

## REAL TIME TRAFFIC LIGHT CONTROLLING USING EMBEDDED SYSTEM

Dr.A.RANGANAYAKULU <sup>(1)</sup>, Mr.D.SATYANARAYANA <sup>(2)</sup>, VARRA ARCHANA <sup>(3)</sup>, GUNJE LAVANYA <sup>(4)</sup>,

GOGU MAHESWARI <sup>(5)</sup>, GOCHIPATHALA NIKHITHA <sup>(6)</sup>

<sup>1,2</sup> Faculty ECE Department, Krishna Chaitanya Institute of Technology & Sciences- Markapur, AP, India.

<sup>3,4,5,6</sup> Student, ECE Department, Krishna Chaitanya Institute of Technology & Sciences, Markapur, AP, India.

### ABSTRACT

The development of an traffic signal control (TSC) system is needed because present traffic light controllers are based on old microcontrollers such as AT89C51 which has very less internal memory and no in-built ADC. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This frequency range varies between 30 kHz & 300 GHz. This type of modulation is an Amplitude Shift Keying (ASK). the TSC system will be able to deal two basic problem of traditional traffic light system: i) Detection of traffic volume by using genetic algorithm. ii) Emergence vehicle detection such as ambulance, police etc. by using wireless sensor network (RF) embedded at the signal intersection. As the problem of urban traffic congestion spreads, there is a pressing need for the introduction of advanced technology and equipment to improve the state of the art of traffic control. Traffic problem now a days are increasing because of the growing number of vehicles and the limited resources provided by current infrastructures. The simplest way for controlling a traffic light uses a timer for each phase. Another way is to use electronic sensors in order to detect vehicles and produce signals that cycles. We propose a system for controlling the traffic lights by Embedded systems. The system will detect vehicles through instead of using electronic sensors embedded in the pavement. A camera will be installed alongside the traffic light It will capture Embedded systems. The embedded Systems will then be analyzed using digital image processing for vehicle detection, and according to traffic conditions on the road traffic light can be controlled. In developing countries like India, the population is significantly growing. As the population grows, the number of vehicles on the roads is also exponentially increasing, which results in an increase in road accidents and traffic congestion. Specifically, when an emergency vehicle such as Ambulance or Fire engine gets stuck in traffic jam, saving the human life becomes difficult. Under such circumstances, a promising system which can clear the traffic congestion, especially in peak hours and thereby providing a safe path for emergency vehicles is very essential. In the existing literature, less focus is given towards the problem of providing a clear path for emergency vehicles during traffic congestion. To solve these issues, an RF sensor and RFID-based system is proposed, which manages and regulates the traffic signals at junctions when the emergency vehicle arrives, by allowing the easy passage out of the traffic congestion. The proposed framework is modeled by means of an experimental setup using ARDUINO NANO and LEDs which simulates a real time traffic scenario. RF sensors are installed on the roads to manage the traffic efficiently.

### I INTRODUCTION

Traffic congestion is a condition on road transport networks that occurs as usage increases and is characterized by slower speeds and increased vehicular queuing. The most common example is the physical use of roads by

vehicles today as shown in Figure 1 below. When traffic density is high, it slows down the speed of the traffic flow and this results in traffic congestion. Traffic congestion is an ever increasing problem on our roadways and city streets. The main contribution of this survey is a taxonomy of adaptive traffic signal control strategies achieved through various levels of vehicular communications. Strategies to optimize traffic signals fall into three categories based on the level of vehicle involvement. The first category involves those strategies that utilize legacy devices with no vehicular involvement. The second category comprises those strategies that utilize vehicles on the road to wirelessly transmit data about themselves (e.g. location, velocity). The third category involves strategies that utilize the vehicles' on-board computation power to help optimize traffic signals. The bulk of this survey deals with the second category as it appears to be the most prevalent in the research literature. We are however, quick to point out that the third category seems to be gaining momentum, as the prevalence of smartphones has suggested supplementing legacy traffic monitoring with traffic-related reports submitted by the driving public.

## II LITERATURE SURVEY

The exponential growth in the amount of traffic every year has elevated the need for the design of an intelligent traffic control system. A lot of research is going around the world in order to invent novel approaches and innovative systems to solve this problem. The car waiting time at a junction, the extension of the waiting cars along the lane, the optimal timing slots for green, yellow, and red lights that best fit the real and veritable situation and the efficient combination of routing. As a result, various methodologies have been proposed and are being worked upon in the literature. Authors have proposed various IoT based system models that are focused on identifying the traffic density. Models have also been proposed for clearing traffics to let emergency vehicles pass the dense traffic in order to reach the site of action quickly. The system proposed in focuses on calculating the traffic density using IR. It also provides a model to aid in clearing traffic for emergency vehicles. They propose to do this manually by giving a handheld device to the traffic officer that would enable the officer to control the traffic. The proposed system though has some drawbacks. The system uses RFID technology to detect emergency vehicles. Each vehicle is proposed to have an RFID tag installed in them, including emergency vehicles. RFID readers are installed near traffic signals to detect RFID tags belonging to emergency vehicles. Once emergency vehicles are detected, signals are changed appropriately to help emergency vehicles to pass through the traffic. Though the system is very efficient in detecting emergency vehicles and creating a path for them, it still has some major drawbacks. The RFID tags are required to be read by RFID readers installed near traffic signals and in order for this to happen the vehicle is required to be in the range of RFID readers. The problem here is that currently, the range of RFID readers is only a few meters. The maximum range that can be offered by RFID is 100 meters but the tags and readers to enable it are too expensive to be implemented at a large scale. In addition to this, the average length of traffic jams in metropolitan cities has increased to 150 to 250 meters. Even if we ignore the cost and are able to increase the range, we are faced with yet another difficulty.

## III EXISTING SYSTEM

In the existing system, the traffic signal runs normally as per the timers fixed to the traffic lights. • In this system, there is no Emergency-Vehicle-Detection. So generally when the Vehicles like Ambulance/Fire Truck/Police Car stuck in the Traffic and waiting for the signal to turn Green, the traffic signal will act upon the timer which is Pre-Programmed. So they have to wait in the traffic till the signal turns green.

## IV PROPOSED SYSTEM

In the New system, we are proposing a way to detect the vehicles and classify them into two categories as Emergency-Vehicles and Regular Vehicles.

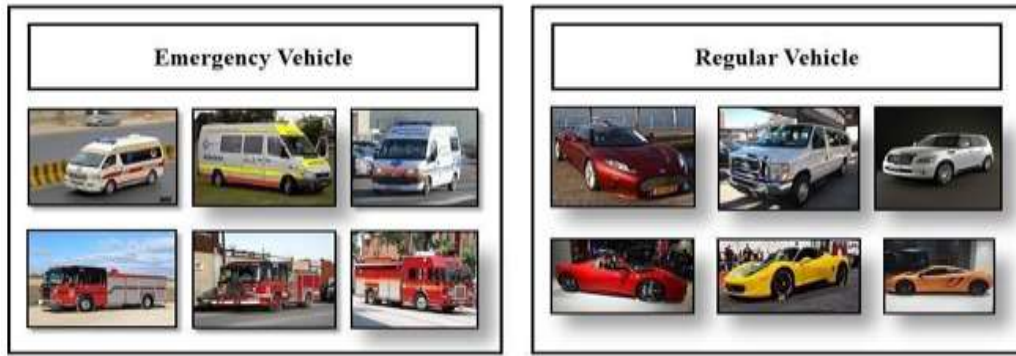


Fig 1: vehicles differentiation

From the above figure it is clear that the all vehicles can be differentiated into two categories First one is the emergency vehicles and other is emergency vehicles.

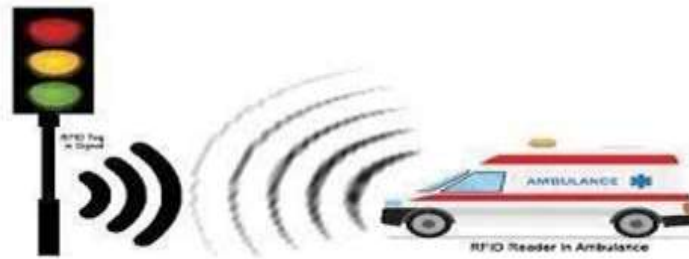


Fig 2: RFID reader and RFID tag

RFID tags are placing at signal poles and RFID Reader is fixing in the Emergency vehicles like (Ambulance, fire engine etc.) are detected then the traffic signalling is automatically changes to Red to Green. The priority will be given depends on which directions traffic density is more, and with which direction emergency vehicle is detected. RFID always transmits radio waves to the RFID receiver, the Receiver can receives that signals and checks whether the data is valid or not.

**BLOCK DIAGRAM**

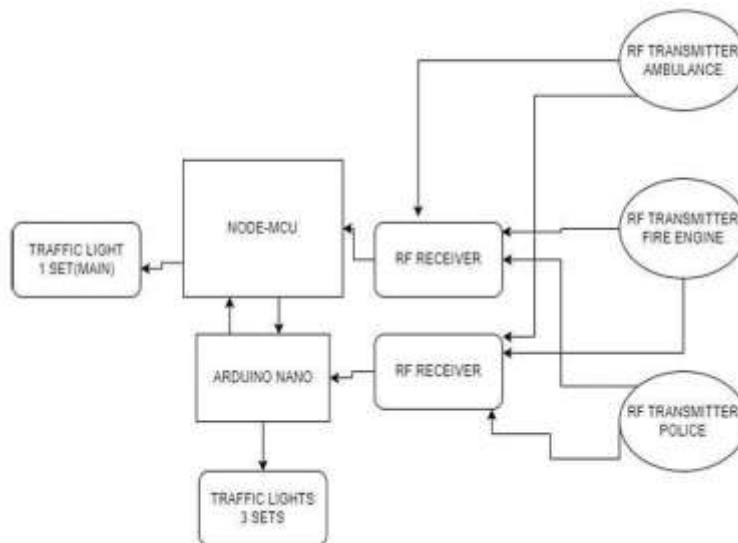


Fig 3: Block Diagram Of REAL TIME TRAFFIC CONTROL SYSTEM

## WORKING PRINCIPLE

The block diagram illustrates an RF-based emergency vehicle priority system designed to improve traffic management by giving precedence to emergency vehicles such as ambulances, fire engines, and police vehicles. The system incorporates RF transmitters installed in emergency vehicles, which continuously send signals when they are in proximity to an intersection. These signals are received by RF receivers positioned at traffic signals, ensuring real-time detection of emergency vehicles. At the core of the system is the Node MCU, which functions as the primary controller, processing incoming signals from the RF receivers and adjusting the main traffic light set accordingly. Alongside the Node MCU, an Arduino Nano is used to control three additional sets of traffic lights, ensuring smooth coordination of the entire intersection. When an RF transmitter from an emergency vehicle sends a signal, the corresponding RF receiver captures it and transmits the data to the Node MCU. The Node MCU then overrides the usual traffic light cycle and switches the respective traffic light to green, allowing the emergency vehicle to pass without delay. Simultaneously, the Arduino Nano adjusts the remaining traffic lights to maintain proper traffic flow while minimizing disruptions for other vehicles. By integrating IoT-based smart traffic control mechanisms, this system significantly enhances urban traffic management. It reduces emergency response time, ensures faster clearance of roads for critical situations, and helps prevent congestion at busy intersections. Additionally, the automation of traffic signal adjustments eliminates the need for manual intervention, making the process more efficient and reliable. Ultimately, this system enhances road safety and operational efficiency, contributing to a smarter and more responsive urban infrastructure.

## V RESULTS

A working prototype has been successfully developed. The interfacing of the various components like IR sensors, LCD, is successful. The moving vehicles through the particular lane are detected by using IR sensors. Immediate information is sent to the microcontroller regarding density of the traffic and timing is changed accordingly. RFID TAGs are placed at signal poles and RFID Reader is fixed in the Emergency vehicles like (Ambulance, fire engine etc) are detected then the traffic signalling is automatically changes Red to Green.

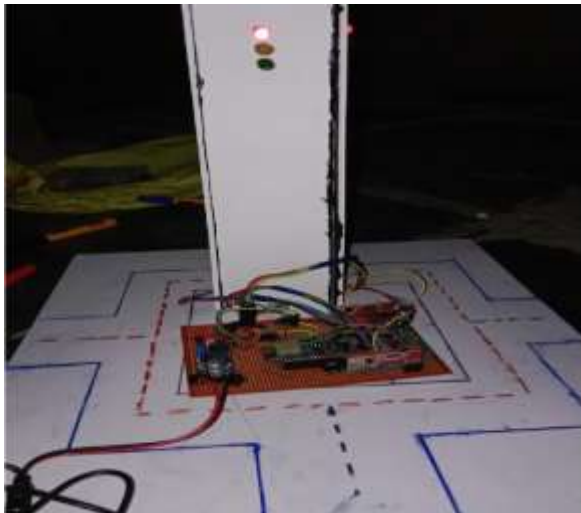


Fig 4: OUTPUT AT DIRECTION -1

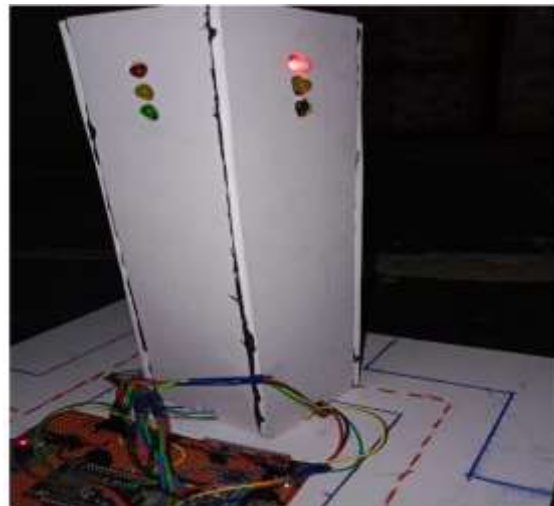
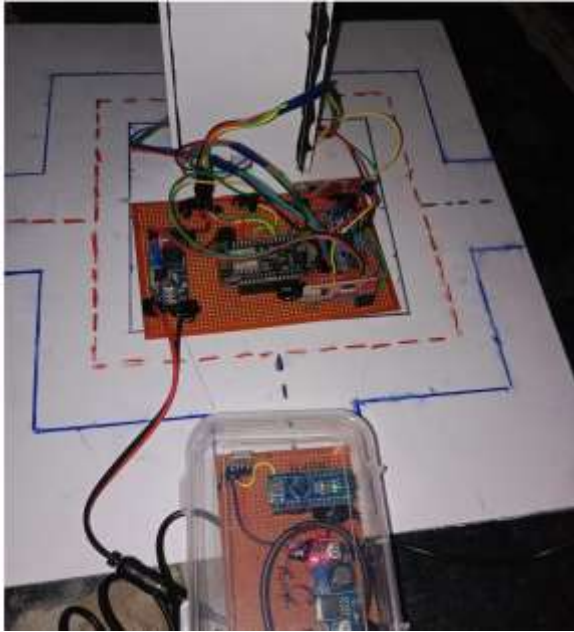
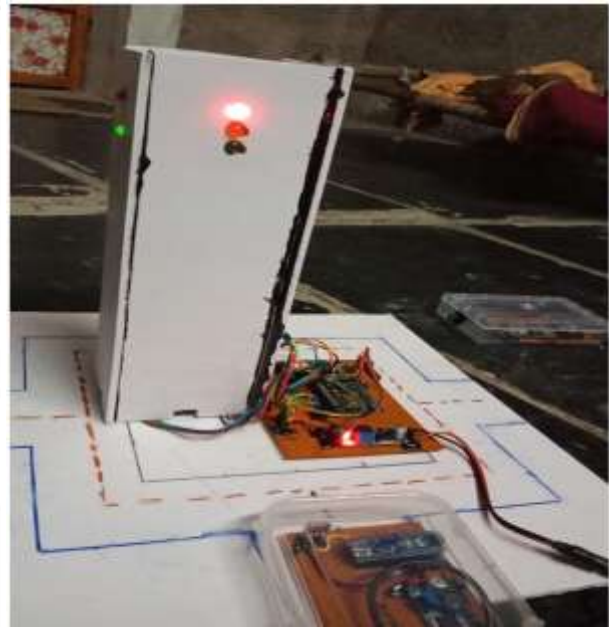


Fig 5: OUTPUT AT DIRECTION -2



**Fig 6:when Emergency vehicle detect**



**Fig 7:when Emergency vehicle not detected**

## VI CONCLUSION

In this system, real-time traffic assistance to ambulances is realized through maximum utilization of resources that IoT can offer while keeping the design as simple as possible. The proposed design aids in providing high-quality ambulance service to the patients, thus saving their lives. The proposed system has the potential to change how the services are offered to patients. It can flourish to be an integral part of city management by expanding its use to multiple aspects of challenges that might present themselves. The development and installation of the system are cost- efficient and can be easily relied upon.

## VII REFERENCES

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