

## RF Communication Based Traffic Control and Stolen Vehicle Detection System

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**Abstract—** Now a days, we find many vehicles struck at the traffic junction and spend a lot of time due to heavy traffic. And also we find theft of the vehicles as well as ambulance struck in the traffic. In this proposed system, we are going to control congestion, stolen vehicle detection by using GSM & GPS and ambulance clearance. Here we use RFID tags, RFID reader, ARM7 LPC2148 controller, GSM, GPS, RF Module. In this project, RFID tags are the vehicles and when the vehicles reach traffic junction the RFID reader reads the RF tags & based on the traffic density the traffic light go GREEN for a specified duration. When the stolen vehicle details matches, through GPS & GSM present at the traffic light junction sends the exact location of the stolen vehicle to the police control room. Then police takes the appropriate action. And also when the ambulance approaching the traffic junction RF transmitter and RF receiver communicates wirelessly and the traffic light go GREEN from RED and the way gets cleared.

**Key Words:** ARM7 LPC2148 controller, GSM, GPS, RFID tags, RFID reader, RF module

### 1. INTRODUCTION

INDIA is the second most populous Country in the world and is a fast growing economy. It is seeing terrible road congestion problems in its cities. Infrastructure growth is slow as compared to the growth in number of vehicles, due to space and cost constraints [1]. Also, Indian traffic is non lane based. It needs a traffic control solutions, which are different from the developed Countries. Intelligent management of traffic flows can reduce the negative impact of congestion. In recent years, wireless networks are widely used in the road transport as they provide more cost effective options [2]. Technologies like RF Communication, RFID, GSM and GPS can be used in traffic control to provide cost effective solutions. RFID is a wireless technology that uses radio frequency electromagnetic energy to carry information between the RFID tag and RFID reader. Some RFID systems will only work within the range inches or centimeters, while

others may work for 100 meters (300 feet) or more. A GSM modem is a specialized type of modem, which accepts a SIM card and operates over a subscription to a mobile operator, just like a mobile phone. GPS is one of the popular systems in communication. It helps users to track locations as well as objects.

### 2. OBJECTIVE

The main aim of this project is to pass vehicles smoothly and to save time.

1. There is less need of human intervention to control traffic.
2. Traffic congestion can be controlled automatically and saves lot of time.
3. Stolen vehicle detection can be possible.
4. Emergency vehicles reach their destination on time.

### 3. PROPOSED SYSTEM

The proposed system is implemented to control the traffic automatically. With this system it can be possible to control congestion, stolen vehicle detection by using GSM and GPS and ambulance clearance.

#### A. Requirements

The system can be implemented by using hardware modules and software modules. Hardware modules are ARM7 LPC2148 controller, RFID tags, RFID reader, GSM, GPS, RF module.

Software modules are keil  $\mu$ vision and flash magic.

#### B. System Architecture

The system has two section i.e. transmitter section and receiving section.

Fig.1 shows the block diagram of the receiver section at the traffic junction unit. The below section is present at the traffic junction unit. It contains ARM7 LPC2148 controller, RFID reader, RF receiver, GSM, GPS, LCD and traffic lights (RED, GREEN & YELLOW). All the modules are interface to the controller. When the vehicles with RFID tags approach traffic junction, RFID reader reads

the RFID tags and based on the density the traffic light go GREEN for specified duration. In this project, if the count is more than 5 green light duration is set to 20 seconds and on the LCD it displays heavy traffic. If the count is between 2 and 5 green light duration is set to 15 seconds and the LCD displays medium traffic. If the count is less than 2 green light duration is set to 10 seconds and the LCD displays low traffic. Thus the controller controls the green light duration based on traffic density.

#### a) Traffic Junction Unit

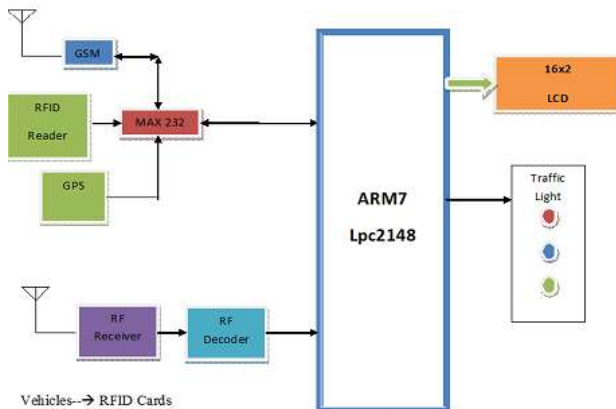


Fig.1: Block diagram of Receiver section

The second one is stolen vehicle detection system. Whenever the vehicle is stolen, the details of the vehicle are stored in the system by police. If that stolen vehicle approaches traffic junction, the RFID reader reads the RFID tag and if details matches with the stored data GPS track the location of that vehicle and through GSM it sends the information to the police control room. On LCD it also displays the stolen vehicle number. Thus the police take appropriate action immediately.

#### b) Ambulance Section:

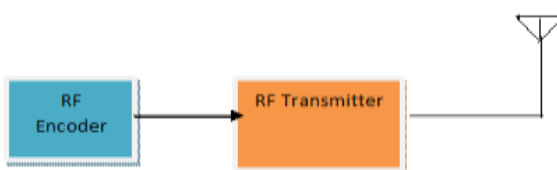


Fig.2: Block diagram of Transmitter section

The above Fig.2 shows the block diagram of the transmitter section present in the ambulance. Whenever the ambulance approaches the traffic junction, the RF transmitter presents in it transmits the signal to the RF receiver. Then RF receiver send information to the controller and the traffic light go green. Thus the ambulance way gets cleared and it reach the hospital on time.

## 4. HARDWARE DESCRIPTION

### 1) ARM7 LPC2148 Controller

The ARM7 is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers (CISC). This simplicity results in a high instruction throughput and impressive real time interrupt response from a small and cost-effective processor core. Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory. The ARM7TDMIS processor also employs a unique architectural strategy known as Thumb, which makes it ideally suited to high volume applications with memory restrictions, or applications where code density is an issue. The key idea behind Thumb is that of a super reduced instruction set. Essentially, the ARM7TDMIS processor has two instruction sets:

- The standard 32-bit ARM set.
- A 16-bit Thumb set.



Fig .3: ARM7 LPC2148 board

## 2) RFID

Radio Frequency Identification (RFID) is an IT system that transmits signals without the presence of physical gadgets in wireless communication. The working of an RFID system is very simple. The system utilizes tags that are attached to various components to be tracked. The tags store data and information concerning the details of the product of things to be traced. The reader reads the radio frequency and identifies the tags. The antenna provides the means for the integrated circuit to transmit its information to the reader. There are two types of RFID categories, active and passive tags. The tags that do not utilize power are referred to as passive and they are driven by an antenna that enables the tag to receive electromagnetic waves from a reader. On the contrary, active tags rely on power and they have inbuilt power sources that enable it to send and receive signals from RFID reader. RFID range depends on transmit power; receive sensitivity and efficiency, antenna, frequency, tag orientations, surroundings. RFID reader uses frequency 125 KHz with a range of 10 cm.

## 3) RF MODULE

RF Module: RF module is the radio frequency within the electromagnetic spectrum associated with radio wave propagation. The 10 KHz to 300GHz frequency range that can be used for wireless communication.

1) Transmitter (TWS-434): The Transmitter is extremely small and are excellent for application requiring short range RF[7]. The output is up to 8mw at 433.92MHz that is 400 foot outdoor and 200 foot indoor.



Fig.4: RF Transmitter

2) Receiver (RSW-434): The receiver operates at 433.92MHz and it has a sensitivity of 3microvolt. It gives both digital and linear output.



Fig.5: RF Receiver

## 4) GPS

GPS is one of the popular systems in communication. Global positioning system technology became a reality through the efforts of military of the American. It established a satellite-based navigation system consisting of a network of group of satellites orbiting the earth. There are 24 satellites in a system. GPS is also known as the NAVSTAR. It operates all across the world. It works in all weather conditions[4]. It helps users to track locations as well as objects. By using GPS technology we can track each individual having GPS receiver. Thus we can say that the GPS technology can be used by any person having GPS on the earth.



Fig.6: GPS Receiver

## 5) GSM

Here, a GSM modem is connected with the microcontroller. This allows the computer to use the GSM modem to communicate over the mobile network. These GSM modems are most frequently used to provide mobile Internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. GSM modem must support an “extended AT command set” for sending/receiving SMS messages. GSM modems are a cost effective solution for receiving SMS messages, because the sender is paying for the message delivery. SIM 300 is designed for global market and it is a tri-band GSM engine. It works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS 1900 MHz . SIM300 features GPRS multi-slot class 10/ class 8 (optional) and supports the GPRS coding schemes. This GSM modem is a highly flexible plug and play quad band GSM modem, interface to RS232, it supports features like voice, data, SMS, GPRS and integrated TCP/IP stack. It is controlled via AT commands. It uses AC – DC power adaptor with following ratings DC Voltage: 12V/1A.



Fig.7 : GSM modem

## 5. SOFTWARE DESIGN

The software design includes the ARM7 programming code. In this project, keil  $\mu$  vision and flash magic is used. Keil  $\mu$  vision is used to compile the program and flash magic is used to dump the program in to the microcontroller.

## 6. RESULT

At Traffic Junction unit

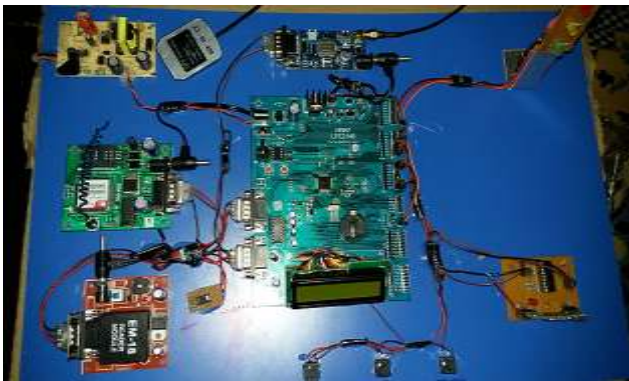


Fig.8: Prototype of Receiver section

The above receiver section is present at the traffic junction. All the modules are interfaced to the ARM7 controller. RFID reader reads the vehicles RFID tags and control congestion and also detects stolen vehicle through GPS & GSM and sends the location to the police control room.

In Ambulance section

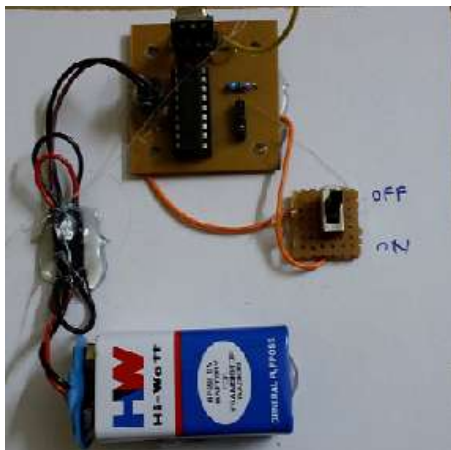


Fig.9: Prototype of Transmitter section

The above section is present in the ambulance. It contains encoder, RF transmitter and antenna. When the switch present in the transmitter is pressed it communicates with the receiver and traffic light go GREEN from RED and the ways gets cleared.

## 7. CONCLUSION

As the entire system is automated, it requires very less human intervention. Many people spend a lot of time in traffic jams, with this project it saves a lot of time and they reach their destination early. With this project stolen vehicle detection is possible. Emergency vehicles reach their destinations at the earliest.

## 8. FUTURE SCOPE

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. Automatic traffic density estimation and vehicle classification through video processing is very important for traffic management especially in mega cities. The live camera can be interfaced to have live video monitoring. Whenever any vehicle cross the wrong signal a message about the vehicle information can be send to the police control room to take the action.

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**BIOGRAPHIES**

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