

# Design And Development of Intelligent Vehicle Network

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## ABSTRACT

This paper presents an intelligent traffic control system to pass emergency vehicles smoothly. Each individual vehicle is equipped with ZIGBEE. We use ZIGBEE and PIC16F877A. It determines the network congestion, and hence the green light duration for that path. If the ZIGBEE belongs to the vehicle, then a message is sent using GSM SIM900 to the police control room. In addition, 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 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, GSM, SIM900, PIC16F877A, ambulance vehicle, Emergency Vehicle Clearance, E-Cop System

## I. INTRODUCTION

In the past few years, traffic accidents & congestions have increased enormously. Though the vehicle volume has increased exponentially, the road infrastructure has not been improved proportionately. This in turn leads to increased traffic congestion and road accidents. Different technologies are there to detect traffic congestion and to make congestion management more efficient, but these technologies have several drawbacks, such as installation problems, complexity, cost, etc. In an attempt to reduce the problems related to traffic & improve the traffic discipline, advanced technological solutions have been proposed in this project.

In this project we implement two concept.

### - E-Cop System.

### - Emergency Vehicle Clearance

#### I. BASIC OPERATION OF SYSTEM

Block diagram consists of:

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1. LPC 2148 : It is the main heart of the system used to control the whole system.

2. ZIGBEE TRANSMITTER AND RECEIVER: To Transmit and receive the data.

3. 16x2 LCD: Used to provide the display facility.

4. EMERGENCY BUZZER: It is a switch used for emergency vehicle clearance .

5. GSM: Used to send the message to server .

1) LPC 2148:

The LPC2141/2/4/6/8 microcontrollers are based on a 32/16 bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combines the microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size

applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. Due to their tiny size and low power consumption, LPC2141/2/4/6/8 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. A blend of serial communications interfaces ranging from a USB 2.0 Full Speed device, multiple UARTs, SPI, SSP to I2Cs, and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers particularly suitable for industrial control and medical systems.

## 2) Operation:

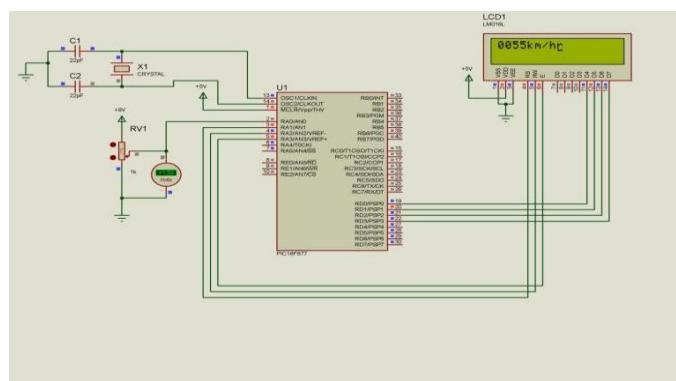
This module works in half duplex mode. Means it can either transmit or receive but not both at same time. After each transmission, module will be switched to receiver mode automatically. The LED for TX and RX indicates whether IC is currently receiving or transmitting data. The data sent is checked for CRC error if any. If chip is transmitting and any data is input to transmit, it will be kept in buffer for next transmission cycle. It has internal buffer for incoming data so they do not get lost when module is active transmitting data. When you power on the unit, the TX LED will briefly blink indicating that initialization is complete and it is ready to use. The RX LED is directly on TX OUT pin to indicate that actual data is received and it is sent to output pin.

## 3)LCD:

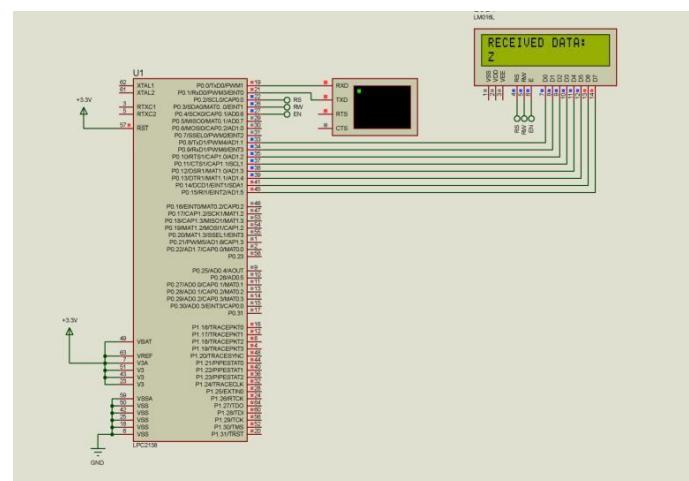
We use 4 bit LCD which is used for displaying the o/p. In 4 bit mode we send the data nibble by nibble ,first upper nibble and then lower nibble.Nibble is group of 4 bits so the lower 4 bits (D0 to D3) of a byte form the lower nibble while the upper 4 bits(D4 to D7)of a byte form the higher nibble.This enables us to send 8 bit data be it the ASCII code or the command code by using 4 pins instead of 8 pins.

## II. METHODOLOGY

### Circuit diagram:



### Serial communication:



### Operation:

## 2) Operation:

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### BLOCK DIAGRAM

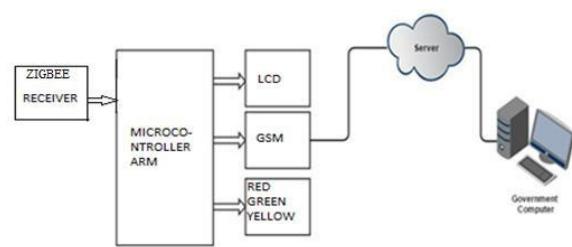


Fig: Base Station

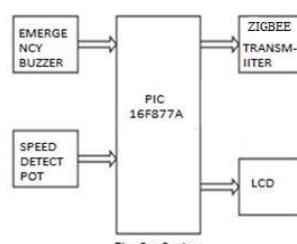


Fig: Car System

## SPECIFICATION

### 1. LPC2148

The LPC2148 microcontrollers are based on a 32/16 bit ARM7TDMI-S CPU with real-time emulation and embedded trace support. The microcontroller with 32 kB, 64 kB, 128 kB, 256 kB and 512 kB of embedded high-speed flash memory. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty.

- CPU:32/16 bit ARM7TDMI-S CPU
- Package: LQFP64
- Memory(SRAM): 512KB
- Timer/Counter: 32-bit
- Real-time clock: Low power clock with independent power and dedicated 32kHz clock input.
- General Purpose I/O: 47 pins
- External Crystal: 1 to 50 MHz
- Operating Voltage Range: 3V to 3.6V

### 2. 16x2 LCD

A liquid-crystal display (LCD) is a flat panel display that uses the light modulating properties of liquid crystals. Liquid crystal do not emit lightly directly.

LCDs are used in a wide range of applications. They are commonly used in the consumer devices. The LCD screen is more efficient and can be disposed of more safely. Its low electrical power consumption enables it to be used in a battery-powered electronic equipment. It is an electronically modulated optical device made up of any no. of segment filled with liquid crystals and arrayed in front of light source (backlight) or reflector to produce images in color or monochrome.

Pin Specification Of 16x2LCD:

1	VSS	Ground	0v(ground)
2	VCC	Power supply for logic circuit	5+
3	VEE	LCD contrast adjustment	
4	RS	Instruction/data register select	RS=0 : Instruction register RS=1 : Data register
5	R/w	Read/write selection	R/W=0 :Register write R/W=1 :Register read
6	E	Enable signal	
7	D0	Data input/output line	8 Bit
8	D1	Data input/output line	8 Bit
9	D2	Data input/output line	8 Bit
10	D3	Data input/output line	8 Bit
11	D4	Data input/output line	8 Bit
12	D5	Data input/output line	8 Bit
13	D6	Data input/output line	8 Bit
14	D7	Data input/output line	8 Bit
15	LED+	Supply voltage for LED+	+5v
16	LED-	Supply voltage for LED-	0v

module.

It can communicate with controllers via AT commands.

This module support software power on and reset. It works on frequency of 850/900/1800/1900 MHZ.

The GSM900 device integrates an analog interface ,an A/D converter, an RTC, an SPI bus ,an i2c bus and a PWM module

### 3. ZIGBEE

ZigBee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios.

The technology defined by the ZigBee specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs), such as Bluetooth or Wi-Fi. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that requires short-range low-rate wireless data transfer.

Its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics.[1] ZigBee devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. ZigBee is typically used in low data rate applications that require long battery life and secure networking (ZigBee networks are secured by 128 bit symmetric encryption keys.) ZigBee has a defined rate of 250 kbit/s, best suited for intermittent data transmissions from a sensor or input device.

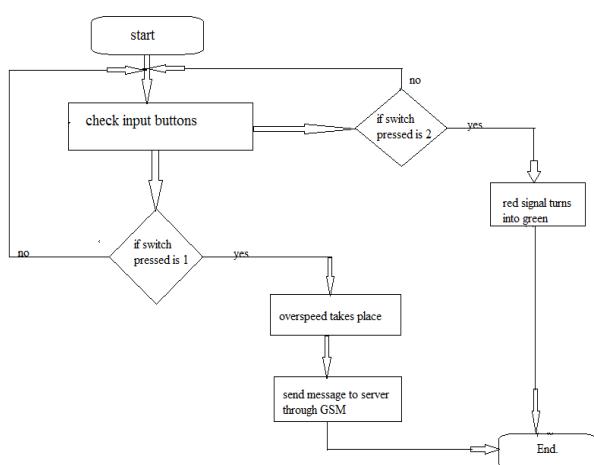
ZigBee was conceived in 1998, standardized in 2003, and revised in 2006. The name refers to the waggle dance of

honey bees after their return to the beehive.

#### ZIGBEE SPECIFICATION:

- 3.3V @ 50mA
- 250kbps Max data rate
- 1mW output (+0dBm)
- 300ft (100m) range
- Fully FCC certified
- 6 10-bit ADC input pins
- 8 digital IO pins
- 128-bit encryption
- Local or over-air configuration
- AT or API command set
- Trace Antenna

#### FLOWCHART



#### III. CONCLUSION

With automatic traffic signal control based on the traffic density in the route ,the manual effort on the part of traffic policeman is saved.As the entire system is automated,it requires very less human intervention.With overspeed detection ,the message is send to server so that appropriate action can take place.Emergency vehicles like ambulance,fire trucks need to reach their destinations at the earliest.If they spend a lot of time in traffic jams,precious lives of many people may be in danger. With emergency vehicle clearance the traffic signal turns to green as long as the emergency vehicle waiting in the traffic junction.The signal turns to red only after the emergency vehicle passes through.

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