Karthik C S[1], J M Chinmai Jyothi[2], Vaishnavi D H[3] ,Dr.Jyothi R[4],Dr.Veena V Pattanakar[5]

[1]*Varun Karthik C S, Dept of CSE, Global Academy of Technology , Bangalore, India,*
[2] *J M Chinmai Jyothi, Dept of CSE, Global Academy of Technology, Bangalore, India,*
[3] *Vaishnavi D H, Dept of CSE, Global Academy of Technology , Bangalore, India,*
[4] *Dr. Jyothi R ,Associate Professor, Dept of CSE, Global Academy of Technology Bangalore, India,*
[5] *Dr.Veena V Pattanakar, Associate Professor, Dept of CSE, Global Academy of Technology, Bangalore, India*

Abstract - Ambulance detection in traffic signals has become majorly important to avoid unfortunate deaths midway to the hospital. Our project proposes a system that detects any ambulance nearby a traffic signal and clears the path ahead efficiently. The system will have four signal lights (Red, Yellow, Green, and Blue). The signal, when it detects an ambulance nearby, will turn on the green and blue light to indicate an ambulance is approaching and will clear the path for the ambulance.

Key Words: IoT, Radio Frequency, Microcontrollers, Arduino UNO, Transmitters, Receivers.

1.INTRODUCTION

It is important to develop a system that will help ambulances reach hospitals in a timely manner and help save precious lives in emergency cases. As a result, we have developed a system that will clear traffic on roads for ambulances. This system has RF transmitter and receiver modules that will be installed in ambulances as well as in traffic signals. When the ambulance approaches the nearby traffic signal pole, the signal lights will automatically turn green after the click of the Panic button which will be under the control of the ambulance driver. At that time even blue signal light also appears on all the sides of traffic signal pole to indicate that an ambulance is passing. After the ambulance passes the signal and reaches beyond the specified range, blue lights will turn off and the traffic lights will resume their regular operation. In our project, we have introduced a blue signal light with an ambulance symbol on the light, and when an ambulance passes by, it is displayed on all lanes' traffic signal poles. Along with that, the traffic light on the side in which the ambulance turns blue and green, and the lights on all other sides turn red indicating all other sides apart from the direction in which the ambulance passes, to stop in order to avoid accidents and for an easy movement of ambulance.

2. WORKING

To overcome the major traffic problem faced by patients inside an ambulance, we have come up with an idea called "Automatic Ambulance Detection System in Traffic Signals using IoT". This system uses RF (RADIO FREQUENCY) TRANSMITTERS AND RECEIVERS for communication. When the ambulance approaches the traffic signal in the specified range, ambulance driver needs to click on the Panic button installed within the RF transmitter inside the ambulance, at that time, that side of the signal from where the ambulance is passing automatically turns green as RF signals will be generated from transmitter to the RF receiver which will be installed inside the traffic signal pole. We have introduced a new feature of blue light with an ambulance symbol on it which will also turn on to indicate the ambulance coming. There would be RF transmitter module installed in ambulance and RF receiver module will be installed in traffic signal pole. Hence, when the ambulance reaches near the traffic signal junction, the RF transmitter module in the ambulance sends signal to the RF receiver module in the traffic signal pole which turns OFF the red light and turns ON the green and blue lights at the lane where the ambulance is passing and whereas for the other paths, the red and the blue light will be ON. The blue light here is switched on for all the sides of paths to indicate that an ambulance is passing by and to inform the other travelers not to do any signal jumps which can further increase the chaos. The purpose of switching on the blue light in all directions is to clearly indicate that no vehicle will be permitted to pass the signal under any condition. Normal traffic operations of signal lights before the occurrence of interrupt signal from the ambulance module is controlled via Arduino UNO Board. When the Panic button is pressed by ambulance driver, interrupt signal is generated by Arduino program which will pause the ongoing operations of the traffic lights, at that time green light is turned ON for the lane in which ambulance is passing and blue light is also turned ON for all the lanes. Timer boards are used to specify.

The amount of time for which interrupt needs to occur for the ambulance to pass freely in our prototype. After the ambulance passes the signal, Arduino Board resumes the traffic signal lights operation from where the interrupt had occurred. This ensures smooth operation and there is no hampering of the present system. This is a vital addition to the traffic signal operations for the ambulance to reach as early as possible to the hospital. Another purpose of switching on the blue light in all directions is to make it clear to the travelers and also for the pedestrians on the street as they can get confused by looking at the red light and try to cross the road. The blue light indication will overall prevent

confusions of any sort which will make it safe for the ambulance as well as others on the road. This in turn prevents accidents caused due to such confusions. According to our system, RF modules should be installed in all ambulance vehicles and traffic poles. After the ambulance passes through the signal and exceeds the specified range, the signal operations will be back to its normal operation and will resume from the point where the interrupt had occurred from the ambulance. This interrupt signal is generated programmatically in Arduino program. In this way, we make sure to ease the path for ambulance and help it reach the hospital as soon as possible. This will help save precious lives of many patients who fight between life and death, where every minute is considered precious. We, not only help the ambulance reach the hospital faster but also make sure there aren't any further misfortunate

incidents in the process. Hence, we can make sure that this new change will be completely safe and won't hinder any of the existing traffic rules. We can assure this because we are not allowing any commuter to get confused with any instructions as they will be clear enough to understand the indications. This system can be proved practical in the society. In addition to this, we are also introducing LCD display screen for the arrival of ambulance at a traffic junction, which further makes the people aware of ambulance approaching. Along with this, we can also use buzzers to alert the people to indicate the ambulance when the Panic button is pressed. In our prototype we have used Relay boards for voltage regulation for the safety of components.

We make use of radio frequency modules, RF signals for communication and LED lights for the implementation. Our main objective is to make the path of the ambulance smoother and thereby making it reach the area of accidents and the nearest hospital faster without any delay caused due to excessive traffic in high intensity areas. Our important feature is the introduction of new blue light with ambulance symbol along with existing three signal lights which are red, yellow, and green.

The main area of application of this system is in our society. We can implement this system in all the traffic signal junctions which makes the ambulance reach faster to the hospitals or to the patient who is required immediate attention. This will help the patient receive medical aid in time. This system will help patients under any circumstances like an accident or a cardiac arrest of high intensity where the "Golden hour" of patients is very important. This idea is purely for the societal concerns.

3. TECHNICAL DESCRIPTION

In our project we aim for detection of arrival of Ambulance from a distance of 100 Feet from the traffic signal junction wirelessly and clearing of the signal with green light for Ambulance to pass through without any delays due to traffic jams. This project is mainly built on two separate units: the Transmitter unit, and the receiver unit.

The RF transmission system makes use of a receiver/transmitter (Rx/Tx) pair that operates at 434 MHz. The transmitter module receives serial input and transmits it through RF. The receiver receives sent signals and transmits them to a module located far away from the source of transmission. A radio frequency (RF) signal begins as an alternating current (AC) signal created by a transmitter. The Ambulance is outfitted with an RF transmitter and is controlled by a microcontroller inside the traffic signal pole. The Traffic Signal pole is equipped with an RF receiver, and the traffic signals are controlled by a microcontroller based on the data from the receiver. This microcontroller will also be installed inside the traffic signal pole. The RF transmitter sends the RF signal whenever the ambulance driver taps on the panic button provided in the ambulance.

Power supply of 12 / 6 volts is provided to the Arduino board using a DC Adaptor.

The system also consists of an LCD display unit of dimension 16 x 2 bits which displays the status of Ambulance coming and passing the traffic junction. LCD Pins are connected to the pins of Arduino. Here LCD is used in the 4 data bits mode. Interrupt pins 0 and 1 are used for the commands to receive from the RF Transmitter which is placed on the Ambulance body at a far distance.

Basically the RF modules are 433 MHz RF transmitter and receiver modules. The transmitter draws no power when transmitting logic zero while fully suppressing the carrier frequency thus consume significantly low power in battery operation. When logic one is sent carrier is fully on to about 4.5mA with a 3volts power supply. The data is sent serially from the transmitter which is received by the tuned receiver. Transmitter and the receiver are duly interfaced to two microcontrollers for data transfer.

The signal lights will be sequentially lit in the junction at a 5 seconds delay. Once the ambulance is approaching the traffic signal pole and the traffic signal at the direction in which the ambulance is approaching is red, the ambulance driver has to press the panic button provided in the ambulance. Once the panic button is pressed by the ambulance driver, transmitter board present in the ambulance transmits interrupt signals to the Arduino board. By this, the program loaded to the Arduino board which will be executing normal traffic lights operation, gets an interrupt and ambulance detection code snippet is executed. The Arduino board indicates the receiver board to receive the transmitted signals from the transmitter end, this turns the traffic signal at the direction of which the ambulance is approaching to blue and green for 7 counts. At that time blue light turns ON at other sides of the traffic junction as well to indicate the other travellers that an ambulance is arriving and to remain patient without doing signal jumps due to confusion. The

time can be programmed and is not a fixed value. After the Ambulance passes the traffic signal junction, the traffic lights resume back to its normal operations from where it had received an interrupt.

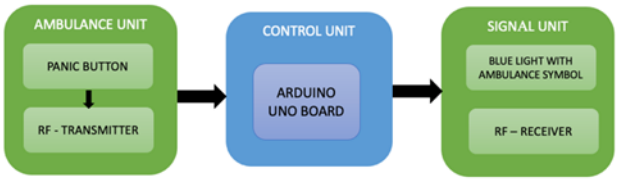


Fig 1. Flow of work – Ambulance Detection

Here in this system, on pressing the panic button, Two operations are performed: the blue light in which the ambulance symbol is implanted starts glowing, and the buzzer connected to the microcontroller(Arduino UNO Board) installed inside traffic signal pole is also activated. This buzzer is an additional indication to the other travellers for the arrival of ambulance at the traffic signal junction to avoid confusions. This buzzer is generated till the ambulance passes the traffic signal and moves away from the signal .After the ambulance passes the junction ,the buzzer will also

Stop. For the delay purpose we are using ON Delay timers. These delay timers can be used everywhere where timing needs to be controlled. The timer includes 4 delay timing cycles: ON delay, ON OFF cyclic, OFF ON cyclic and OFF delay. Out of which we are using ON Delay Mode for the Timer. The timing range is from one second to one hour. In our project we have used 7 seconds delay which can be controlled and adopted to the existing system of traffic signals. The time is adjusted using POT. For the voltage regulation we are using Relay boards. A single channel relay module is a convenient board which can be used to control high voltage and high current loads. This makes use of an electromagnet used for regulating the voltage. We are also making use of a DC to DC converter which is LM2596 DC-DC Buck Converter. It is an adjustable step down power supply module which takes an input voltage of 3.2 volts to 40 Volt DC, end output voltage of 1.25 volts to 35 volts DC. This converter can take inputs in both AC or DC form and convert it to DC voltage.

4. CIRCUIT DIAGRAM

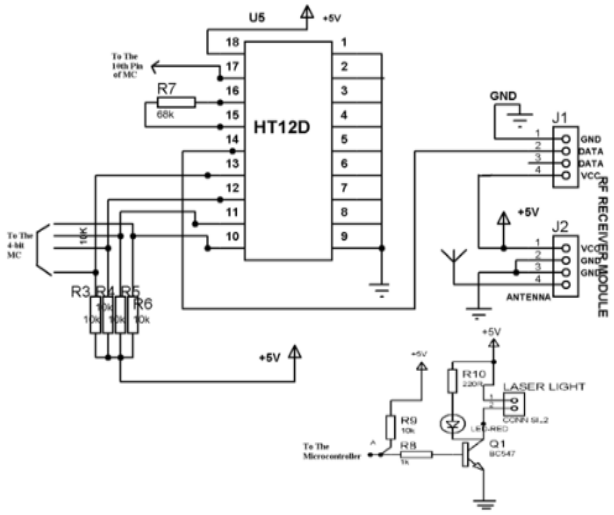


Fig 2. Pin configuration

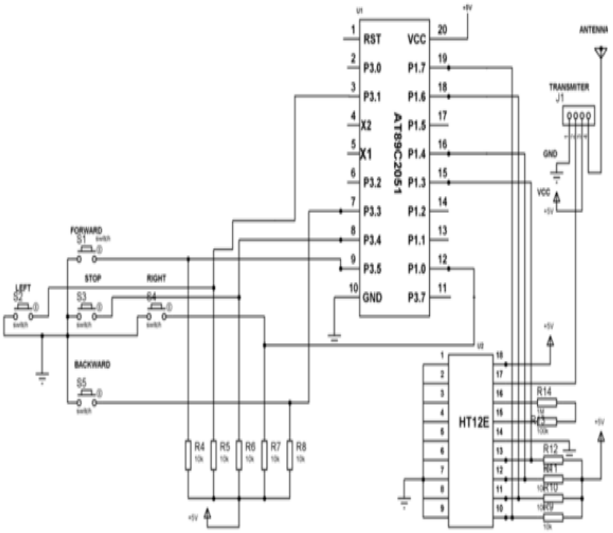


Fig 3. RF Receiver module

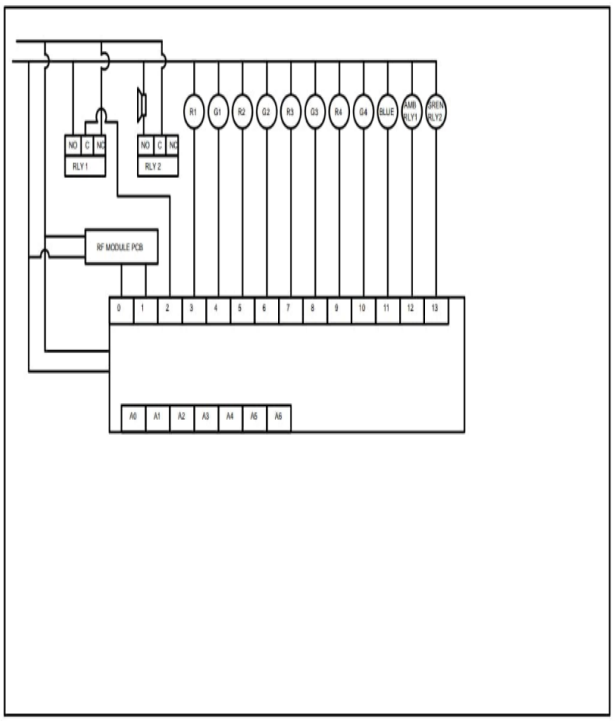
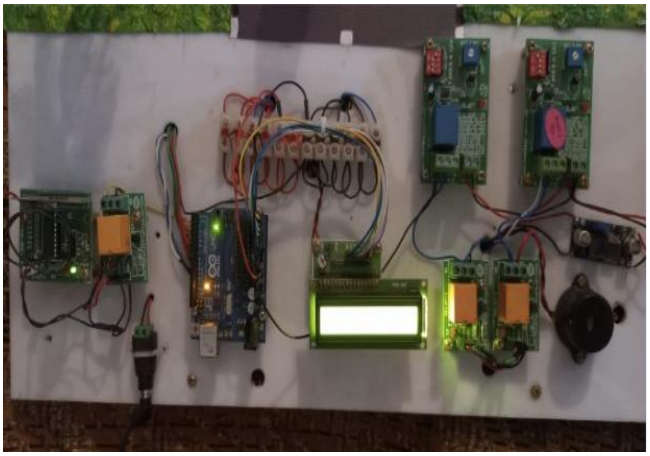


Fig 4: Arduino Board connections

5. RESULTS

Snapshot 1: Overview of Ambulance approaching the signal in the prototype

Snapshot 2: The traffic lights in the project. Red, Green and Blue



Snapshot 3: Components used in the project prototype

6. SCENARIOS

First scenario: First scenario possible is two ambulances approaching the same traffic junction at the same given time. When this scenario occurs, the system will work in a systematic way. Priority number will be given to the ambulances sequentially. Whichever ambulance reaches the junction first and presses the Panic button will get the first priority followed by the second .After the ambulance with first priority number passes, the second priority numbered ambulance gets the green light to pass.

Second scenario: This can be when two ambulances approach the same signal in the same direction. In this case as well, the ambulance getting first priority number will be permitted and as soon as the first priority numbered ambulance goes out of range, the next connection will be accepted and the second priority numbered ambulance will be permitted to move.

7. FUTURE ENHANCEMENTS

In future enhancements, for the purpose of implementation in real time, we will be intstalling transceivers which is used for both transmission and receiving of RF signals for the sake of communication. More microntrollers can also be utilized for making the operation flawless and smoother. Separate transceivers can be installed in each signal light for decreasing the complexities during situations where two ambulances arrive at same traffic junction. It also prevents a situation where there are chances of multiple RF receivers reacting to a single ambulance which could cause chaos. So in order to prevent all these it is better to install transceivers and microcontrollers in each signal pole. Timers are also installed for each signal pole incase if there is a need to reset the timers after the ambulance passes the signal. All these transceivers and timers can be connected to the microcontrollers installed in each signal pole. These microcontrollers can be programmed according to the needs. Concept of Interrupts can be used in programs when there are two ambulances arriving at a junction for a disciplined and faster operation.

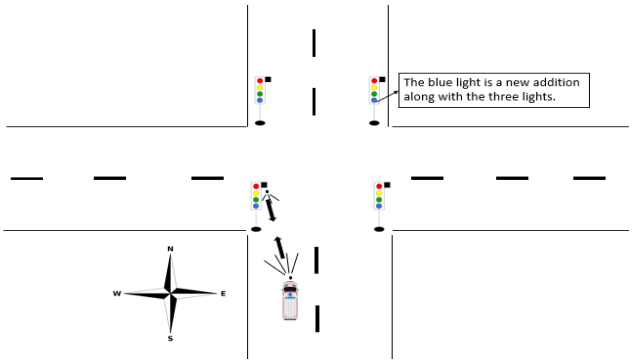


Fig 5. Phase one – Ambulance headding towards signal.

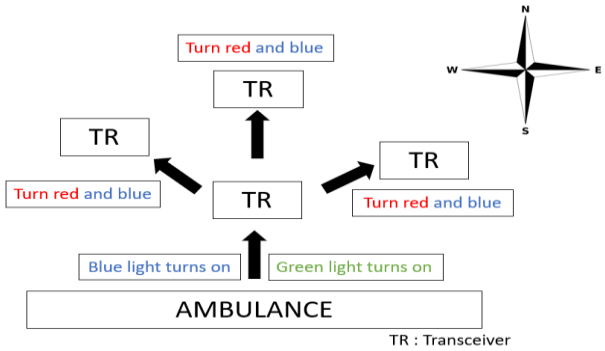


Fig 6. Signals sent to transceivers

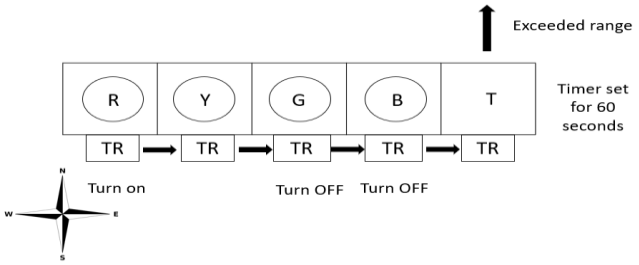


Fig 7. Exceeded Range

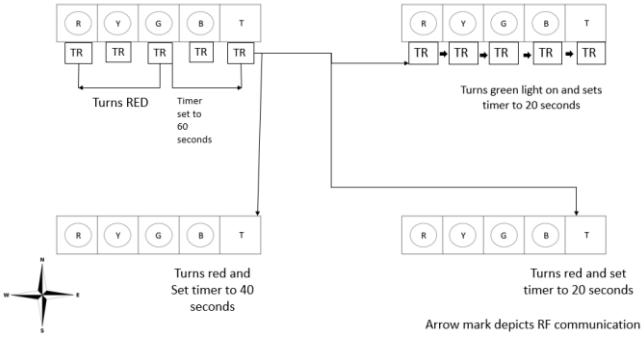


Fig 8. Flow of commute to next terminals

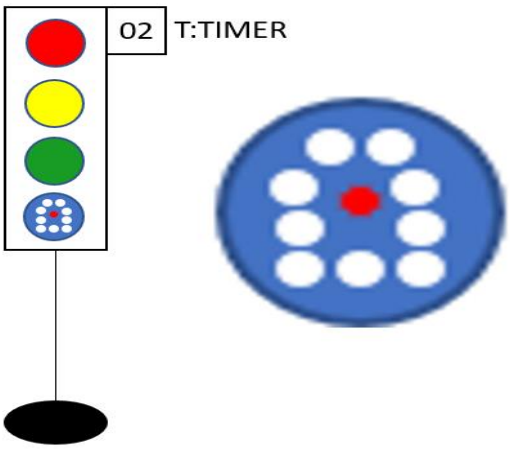


Fig 9. The new traffic signal proposition

REFERENCES

[1]. Philo Stephy A, Preethi C and K.Mohana Prasad, "Analysis of Vehicle Activities and Live Streaming using IOT" , 2019

[2]. https://robocraze.com/blogs/post/how-433mhz-rf-module-works-interfacing-with-arduino

[3]. "The Second Machine Age: Work, Progress and Prosperity in a Time of Brilliant Technologies" by Erik Brynjolfsson and Andrew McAfee

[4]. "The Internet of Things" by Samuel Greeng