iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** III **Month of publication:** March 2022

DOI: https://doi.org/10.22214/ijraset.2022.40575

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue III Mar 2022- Available at www.ijraset.com

Intelligent Traffic Control System for Congestion Control, Ambulance Clearance and Stolen Vehicle Detection

Mohammed Saiem Akther G[1], Prof. Arun Raj S.R[2]
[1, 2]*Department of Electronics and Communication, UBDTCE, Davanagere, India*

Abstract: ***Over the years, the number of vehicles has increased dramatically, which has led to serious problems such as traffic jams, accidents, and many other problems, as cities turn into smart cities. In recent years, traffic jams have become one of the main challenges for engineers and designers to create an intelligent traffic management system capable of effectively detecting and reducing the overall density of traffic in most urban areas. This paper presents an intelligent traffic control system to pass emergency vehicles smoothly. Each individual vehicle is equipped with special RFID tag (placed at a strategic location), which makes it impossible to remove or destroy. We use RFID reader, NSK EDK-125–TTL and PIC16F877A system-on-chip to read the RFID tags attached to the vehicle. It counts number of vehicles that passes on a particular path during a specified duration. It also determines the network congestion, and hence the green light duration for that path. If the RFID-tag-read belongs to the stolen vehicle, then a message is sent using GSM SIM300 to the police control room. Also, when an ambulance is approaching the junction, it will communicate to the traffic controller in the junction to turn on the green light. This module uses ZigBee modules on CC2500 and PIC16F877A system-on-chip for wireless communications between the ambulance and traffic controller. The prototype was tested under different combinations of inputs in our wireless communication laboratory and experimental results were found as expected.***

Keywords: ZigBee, CC2500, GSM, SIM300, PIC16F877A, Ambulance Vehicle, Stolen Vehicle, Congestion Control, Traffic Junction.

I. INTRODUCTION

India is next to China in highest population plus it's a rapid increasing economy. This is considering awful road clogging troubles in their cities. Infrastructure development is sluggish as evaluated to growth among amount of vehicles, since space plus price are restricted. In addition, our traffic is non- lane type plus disordered. In improved countries, this requires traffic control solutions that are dissimilar. Traffic flows' clever management may reduce harmful result like clogging. During latest time, wireless networks are extensively utilized among road transport since these offer extra price efficient choices. Technologies like ZigBee, RFID plus GSM is utilized among traffic management for giving economically efficient answers.

This is wireless technology that utilizes radio frequency electromagnetic power for carrying information among RFID tag plus RFID reader. Few of these systems may simply operate inside range inches otherwise centimetres, whilst others have 100 meters (300 feet) range otherwise further. GSM modem is specific modem kind that recognizes SIM card plus functions on mobile operator's payment, similar to mobile phone. AT orders are utilized for controlling modems. Such instructions come by Hayes commands which are used from Hayes smart modems. ZigBee functions on low-power plus may be utilized on every layer of work combinations for performing assigned jobs. This functions among ISM bands (868 MHz within Europe, 915 MHz within USA plus Australia, 2.4 GHz within other countries). Information spread speeds vary between 20 Kilobits/second within 868 MHz frequency range to 250 Kilobits/second within 2.4 GHz frequency range. ZigBee utilizes eleven channels for 868/915 MHz radio frequency plus sixteen channels for 2.4 GHz radio frequency. Additionally this utilizes two channel combinations, CSMA/CA plus placed CSMA/CA [1].

Fundamental Aim to actualize this framework is to distinguish Emergency vehicle like Ambulance utilizing RFID innovation and following stolen vehicle. In customary framework, they utilize image processing to recognize crisis vehicles. Inconvenience of this framework is amid terrible climate conditions. In stormy season or in windy season, picture captured by the camera gets bended. So it's hard to recognize required vehicle and hence we actualize Reliable RFID based framework which gives continuous system correspondence regardless of the possibility that the climate condition is bad [2].

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue III Mar 2022- Available at www.ijraset.com

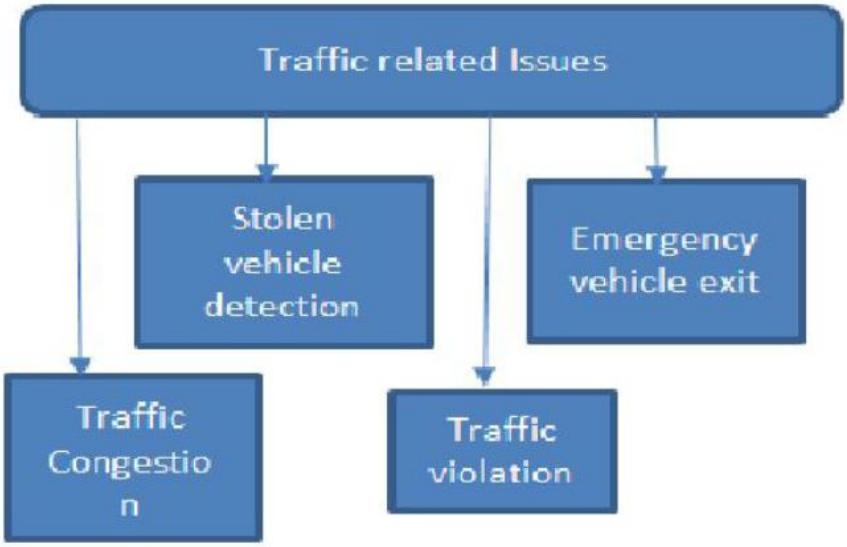


Fig 1: Traffic issues

Advance features of RFID, GSM give practical answer for past framework. For that reason, we will use RFID Tag to recognize stolen vehicle, emergency vehicle. RFID is a unique innovation that utilizes radio recurrence to convey data between the RFID tag and RFID reader. RFID tag is accessible in two sort Active RFID tag and Passive RFID tag. We are utilizing Passive RFID tag.

A. Applications

1) Manual maintenance of traffic will be reduced.
2) The projected system gives traffic compactness with reasonable precision additionally the travelling speed is calculated by tracking information as well.
3) Possessing measured density and speed together we effortlessly set traffic signals to green. Based on the selected threshold value signals are set by the system.
4) Priority will be given in accordance to the vehicle density in the road based on selected threshold value signals are set by the system.
5) Free way for ambulance will be provided.

B. Advantages

1) Traffic maintenance will be easy.
2) In this project auto signal controlling system will be installed.
3) As it works on density of vehicles traffic can be managed.
4) Separate signal control for ambulance helps in reaching hospital as early as possible.
5) Timing of signals can be changed so that priority to smoothen traffic is done.
6) Reduce fuel consumption.
7) It improves public transport service.

II. LITERATURE SURVEY

In [3], the authors proposed an intelligent traffic control system based on the design of a wireless sensor network (WSN) in order to collect data on road traffic and also on available parking spaces in a smart city. In addition, the proposed system has innovative services that allow drivers to view the traffic rate and the number of available parking spaces to their destination remotely using an Android mobile application to avoid traffic jams and to take another alternative route to avoid getting stuck and also to make it easier for drivers when looking for a free parking space to avoid unnecessary trips. Our system integrates three smart subsystems connected to each other (crossroad management, parking space management, and a mobile application) in order to connect citizens to a smart city [3].

In [4], a new intelligent traffic control system is presented, which is based on the deployment of wireless sensor networks on roads, on traffic lights, and on specific places (such as hospitals and petrol pumps) in order to monitor road traffic in the city and find the shortest route to the destination in terms of time and distance, avoiding traffic jams. This system employs intelligent cameras on the roads to identify the vehicle numbers and send this information to the central system to monitor the cars in the city. The proposed system uses more recent technologies which allow the interconnection of the various urban services between them by creating a smart city. However, the deployment of smart cameras can be expensive and also less effective, especially when detecting the numbers of cars in cases where there are visibility problems such as the reflection of light from car headlights, given that there are other cheaper and efficient solutions such as RFID technology which interacts with WSN networks and which allows vehicles to send this information to the central system in a sustainable and efficient way.

In [5], the authors propose an intelligent traffic congestion control based on the deployment of wireless sensor networks in order to measure the density of road congestion created at road crossings. This system consists of two modules. The first is TDMM (traffic density monitoring module) which uses an ultrasonic sensor to measure the length of the queue created by the crowd of cars, and the second is TMM (traffic management module) which is software deployed in a computer which makes it possible to control the traffic lights according to the data collected by the various TDMM implemented in the roads. The TDMM deployed on each road in a road crossing send their collected data to their nearest TMM via Wi-Fi using multihop or single-hop communication depending on the communication range in order to determine the density of road congestion (strong, medium, or low) and dynamically define the operating time of the traffic lights according to the values obtained from the different routes. This system uses a self-organization protocol which creates a nonautonomous tree type topology between the different nodes, of which each monitoring node communicates via a single hop with the nearest node which in turn communicates with the sink node via intermediate nodes to transmit data to the traffic management module. However, the nonautonomous tree structure formed by this system creates an imbalance in the energy consumption between the various monitoring nodes, especially for the intermediate nodes, and also, it decreases the quality of data delivery to the central node when one of the routing nodes becomes faulty or exhausted in energy. In addition, the deployment of ultrasonic sensors should only be used on roads with little traffic and moderate traffic. Car vehicle detection on multiple lanes with roadside ultrasonic sensors is subject to a reduction in detection accuracy in heavy traffic. This can cause a system stability problem, especially during peak hours with heavy traffic, which can lead to poor decisions when estimating the running time of traffic lights.

The authors in [6] propose a system for monitoring road traffic based on mobile devices and Bluetooth beacons with low energy consumption. The vehicle detection offered by this system uses mobile devices (for example, smartphones) installed on the side of the road to measure the strength of the RSSI signal when receiving radio frequency frames emitted by Bluetooth beacons on the other across the street. Bluetooth beacons are installed along the road at different heights in order to identify and classify the type of vehicles traveling on the road (cars or trucks). The RSSI values detected by mobile devices on each route as well as their positions are sent via a cellular network or Wi-Fi communication to a server in order to measure the density of road congestion and monitor traffic on the roads. On the other hand, Bluetooth technology can cause major synchronization problems and communication breakdowns between the BLE beacon and the smartphone, which negatively affect the feasibility of the system, especially in the case of heavy traffic. So, an agent must be on-site to pair the two devices to resume communication.

The authors in [7] present a new intelligent traffic monitoring and traffic light control system based on wireless sensor networks. These sensor nodes are installed along the roads constituting a road intersection. The data captured by the sensors is sent to a two-traffic signal controller to assess the congestion conditions of traffic on each road at an intersection and to predict the state of traffic jams. This system uses a self-organization protocol (Alg5) which creates a star topology between the different nodes of the network. However, the algorithm adopted by this system will create dark areas for certain nodes far from their associated central node which they will not be able to communicate with it and which will cause degradation in the quality and in the feasibility of this system. This solution makes it possible to dynamically manage the traffic lights according to the states of traffic congestion obtained in an intersection and also makes it possible to optimize the synchronization phase of traffic light control in order to avoid traffic jams before its formation. The intelligence of this system remains beyond the reach of drivers and citizens because they do not interact with the remote system and also do not connect to roads in real time. The authors in [8] describe a new intelligent system of adaptive traffic light control based on the deployment of the wireless sensor network (WSN) in the roadways leading to an intersection. These nodes are magnetic sensors installed in the ground along all the paths that form an intersection. These sensors form a cluster-type network topology in which each node detects the presence of vehicles and sends the data to the nearest head cluster to reach the base station. The data collected by the WSN is used by the base station by running an algorithm to detect the rate of traffic congestion in each lane and dynamically control the traffic lights at the road intersection.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue III Mar 2022- Available at www.ijraset.com

III.METHODOLOGY

According to vehicles quantity entering among each road, signal will change. The vehicle can be sensed using RFID and that tallies vehicles quantity plus will transmit information through transmitter to micro controller.

An emergency switch will be given for the ambulance to use in case of emergency and it is pressed the ambulance broadcasts a signal and traffic signal will become green after RFID reader examines RFID tag, which evaluates it with stolen RFIDs record. If it's a match then a SMS is conveyed to police control room plus alters traffic light to red, resulting in stopping of vehicle in traffic intersection plus neighbouring police will take suitable action.

A. Block Diagram

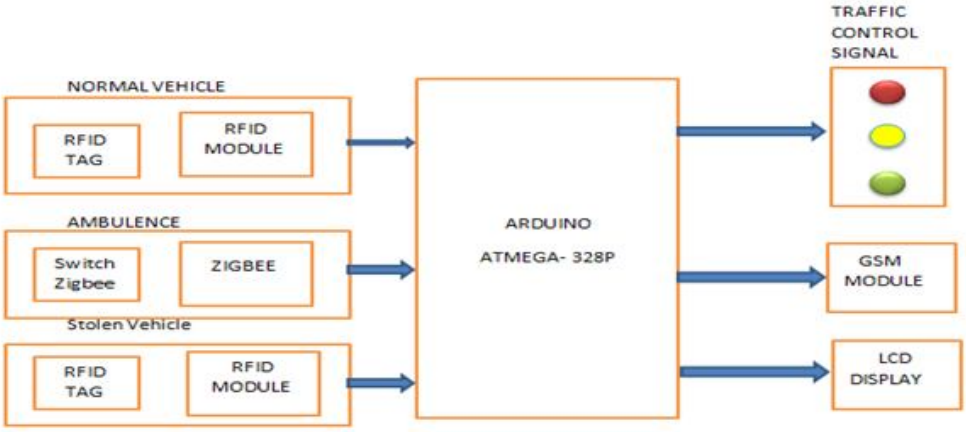


Fig 2: Traffic control system's block diagram.

B. Working of the Project

Fig 2 depicts whole project's block diagram, here we have used RFID tag and reader which are placed at the path of respective circle where this RFID reader are used to count number of vehicles, when the vehicle count is greater than the threshold distance from the path of the micro controller give the green signal for the highly dense path. It is also used to provide green path for the ambulance using zigbee network by switch provided to ambulance and also used for detection of stolen vehicle if RFID Tag read is of theft vehicle which is when SMS is conveyed utilizing GSM S 300 to police control room.

C. Intelligent Traffic System

1) Automatic Signal Control System

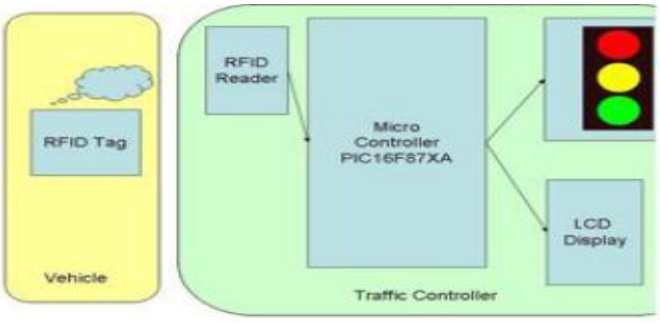


Fig 3: Automatic signal control system's block diagram.

Here, utilized an inert RFID tag plus an RFID reader having a frequency of 125 kHz for the purpose of the experiment. When the vehicle enters the recipient's category, an RFID tag sends exclusive RFID for reader. Microcontroller associated with RFID reader calculates RFID tag examined within 120 seconds. In favor of test purposes, if tally is larger than 10, green light period will be placed at Thirty sec, and when the count is among 5 plus 9, green light period will be placed at 20 sec. When count <5, green light period will be placed at 10 sec. Red light keeps going up to 10 sec plus the orange light up to 2 sec. Diagram three application of programmed signal manage plus taken vehicle recognition framework.

2) Stolen Vehicle Detection System

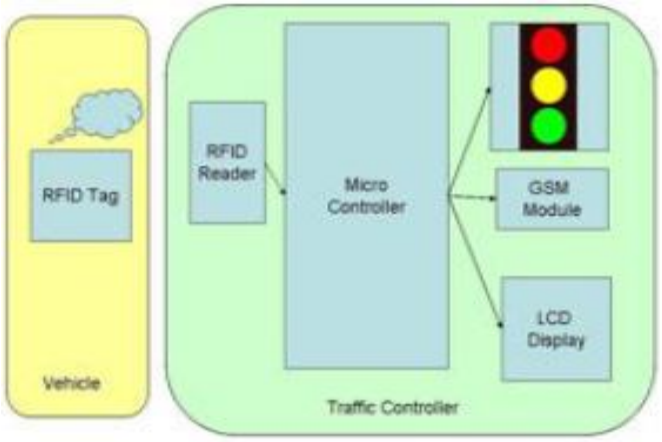


Fig 4: Block diagram for stolen vehicle detection

In this section, for testing purpose, we compare the unique RFID tag read by the RFID reader to the stolen RFIDs stored in the system. If a match is found, the traffic light immediately turns red for 30 seconds. Additionally, an SMS is sent using the GSM SIM300 module specifying the RFID number. The LCD display will show the presence of a stolen vehicle as shown in Fig 4.

3) Emergency Vehicle Clearance System

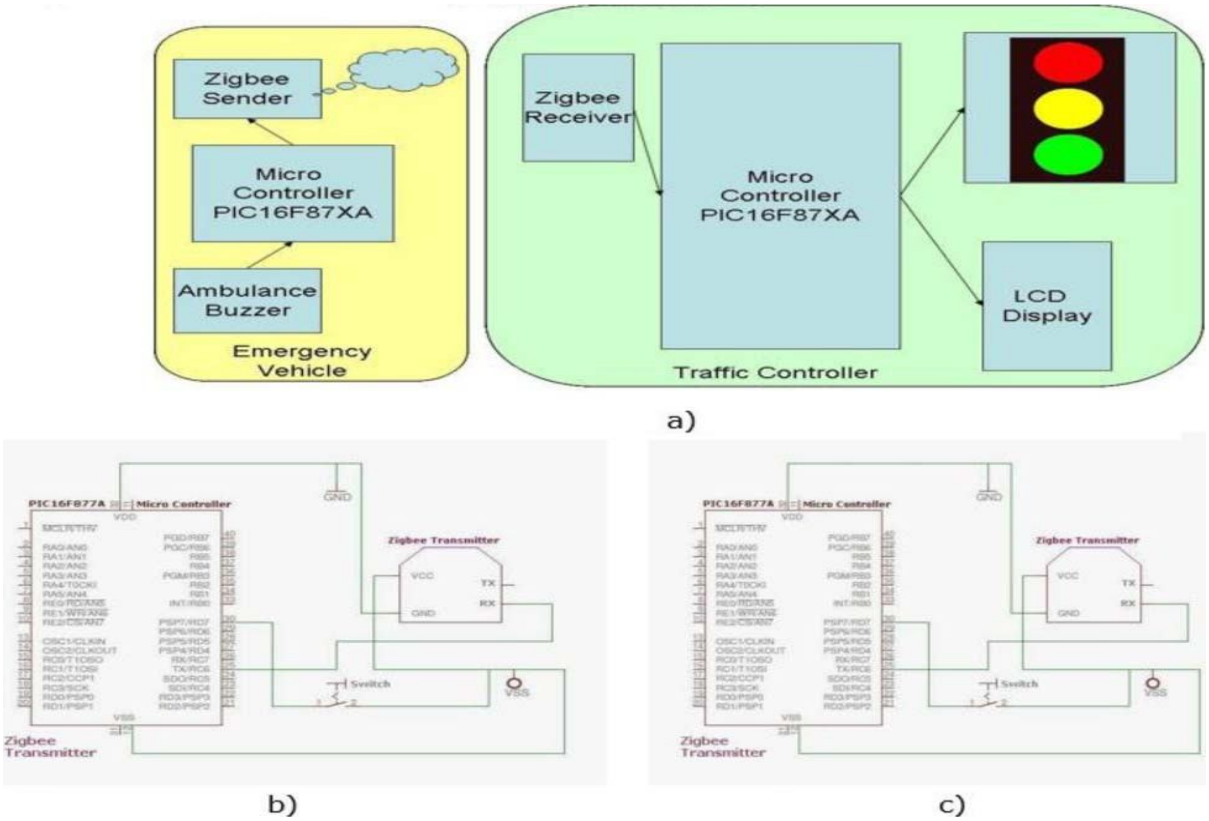


Fig.5: Ambulance applications. (a) Emergency vehicle clearance's block diagram. (b) ZigBee transmitter's PIN Diagram. (c) ZigBee receiver's PIN Diagram.

In this module, there are 2 parts, first part which is ZigBee transmitter is placed in the emergency vehicle. When the switch is pressed, it will transmit the signal. The signal contains unique id and security code. The transmitter contains PIC16F877A microcontroller and ZigBee module. The microcontroller sends the commands and data to the ZigBee via serial communication. Second part is the receiver, which is placed at traffic pole. It also contains PIC16F877A microcontroller and ZigBee module. The receiver compares the security code received to the security code present in its database. If it matches, then it will turn the green light on. For testing purpose, we used short range RFID reader in our prototype. First, the receiver part is turned on. The red and green signal will be on for 10 seconds duration and orange light will be on for 2 seconds duration one after the other. Secondly, we bring the RFID of stolen vehicle into the range of RFID reader. Then the signal will turn to red for duration of 30 seconds and a SMS is received. Thirdly, we bring 12 RFIDs into the range of RFID reader, and then the green light duration will change to 30 seconds. Fourthly, we bring an emergency vehicle carrying ZigBee transmitter into the range of ZigBee receiver, and then the traffic light will change to green till the receiver receives the ZigBee signal as shown in Fig 5.

IV. EXPERIMENTAL RESULTS

The results of the study are shown below.

Here, we have discussed about the present traffic system and providing green signals for the highly densed path by giving more counts to the regular timer using the RFID transmitter and receiver and by providing continuously green path for the ambulance and the traffic in the path of that ambulance is cleared.

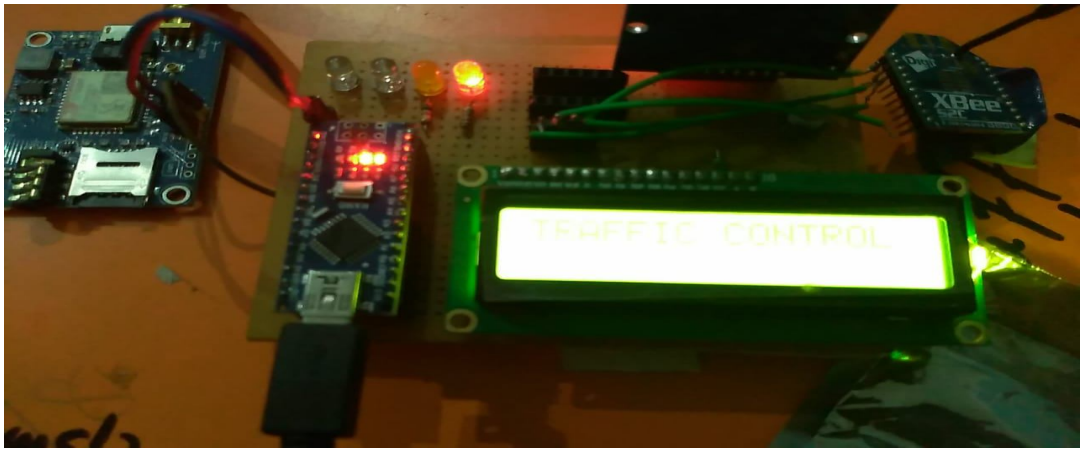


Fig 6: overall model of our project

The above figure shows the overall model which is designed to provide free path way for ambulance, providing green signals for highly densed path and also for stolen vehicle detection

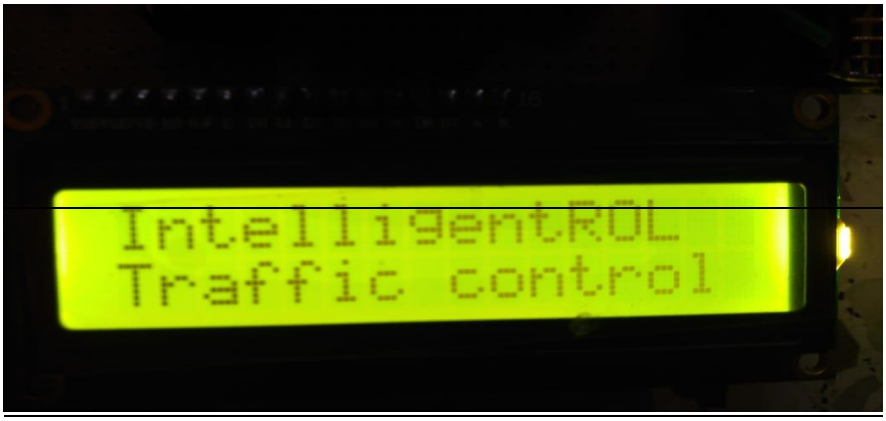


Fig 7: Display of LCD when traffic is dense

The above figure shows intelligent traffic control that is depending upon the number of vehicle suppose the vehicle is 1,2,3,4,5 it gives 5sec and it <10 it gives 10sec and <15 it gives 15sec.

Fig 8: LCD Display when ambulance enters

Above figure shows the LCD display status, when an ambulance coming near to junction.

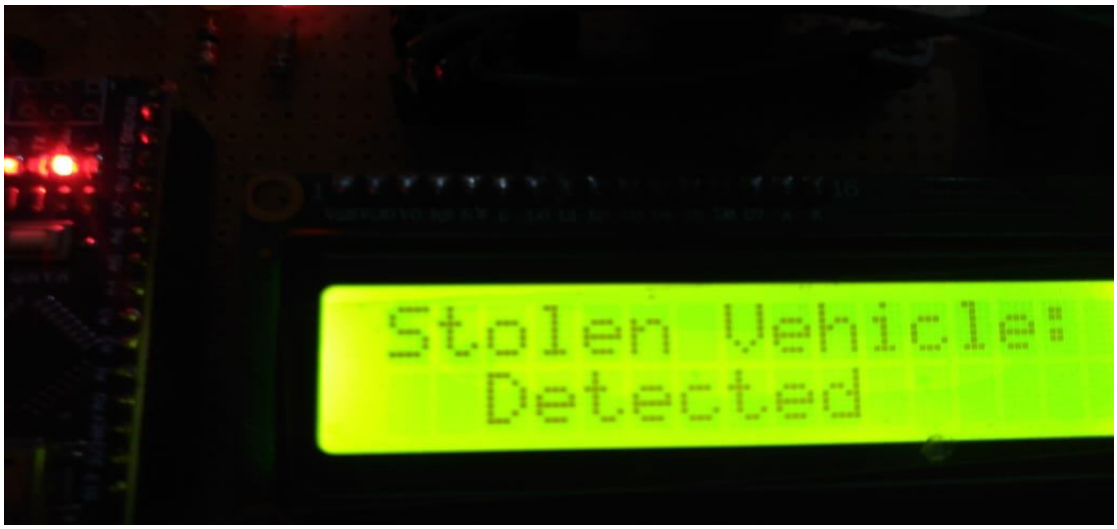


Fig 9: LCD Display when stolen vehicle detected

The above figure shows the that stolen vehicle is detected, then the signal turns to red and the information is send using the gsm sim300 to the nearest police station.

IV. CONCLUSION

As the whole system is automated, it requires less human mediation. With stolen vehicle discovery conceivable intersections ready message notice sending done alongside ringer sign. Emergency vehicles like ambulance need to achieve their goals at the most punctual. In the event that they invest a considerable measure of energy in congested roads. With crisis vehicle freedom, the activity flag swings to green and the length of the crisis vehicle is holding up in the movement intersection. The signal swings to red, simply after the crisis vehicle goes through. As of now, it is actualized framework by thinking of one as street of the activity intersection. In future for improve framework we Add ZIGBEE Module to upgrade framework As ZIGBEE extremely helpful in remote sensor

arrange. We can utilize Road Divider idea. At the point when activity thickness High at one side Divider will move to another side for leeway of movement.

V. FUTURE ENHANCEMENT

Further enhancements can be done to the prototype by testing it with longer range RFID readers. Also GPS can be placed into the stolen vehicle detection module, so that the exact location of stolen vehicle is known. Currently, we have implemented system by considering one road of the traffic junction. It can be improved by extending to all the roads in a multi- road junction.

REFERENCES

[1] R. Sundar, S. Hebbar and V. Golla, "Implementing Intelligent Traffic Control System for Congestion Control, Ambulance Clearance, and Stolen Vehicle Detection," in IEEE Sensors Journal, vol. 15, no. 2, pp. 1109-1113, Feb. 2015, doi: 10.1109/JSEN.2014.2360288.

[2] Kulkarni, S. S., & Ade, D. R. (2017). Intelligent Traffic Control System Implementation for Traffic Violation Control, Congestion Control and Stolen Vehicle Detection. International Journal of Recent Contributions from Engineering, Science & IT (iJES), 5(2), pp. 57–71.

[3] Adil Hilmani, Abderrahim Maizate, Larbi Hassouni, "Automated Real-Time Intelligent Traffic Control System for Smart Cities Using Wireless Sensor Networks", Wireless Communications and Mobile Computing, vol. 2020, Article ID 8841893, 28 pages, 2020. https://doi.org/10.1155/2020/8841893

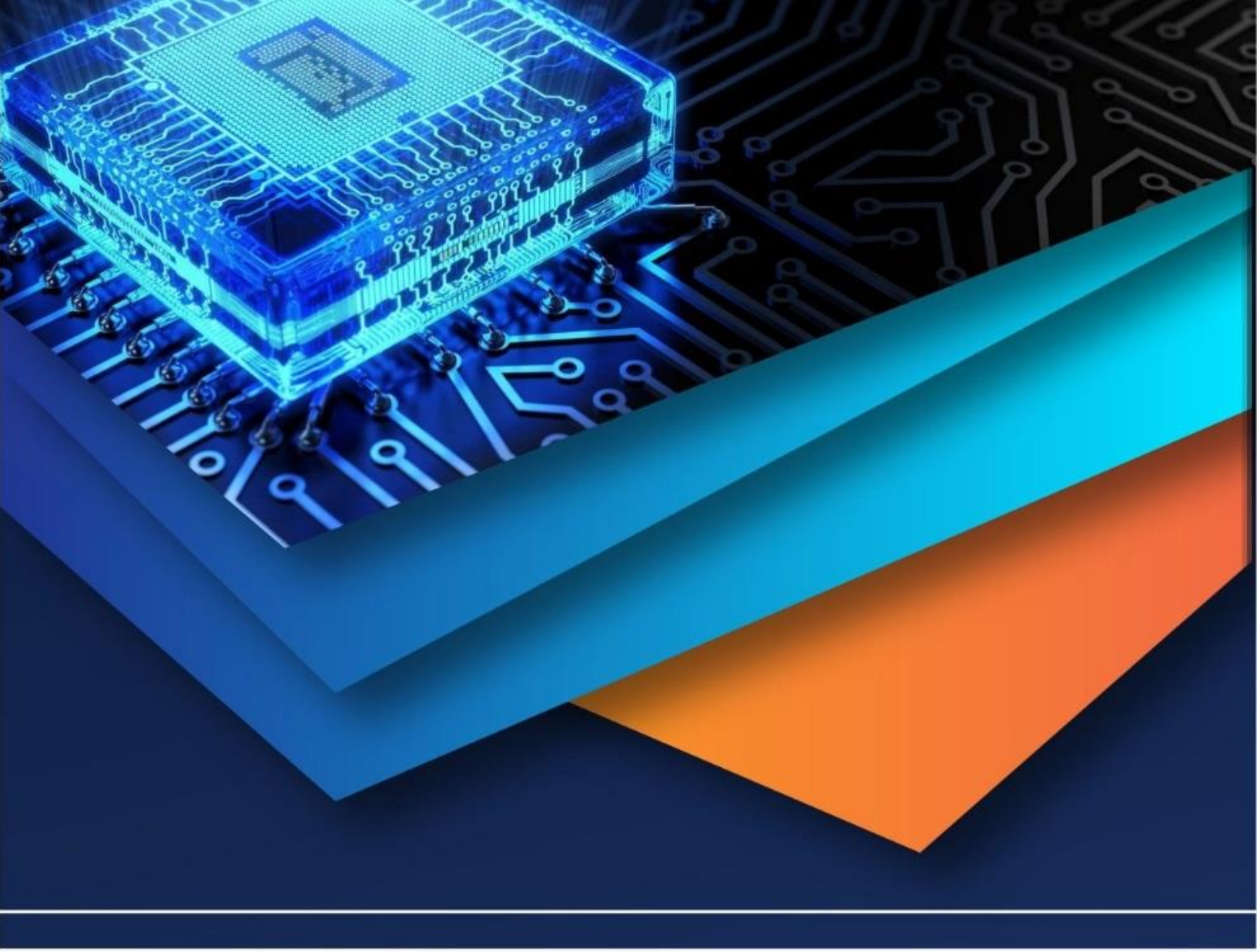
[4] S. Latif, H. Afzaal, and N. A. Zafar, “Intelligent traffic monitoring and guidance system for smart city,” in 2018 International Conference on Computing, Mathematics and Engineering Technologies (iCoMET), pp. 1–6, Sukkur, Pakistan, 2018. View at: Publisher Site | Google Scholar

[5] P. Sadhukhan and F. Gazi, “An IoT based intelligent traffic congestion control system for road crossings,” in 2018 International Conference on Communication, Computing and Internet of Things (IC3IoT), pp. 371–375, Chennai, India, 2018. View at: Publisher Site | Google Scholar

[6] M. Lewandowski, B. Płaczek, M. Bernas, and P. Szymała, “Road traffic monitoring system based on mobile devices and bluetooth low energy beacons,” Wireless Communications and Mobile Computing, vol. 2018, Article ID 3251598, 12 pages, 2018. View at: Publisher Site | Google Scholar

[7] W. Zhang, G. Tan, N. Ding, and G. Wang, “Traffic congestion evaluation and signal control optimization based on wireless sensor networks: model and algorithms,” Mathematical Problems in Engineering, vol. 2012, Article ID 573171, 17 pages, 2012. View at: Publisher Site | Google Scholar

[8] K. Zaatouri, M. H. Jeridi, and T. Ezzedine, “Adaptive traffic light control system based on WSN: algorithm optimization and hardware design,” in 2018 26th International Conference on Software, Telecommunications and Computer Networks (SoftCOM), pp. 1–6, Split, Croatia, 2018. View at: Publisher Site | Google Scholar



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY