

# RFID based Intelligent Traffic Control System

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**Abstract** –Now a days, the growth of industrialization and urban population causes the tremendous increase in the vehicles. There are approximately 1 million licensed vehicles in the last year. Vehicle volume is increased exponentially, but the road infrastructure cannot be, that leads to increase traffic congestion. Different technologies are there to detect traffic congestion and making congestion management more efficient. But these technologies have several drawbacks. RFID is easier, efficient and inexpensive congestion detection technology. Using RFID, we emerge new technique called as “Controller Based Intelligent Traffic Control System”. This uses sensors along with embedded technology. It has facility to control timings of the red and green lights based on the traffic, pass the emergency vehicles such as ambulance, fire brigade etc. and also detects and track the stolen vehicles all in one design. The design also has scope for further expansion.

**Keywords** – *Congestion control, Traffic control, Emergency vehicle, Ambulance, stolen vehicle*

## I. INTRODUCTION

Traffic management has become one of the severe problems today. With the increase in traffic there arise several problems [1] such as heavy traffic jams, violation of traffic rules, long waiting times, loss of fuel and money etc. It is therefore necessary to have a fast, economical and efficient traffic control system. traffic is managed by three techniques, i.e. manual, automatic and autonomous. In the case of manual one, traffic is controlled by the traffic sergeant; automatic traffic[2] is managed by allocating pre-constant time to each side of the signal, while in the case of autonomous, traffic is managed by observing the traffic on each side of the signal and set time accordingly. Different technologies are there to detect traffic congestion and making congestion management more efficient.[3]. The conventional methods used for traffic control are

### A. Inductive loop detection

It can be placed in a roadbed to detect vehicles by measuring the vehicle's magnetic field. Inductive loops work like a metal detector as they measure the change in the field when objects pass over them. Once a vehicle drives over a loop sensor the loop field changes which allows the detection device to detect the presence of an object. The simplest detectors simply count the number of vehicles during a unit of time. Loops can be placed in a single lane or across multiple lanes.

But it has some drawbacks like high error rate, tedious maintenance. Traffic cannot be managed locally.

### B. Visual camera

Cameras are used as input sensors which collect real time traffic condition data and analyzed these conditions to

provide real time outputs. In bad weather conditions they are not working

### C. Magnetometer

Another technology used is a magnetometer. The magnetometer detects the change in the earth's magnetic field when a magnetic object like a car crosses it.

### D. Radio frequency Identification

It is a technology which uses radio waves for the purpose of identification and tracking of objects. RFID tags are placed on objects to be track.. Most RFID tags contain at least two parts. One is an integrated circuit for storing and processing information, modulating and demodulating a radio-frequency (RF) signal, and other specialized functions. The second is an antenna for receiving and transmitting the signal.[4]

## II. LITERATURE SURVEY

Due to increase in urban population number of vehicles on road is also increased [5]. Congestion of vehicles on the roads results into Slow moving traffic which increases travel time. RFID is a smart traffic control method that detects traffic in real time. In RFID based traffic control method [6], each intersection has RFID readers to track the vehicles and each vehicle is attached with RFID tag that contains information regarding the vehicle. This information is collected by the readers and sent to central processing unit that calculates the number of vehicles on the road and speed of the vehicle. That determines the traffic condition and control action are taken out. But the methods of communication between emergency vehicle and the traffic signal controller is not defined.

Emergency vehicles like ambulances also have to wait at the traffic signal that leads to loss of human life. To

overcome this problem new method, Green wave system [7] is introduced. RFID tag placed on the vehicle stores the priority of vehicle like emergency, normal or stolen. According to priority of vehicle, traffic signal changes. In green wave system, vehicle continuously passing through green signal, the biggest disadvantage of this method is that when wave is disturbed, the number of vehicles in green wave increases and some of the vehicles cannot reach the green lights in time. [8] [9].

There is another method for automatic lane clearance of ambulance [10]. In this, there are two units ambulance unit and junction unit. In ambulance unit when

Ambulance is leaving for hospital, RFID card is swiped in front of RFID reader After proper authentication trans receiver transmits the GPS coordinates of ambulance.

The trans receiver in junction unit receives the coordinates When some co-ordinates of a point at a particular distance are crossed by ambulance traffic light changes to green.

### III. PROPOSED MODEL

RFID based traffic control, green wave and RFID -GPS based automatic lane clearance systems are insufficient to handle the problems of traffic congestion, emergency vehicle clearance and stolen vehicle detection. Therefore, we are introducing new method of traffic control. The proposed model of the scheme is as shown below.

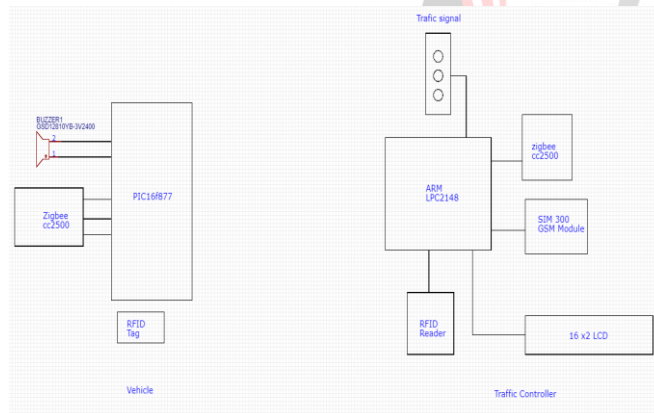


Fig. Schematic diagram for Traffic control system

The proposed system is used for Automatic signal control system, stolen vehicle detection and emergency vehicle clearance .There are two parts in this schematic, one is vehicle itself and another is traffic controller at traffic pole side. RFID tag is placed in the vehicle to be tracked. RFID reader is installed at traffic controller side.

Here we are using two different controllers for two sections.PIC16f877 controller is used at vehicle and ARM2148 is used at traffic pole. After detection of stolen vehicle the message is sent to police control room using GSM module which is connected to traffic controller. For emergency vehicle clearance, ZigBee transmitter and receiver are used at vehicle and traffic controller side respectively.

### IV. WORKING

Intelligent Traffic Control System mainly consists of three parts

#### 1.Automatic Signal Control System

Here, RFID tag is equipped with each vehicle. When vehicle with tag comes in the range of RFID reader, it will send the signal to the RFID reader. The RFID reader will track the number of vehicles have passed through for a specific period. The microcontroller (ARM7LPC2148) connected to the RFID reader will count the RFID tags read in 2-minute duration. Depend upon the count of tags it sets the green light duration for that path. In this module, for experiment purpose, we can use passive RFID tags and RFID reader with frequency 125 KHz.

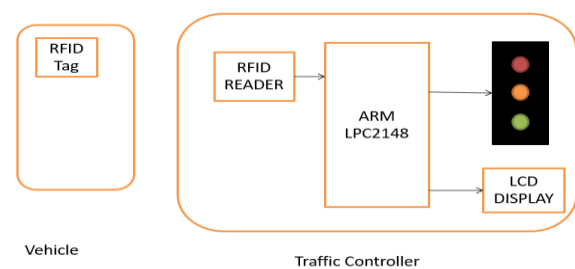


Fig. Block diagram for Automatic signal control System

#### 2.Stolen Vehicle Detection System

The second part is responsible for stolen vehicle detection. Here, when the RFID reader reads the RFID tag, it compares it to the list of stolen RFIDs. If a match is found, it sends SMS to the police control room and changes the traffic light to red, so that the vehicle is made to stop in the traffic junction and local police can take appropriate action. In this module, we will compare the unique RFID tag read by the RFID reader to the stolen RFIDs store in the system. If a match will be found, then the traffic signal will immediately turn to red for a duration of 30 seconds. Also, an SMS will be sent specifying the RFID number by using SIM300 GSM module. The LCD display will indicate that stolen vehicle is present.

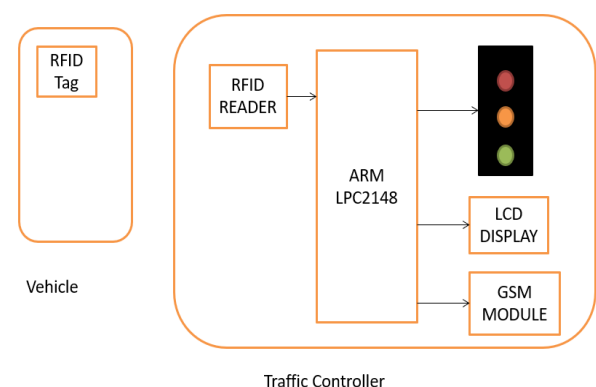
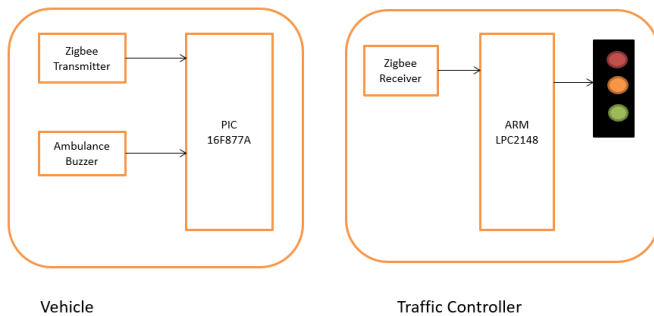


Fig. Block diagram for Stolen vehicle detection system

### 3. Emergency Vehicle Clearance System

Here, each emergency vehicle contains ZigBee transmitter module and the ZigBee receiver will be implemented at the traffic junction. The buzzer will be switched ON when the vehicle is used for emergency purpose. This will send the signal through the ZigBee transmitter to the ZigBee receiver. It will make the traffic light to change to green. Once the ambulance passes through, the receiver no longer receives the ZigBee signal and the traffic light is turned to red.

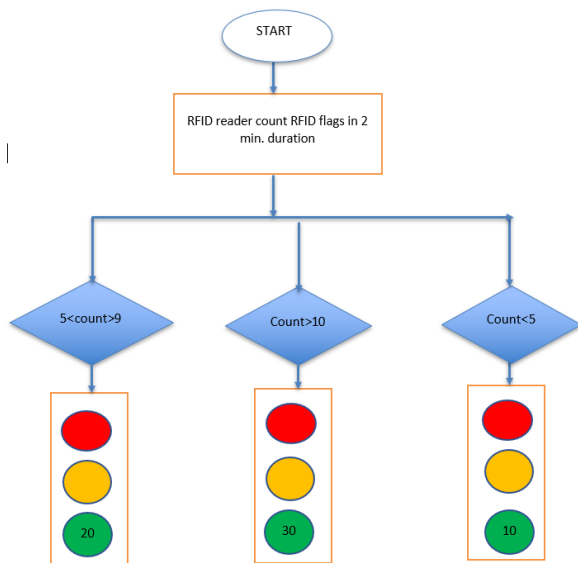


**Fig. Block diagram for Emergency vehicle clearance system**

## V. FLOW CHART

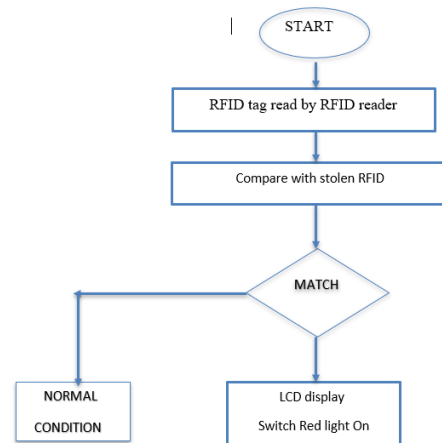
We propose our Intelligent Traffic Control System. It mainly consists of three parts.

- 1 First part contains automatic signal control system. Here, each vehicle is equipped with an RFID tag. When it comes in the range of RFID reader, it will send the signal to the RFID reader. The RFID reader will track how many vehicles have passed through for a specific period and determine the congestion volume. Accordingly, it sets the green light duration for that path.



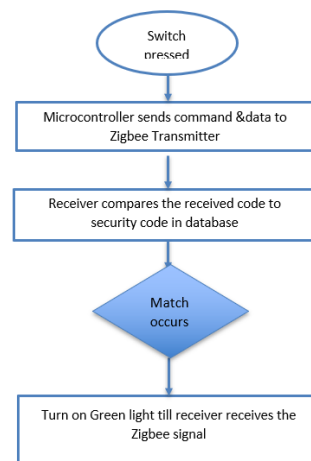
**Fig. Flowchart for Automatic Traffic Control System**

- 2 Second part is Stolen Vehicle detection system. Here RFID reader reads the tag is match with stolen tag then message is sent to police control room and traffic light is turned to red.



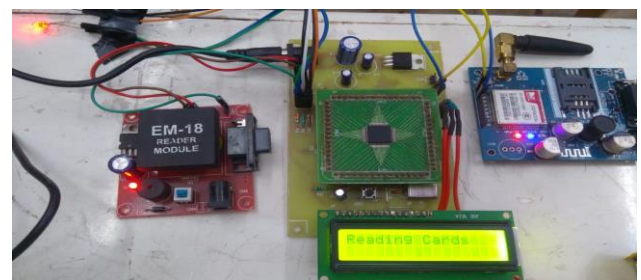
**Fig .Flowchart for Stolen Vehicle detection system**

3. Third one is Emergency vehicle clearance system. For that Zigbee transmitter is used for emergency vehicle and Zigbee receiver at traffic pole. When buzzer of emergency vehicle is turned on it transmits signal from transmitter to receiver. That time traffic signal turned to green till Zigbee receiver receives signal from transmitter.



**Fig . Flowchart for Emergency Vehicle clearance system**

## V RESULTS



**Fig.1 Experimental setup**





Fig.2 Reading RFID tags



Fig.3 Detection of stolen vehicle



Fig. 4 SMS sent on stolen vehicle detection

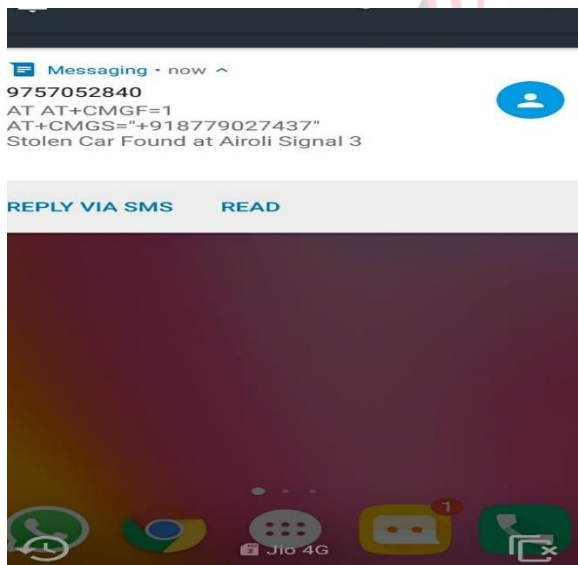


Fig.5 Stolen Vehicle message received



Fig. 6 Receiving Zigbee signal from transmitter

The experimental setup is as shown in fig.1. The figure shows different components used. For testing purpose here we used short range RFID reader. Initially we bring 12 RFID tags in the range of reader (EM-18) then the green light turns on for 30 seconds. Then RFID of stolen vehicle bring into the range of RFID reader then signal turns to red for 30 seconds and SMS is sent through GSM module. Thirdly, emergency vehicle bring into the range of Zigbee receiver then traffic light change to green till the receiver receives the Zigbee signal.

## VI. CONCLUSION

In the proposed traffic control system human intervention is not needed as the whole system is automated. For Automated traffic control system the green light duration is varied according to traffic congestion. With stolen vehicle detection traffic light turns to red and SMS is sent to police control room so they can take appropriate action. If emergency vehicles stuck in the traffic for more time then lives of many people are in danger. With turning traffic light to green for emergency clearance it will reach to their destinations in appropriate time and saves many lives. Further enhancements can be done by using long range RFID readers. The system can be improved by implementing the system to all roads in a multi-road junction.

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