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IMPLEMENTATION GREEN WAVE SYSTEM TO DETECT STOLEN VEHICLES

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ABSTRACT

The Embedded Technology is now in its prime and the wealth of Knowledge available is mind-blowing. Embedded System is a combination of hardware and software. Embedded technology plays a major role in integrating the various functions associated with it. This needs to tie up the various sources of the Department in a closed loop system. This proposal greatly reduces the manpower, saves time and operates efficiently without human interference. This project puts forth the first step in achieving the desired target. With the advent in technology, the existing systems are developed to have in built intelligence.

Keywords: *Embedded systems, GSM, RFID.*

I. INTRODUCTION

In this paper, Embedded Technology which is a combination of hardware and software is used. Embedded technology plays a major role in integrating the various functions associated with it. This needs to tie up the various sources of the Department in a closed loop system. This proposal greatly reduces the manpower, saves time and operates efficiently without human interference. This project puts forth the first step in achieving the desired target. With the advent in technology, the existing systems are developed to have in built intelligence.

OBJECTIVE

The primary objective is to identify the emergency vehicle and track its location so that we can provide a green wave to the emergency vehicle. Along with this we can identify the stolen vehicle and black listed vehicle in the traffic signals.

EXISTING SYSTEM

In existing system, the stolen vehicles are finding by using human resources. There is no system available to control the traffic signal, when the emergency vehicle is present in the traffic signal.

DISADVANTAGES OF EXISTING SYSTEM

- Possible to occur the human death.
- Difficult to find the theft vehicle..

PROPOSED SYSTEM

In proposed system, we can design a new green wave system to provide the priority to the emergency vehicle in the traffic signal. This system also provides the theft vehicle information.

ADVANTAGES OF PROPOSED SYSTEM

- Low cost
- Easy to find the theft vehicle.
- High flexibility
- Reduces the loss of human life

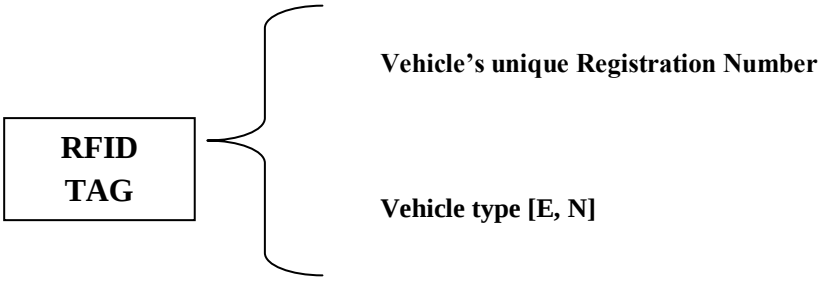
PROJECT DESCRIPTION

GENERAL INTRODUCTION TO EMBEDDED SYSTEM

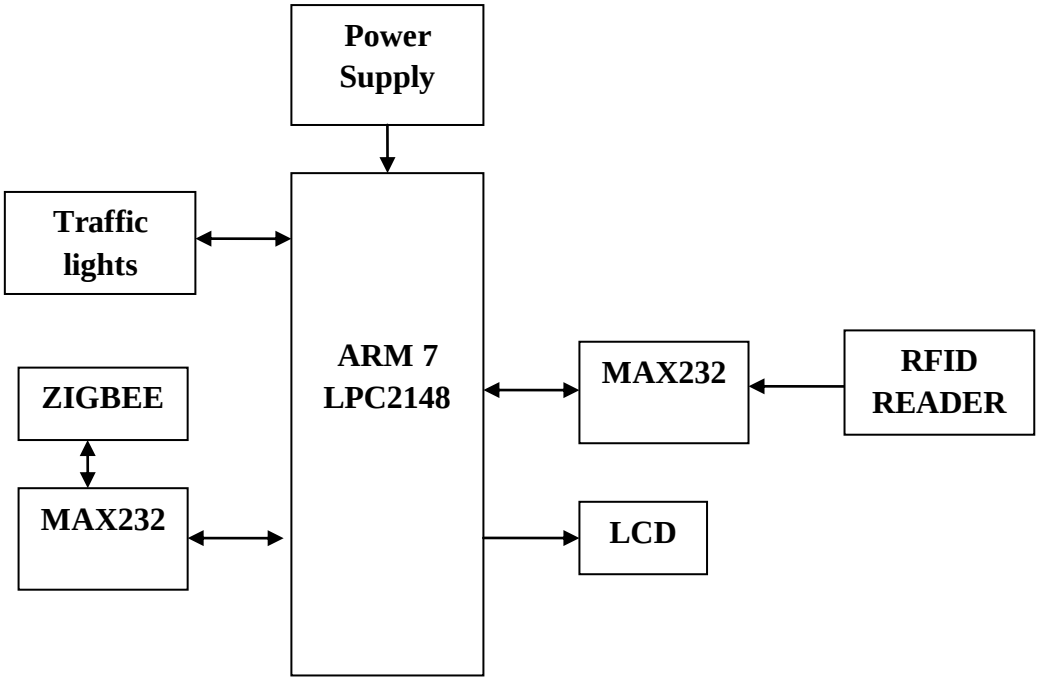
Embedded systems are designed to do some specific task rather than be a general purpose computer for multiple tasks. Some also have real time performance constraints that must met, for reason such as safety and usability; others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs.

BLOCK DIAGRAM

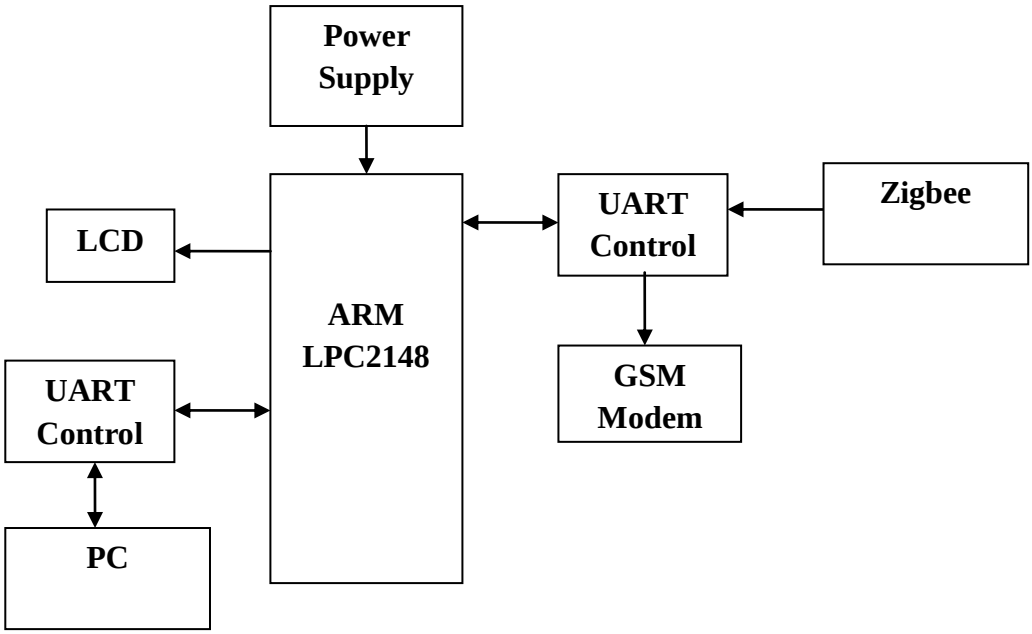
Vehicle Unit:



Traffic signal section:



Control Unit:



MODULES

Power Supply

Microcontroller

Advanced RISC Machine 7(ARM7)

CAN Controllers and Acceptance Filter

UARTs

Pulse Width Modulator

Crystal Oscillator

Reset and Wake-Up Timer

Memory Mapping Control

Power Control

MAX232

Liquid Crystal Display (LCD)

Logic Diagram

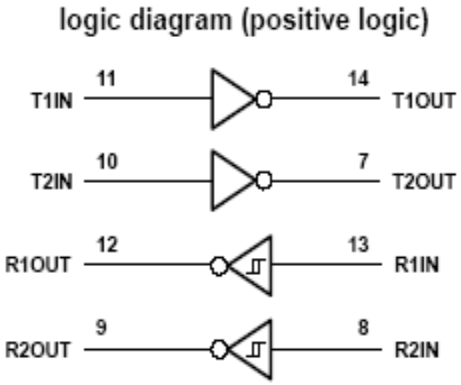


Fig.2.6.1.1 Logic Diagram

In this circuit the microcontroller transmitter pin is connected in the MAX232 T2IN pin which converts input 5v TTL/CMOS level to RS232 level. Then T2OUT pin is connected to reviver pin of 9 pin D type serial connector which is directly connected to PC.

In PC the transmitting data is given to R2IN of MAX232 through transmitting pin of 9 pin D type connector which converts the RS232 level to 5v TTL/CMOS level. The R2OUT pin is connected to receiver pin of the microcontroller. Likewise the data is transmitted and received between the microcontroller and PC or other device vice versa.

Instruction Register (IR) and Data Register (DR)

There are two 8-bit registers in HD44780 controller Instruction and Data register. Instruction register corresponds to the register where you send commands to LCD e.g LCD shift command, LCD clear, LCD address etc. and Data register is used for storing data which is to be displayed on LCD. when send the enable signal of the LCD is asserted, the data on the pins is latched in to the data register and data is then moved automatically to the DDRAM and hence is displayed on the LCD. Data Register is not only used for sending data to DDRAM but also for CGRAM, the address where you want to send the data, is decided by the instruction you send to LCD. We will discuss more on LCD instruction set further in this tutorial.

Commands and Instruction set

Only the instruction register (IR) and the data register (DR) of the LCD can be controlled by the MCU. Before starting the internal operation of the LCD, control information is temporarily stored into these registers to allow interfacing with various MCUs, which operate at different speeds, or various peripheral control devices. The internal operation of the LCD is determined by signals sent from the MCU. These signals, which include register selection signal (RS), read/write signal (R/W), and the data bus (DB0 to DB7), make up the LCD instructions (Table 3). There are four categories of instructions that:

- Designate LCD functions, such as display format, data length, etc.
- Set internal RAM addresses
- Perform data transfer with internal RAM
- Perform miscellaneous functions

Command	Code										Description	Execution Time
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Clears the display and returns the cursor to the home position (address 0).	82μs~1.64ms
Return Home	0	0	0	0	0	0	0	0	1	*	Returns the cursor to the home position (address 0). Also returns a shifted display to the home position. DD RAM contents remain unchanged.	40μs~1.64ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets the cursor move direction and enables/disables the display.	40μs
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Turns the display ON/OFF (D), or the cursor ON/OFF (C), and blink of the character at the cursor position (B).	40μs
Cursor & Display Shift	0	0	0	0	0	1	S/C	R/L	*	*	Moves the cursor and shifts the display without changing the DD RAM contents.	40μs
Function Set	0	0	0	0	1	DL	N$	F	*	#	Sets the data width (DL), the number of lines in the display (L), and the character font (F).	40μs
Set CG RAM Address	0	0	0	1	A_{CG}						Sets the CG RAM address. CG RAM data can be read or altered after making this setting.	40μs
Set DD RAM Address	0	0	1	A_{DD}							Sets the DD RAM address. Data may be written or read after making this setting.	40μs
Read Busy Flag & Address	0	1	BF	AC							Reads the BUSY flag (BF) indicating that an internal operation is being performed and reads the address counter contents.	1μs
Write Data to CG or DD RAM	1	0	Write Data								Writes data into DD RAM or CG RAM.	46μs
Read Data from CG or DD RAM	1	1	Read Data								Reads data from DD RAM or CG RAM.	46μs
	I/D = 1: Increment I/D = 0: Decrement S = 1: Accompanies display shift. S/C= 1: Display shift S/C = 0: cursor move R/L= 1: Shift to the right. R/L= 0: Shift to the left. DL = 1: 8 bits DL = 0: 4 bits N = 1: 2 lines N = 0: 1 line F = 1: 5x10 dots F = 0: 5 x 7 dots BF = 1: Busy BF = 0: Can accept data *# Set to 1 on 24x4 modules* *$ With KS0072 is Address Mode.*										DD RAM: Display data RAM CG RAM: Character generator RAM A_{CG}: CG RAM Address A_{DD}: DD RAM Address Corresponds to cursor address. AC: Address counter Used for both DD and CG RAM address.	Execution times are typical. If transfers are timed by software and the busy flag is not used, add 10% to the above times.

GLOBAL SYSTEM FOR MOBILE COMMUNICATION (GSM)

Global System for Mobile Communications (GSM) modems are specialized types of modems that operate over subscription based wireless networks, similar to a mobile phone. A GSM modem accepts a Subscriber Identity Module (SIM) card, and basically acts like a mobile phone for a computer. Such a modem can even be a dedicated mobile phone that the computer uses for GSM network capabilities.

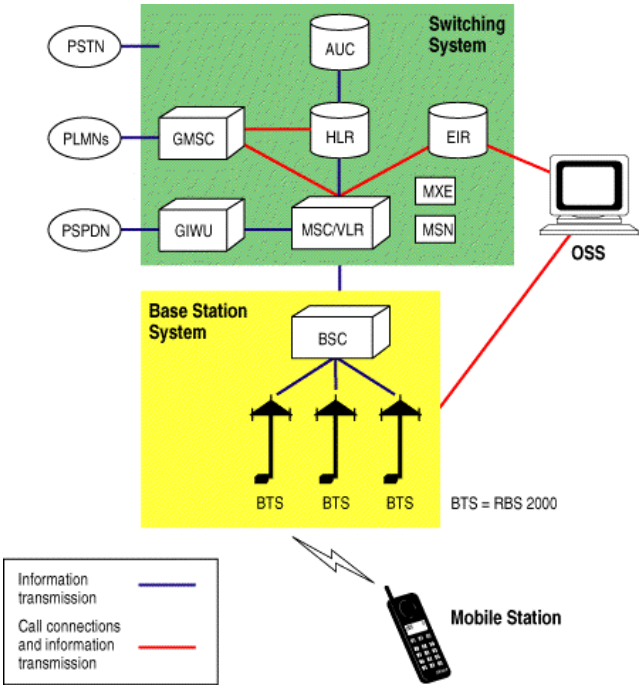
Traditional modems are attached to computers to allow dial-up connections to other computer systems. A GSM modem operates in a similar fashion, except that it sends and receives data through radio waves rather than a telephone line. This type of modem may be an external device connected via a Universal Serial Bus (USB) cable or a serial cable. More commonly, however, it is a small device that plugs directly into the USB port or card slot on a computer or laptop.

It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.

GSM Modem Application

THE GSM NETWORK

GSM provides recommendations, not requirements. The GSM specifications define the functions and interface requirements in detail but do not address the hardware. The reason for this is to limit the designers as little as possible but still to make it possible for the operators to buy equipment from different suppliers. The GSM network is divided into three major systems: the switching system (SS), the base station system (BSS), and the operation and support system (OSS).



GSM Network Elements

The Switching System

The switching system (SS) is responsible for performing call processing and subscriber-related functions. The switching system includes the following functional units.

- **Home location register (HLR)**—The HLR is a database used for storage and management of subscriptions. The HLR is considered the most important database, as it stores permanent data about subscribers, including a subscriber's service profile, location information, and activity status. When an individual buys a subscription from one of the PCS operators, he or she is registered in the HLR of that operator.
- **mobile services switching center (MSC)**—The MSC performs the telephony switching functions of the system. It controls calls to and from other telephone and data systems. It also performs such functions as toll ticketing, network interfacing, common channel signaling, and others.
- **visitor location register (VLR)**—The VLR is a database that contains temporary information about subscribers that is needed by the MSC in order to service visiting subscribers. The VLR is always integrated with the MSC. When a mobile station roams into a new MSC area, the VLR connected to that MSC will request data about the mobile station from the HLR. Later, if the mobile station makes a call, the VLR will have the information needed for call setup without having to interrogate the HLR each time.
- **authentication center (AUC)**—A unit called the AUC provides authentication and encryption parameters that verify the user's identity and ensure the confidentiality of each call. The AUC protects network operators from different types of fraud found in today's cellular world.
- **equipment identity register (EIR)**—The EIR is a database that contains information about the identity of mobile equipment that prevents calls from stolen, unauthorized, or defective mobile stations. The AUC and EIR are implemented as stand-alone nodes or as a combined AUC/EIR node.

The Base Station System (BSS)

All radio-related functions are performed in the BSS, which consists of base station controllers (BSCs) and the base transceiver stations (BTSs).

- **BSC**—The BSC provides all the control functions and physical links between the MSC and BTS. It is a high-capacity switch that provides functions such as handover, cell configuration data, and control of radio frequency (RF) power levels in base transceiver stations. A number of BSCs are served by an MSC.
- **BTS**—The BTS handles the radio interface to the mobile station. The BTS is the radio equipment (transceivers and antennas) needed to service each cell in the network. A group of BTSs are controlled by a BSC.

The Operation and Support System

The operations and maintenance center (OMC) is connected to all equipment in the switching system and to the BSC. The implementation of OMC is called the operation and support system (OSS). The OSS is the functional entity from which the network operator monitors and controls the system. The purpose of OSS is to offer the customer cost-effective support for centralized, regional, and local operational and maintenance activities that are required for a GSM network. An important function of OSS is to provide a network overview and support the maintenance activities of different operation and maintenance organizations.

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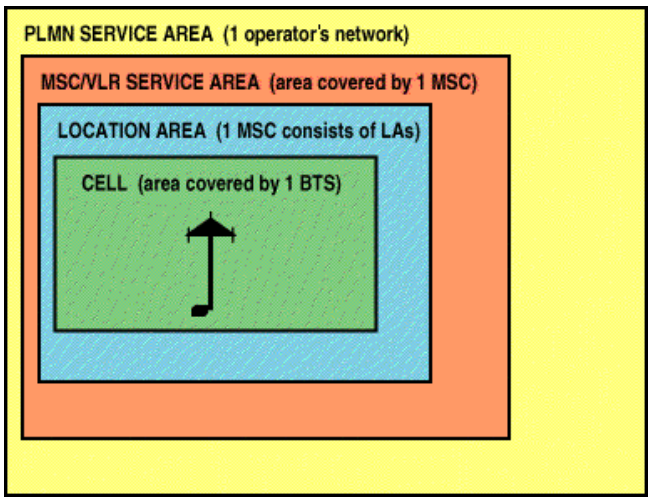
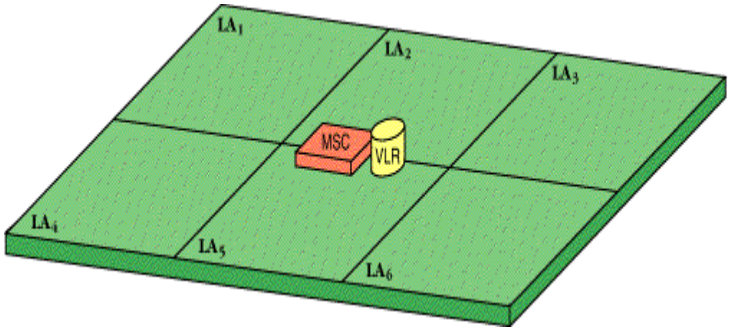
GSM NETWORK AREAS

The GSM network is made up of geographic areas. As shown in *4.2*, these areas include cells, location areas (LAs), MSC/VLR service areas, and public land mobile network (PLMN) areas.



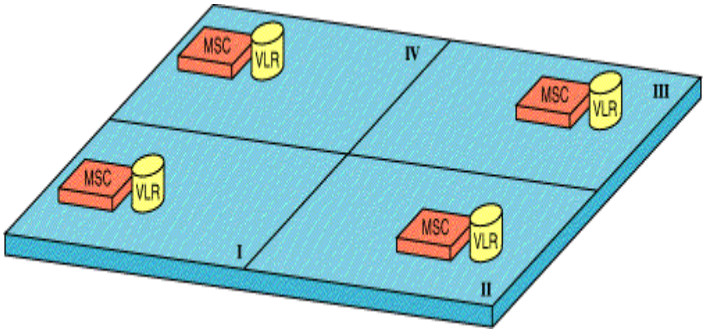
Network Areas

The cell is the area given radio coverage by one base transceiver station. The GSM network identifies each cell via the cell global identity (CGI) number assigned to each cell. The location area is a group of cells. It is the area in which the subscriber is paged. Each LA is served by one or more base station controllers, yet only by a single MSC (fig 4.3). Each LA is assigned a location area identity (LAI) number.



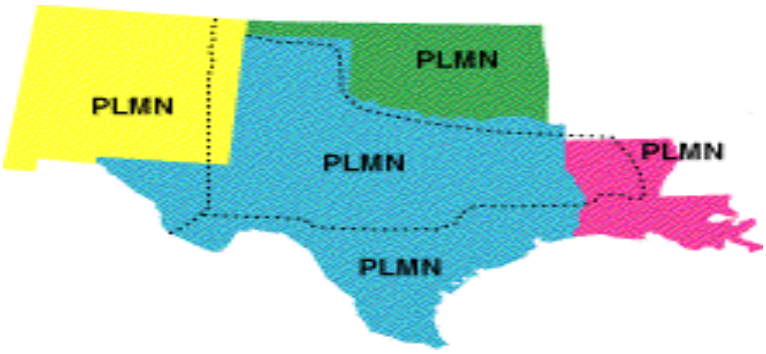
Location Areas

An MSC/VLR service area represents the part of the GSM network that is covered by one MSC and which is reachable, as it is registered in the VLR of the MSC (fig 4.4).



MSC /VLR Service Areas

The PLMN service area is an area served by one network operator(fig 4.5).



SPECIFICATIONS AND CHARACTERISTICS FOR GSM

- **frequency band**—The frequency range specified for GSM is 1,850 to 1,990 MHz (mobile station to base station).
- **duplex distance**—The duplex distance is 80 MHz. Duplex distance is the distance between the uplink and downlink frequencies. A channel has two frequencies, 80 MHz apart.
- **channel separation**—The separation between adjacent carrier frequencies. In GSM, this is 200 kHz.
- **modulation**—Modulation is the process of sending a signal by changing the characteristics of a carrier frequency. This is done in GSM via Gaussian minimum shift keying (GMSK).
- **transmission rate**—GSM is a digital system with an over-the-air bit rate of 270 kbps.
- **access method**—GSM utilizes the time division multiple access (TDMA) concept. TDMA is a technique in which several different calls may share the same carrier. Each call is assigned a particular time slot.
- **speech coder**—GSM uses linear predictive coding (LPC). The purpose of LPC is to reduce the bit rate. The LPC provides parameters for a filter that mimics the vocal tract. The signal passes through this filter, leaving behind a residual signal. Speech is encoded at 13 kbps.

GSM SUBSCRIBER SERVICES

There are two basic types of services offered through GSM: telephony (also referred to as teleservices) and data (also referred to as bearer services). Telephony services are mainly voice services that provide subscribers with the complete capability (including necessary terminal equipment) to communicate with other subscribers. Data services provide the capacity necessary to transmit appropriate data signals between two access points creating an interface to the network. In addition to normal telephony and emergency calling, the following subscriber services are supported by GSM:

- **dual-tone multifrequency (DTMF)**—DTMF is a tone signaling scheme often used for various control purposes via the telephone network, such as remote control of an answering machine. GSM supports full-originating DTMF.
- **facsimile group III**—GSM supports CCITT Group 3 facsimile. As standard fax machines are designed to be connected to a telephone using analog signals, a special fax converter connected to the exchange is used in the GSM system. This enables a GSM–connected fax to communicate with any analog fax in the network.
- **short message services**—A convenient facility of the GSM network is the short message service. A message consisting of a maximum of 160 alphanumeric characters can be sent to or from a mobile station. This

service can be viewed as an advanced form of alphanumeric paging with a number of advantages. If the subscriber's mobile unit is powered off or has left the coverage area, the message is stored and offered back to the subscriber when the mobile is powered on or has reentered the coverage area of the network. This function ensures that the message will be received.

- **cell broadcast**—A variation of the short message service is the cell broadcast facility. A message of a maximum of 93 characters can be broadcast to all mobile subscribers in a certain geographic area. Typical applications include traffic congestion warnings and reports on accidents.
- **voice mail**—This service is actually an answering machine within the network, which is controlled by the subscriber. Calls can be forwarded to the subscriber's voice-mail box and the subscriber checks for messages via a personal security code.
- **fax mail**—With this service, the subscriber can receive fax messages at any fax machine. The messages are stored in a service center from which they can be retrieved by the subscriber via a personal security code to the desired fax number.

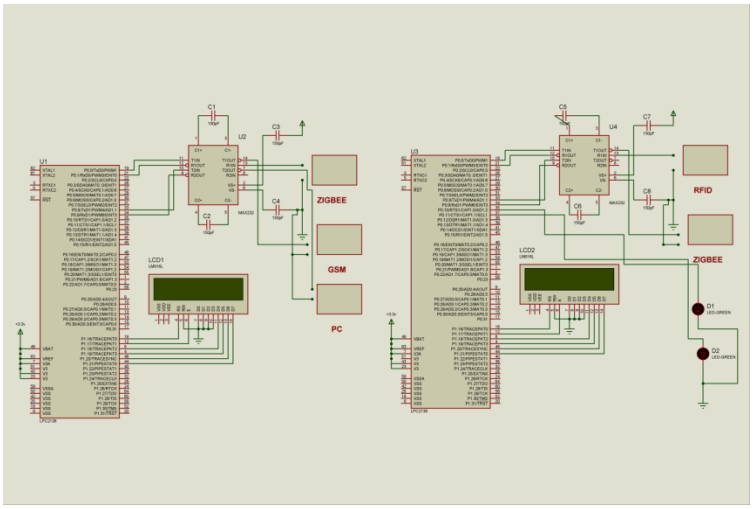
SOFTWARE SPECIFICATION

KEIL software

µVision3 Overview

IMPLEMENTATION

SCHEMATIC DIAGRAM:



4.2 Working Principle

In the proposed system to improve the existing system a new Green wave system is developed. In which the traffic signal management for emergency vehicle is include. To make the proposed system to work, each and every vehicle going for registration is provided with a RFID tag. In which information like vehicle's unique registration number and vehicle type is stored. The vehicle type is mentioned as E (For Emergency) and N (For Normal) in the tag. These data are stored in the database in the Transport office. To read the information in tag a RFID reader is installed in the Traffic control unit.

Whenever the vehicle passed through the signal reader get the vehicle type and gives it to the controller unit. In which if any E (Emergency) type vehicle is found, that lane is made green w.r.to the other lanes. To upgrade

further more theft vehicle detection method is used. To find a theft vehicle, the user has to contact the Transport office to update the database of the vehicle with T (for Theft). So whenever a vehicle is passed through the traffic signal, the Control unit picks up the tag details and sent to the Transport office via Zigbee unit. From the obtained value the PC in the Transport office check with the database. If any theft vehicle is found, the control unit in the Transport office will send to Police station about the vehicle passing through the particular signal. Thus the police able to intercept the vehicle in the next possible path. Thus the single system is used in 2 Tier methods.

II. CONCLUSION

The program was successfully burned on the micro-controller using USB programmer and when an emergency vehicle approaches this reader, it is successfully detected by the system as an emergency vehicle and traffic light module is activated. On the other hand, if any stolen vehicle is detected, it is displayed on the LCD. The system is efficient. This prototype presents a novel solution to implement the concept of green wave in urban cities. The overall system is quite cost effective and has various advantages over the conventional technologies.

In traditional systems, to track the vehicle so as to provide green wave, GPS is used. The cost of a GPS module is very high as compared to a RFID transponder. The transponders are not only very cheap to manufacture but are also very small in size. The small size of transponder gives an advantage over the GPS, GPS can be easily removed by anyone, whereas it is very hard to locate a RFID transponder and remove it. We also have an option of updating the system dynamically with the help of a SMS through the GSM module. In some of the cases, to identify the vehicle, image processing based system is used, which has a major drawback during the bad weather conditions. Bad weather may be due to heavy rain, fog, dust storm. On the other hand, our system is not affected by any of these bad weather conditions. Our system can work in any weather, so it has the capability to provide a 24x7x365 surveillance without any disruption. The traditional system can‟t provide a 24x7x365 surveillance.

This system is very helpful in building a smart city. The city equipped with the developed system will never have any issues related to traffic management. Moreover it will make the city more secure in context of detection of stolen vehicles. Green wave also helps in saving environment as it will reduce emission of CO, NOx, PM10 [1]. It will also reduce the consumption of fuel by the vehicles which are provided with the green wave. Moreover, vehicles travelling in platoons will

get a clear way without any traffic.

Application:

- Implemented at roadways to rescue the accident vehicle.

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