SASI INSTITUTE OF TECHNOLOGY & ENGINEERING
(Approved by AICTE-New Delhi, Affiliated to JNTUK-Kakinada and SBTET-Hyderabad)
TADEPALLIGUDEM - 534101, West Godavari District, Andhra Pradesh
☎ : 08818-244986,987,989,990 Fax:08818-244628 Web : www.sasi.ac.in., hodece@sasi.ac.in
Department of Electronics & Communication Engineering

# Academic Year 2014-15

# Annexure I

**Project title: A GSM GPS BASED AUTOMATIC VEHICLE LOCATING SYSTEM FOR BUS TRANSIT**

**TABLE OF CONTENTS**

## 1.1 Abstract:

One of the vital issues in developing countries like India is improper and delayed public transportation facilities. The Bus-station, In-Bus and Bus-stop are the three modules of public transportation management system. The ARM7 microcontroller based In-Bus module consisting mainly of a GPS receiver and GSM modem then starts transmitting its location. Bus-station module equipped with a microcontroller and GSM modem interfaced to PC designed to keep track record of every bus periodically is used for statistical analysis. LCD is used to display information of every bus. Bus station processes user request about a bus location, send bus location information to user's mobile and to the specified bus stop. Bus-stop module is installed at every bus stop and consists of a GSM modem, and LCD all interfaced to a microcontroller. This module receives buses location information coming towards that stop from Bus-station module and displays the information on a LCD.

The project is implemented in Keil software and the experimental results will be generated using the High performance. So, this system has the advantage of flexibility which means accessing the location, sending to bus station, to passengers with time to time updates. Since this system provides the passengers with all the above discussed advantages like flexibility, high degree of accuracy, it is more efficient system.

## 1.2 Motivation:

Nowadays waiting at bus stands and bus stops causes delay to their works. Hence it is the better way to know the information about bus. So, by using the system like Automatic vehicle locating system with the help of GPS and GSM technologies, we can reduce the waiting times at bus stands and bus stops.

## 1.3 Objective:

The need for a more efficient transit system has led transport agencies across the world to implement Automatic Vehicle Location (AVL) systems. This enables them to identify, collect, and analyze location information about a vehicle in real time and send the information to the transport management centers and passengers.

## 2.1 Block diagram & Working:

The Automatic Vehicle Locating System with three modules namely Bus-Station module, In-Bus module, Bus-Stop module and the design aspect of the individual module is considered. The block diagram of A GSM-GPS Based Automatic Vehicle Locating System for Bus Transit is shown in Fig 1.

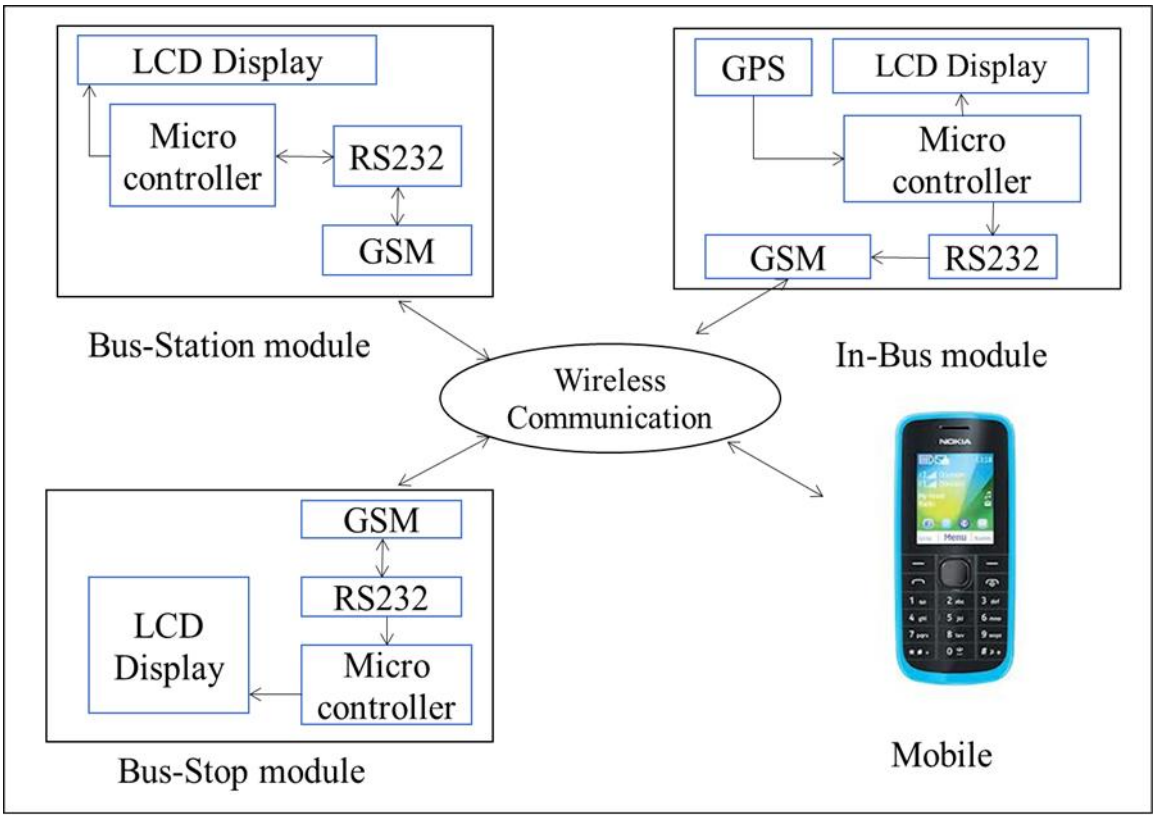


**Fig 1: Block Diagram of a GSM-GPS Based Automatic Vehicle Locating System for Bus Transit**

### 2.1.1Bus-Station Module:

Bus-Station module is the center of network of Automatic Vehicle Locating system. It accepts location information of bus through GSM modem. This module is used for sending and receiving of information. It receives the required information of bus coordinates from In-Bus module and sends information to the Bus-Stop module and to the user mobile. The block diagram of the Bus-Station module is shown in Fig 2, while the schematic flow chart of this module is shown in Fig 3.

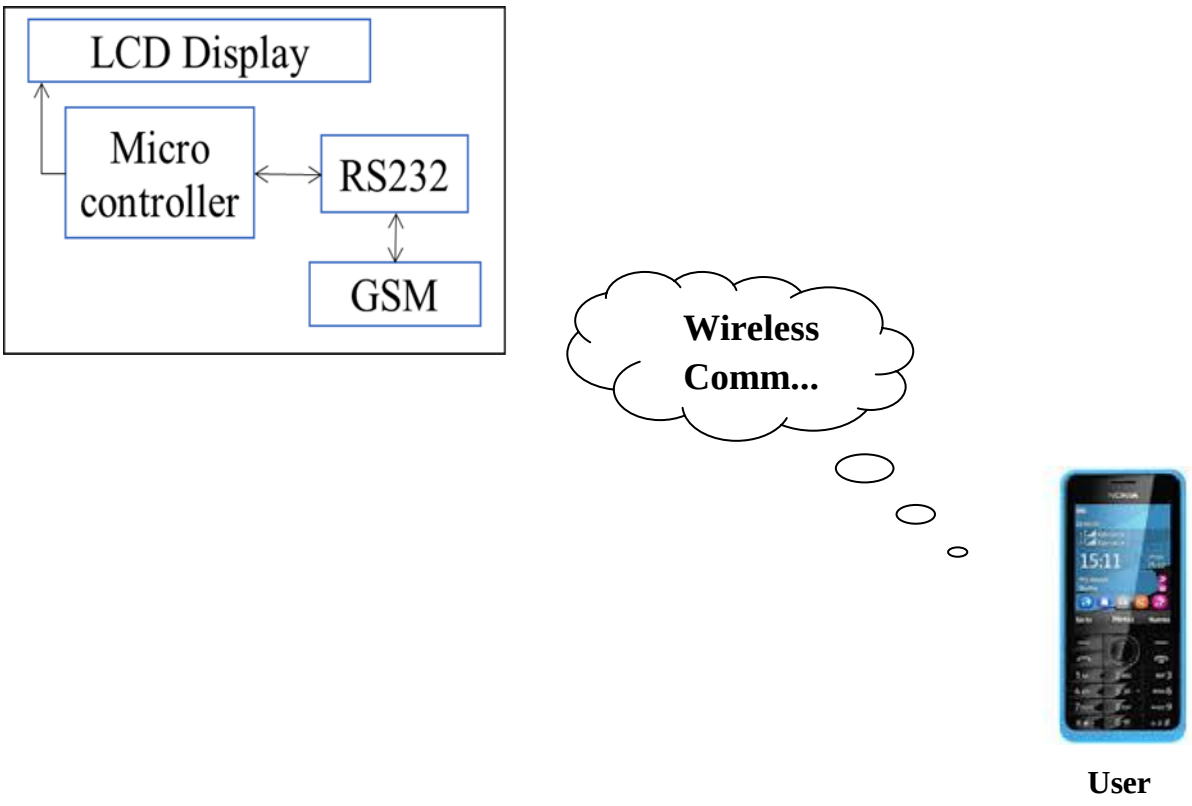


**Fig 2: Block Diagram of Bus-Station module**

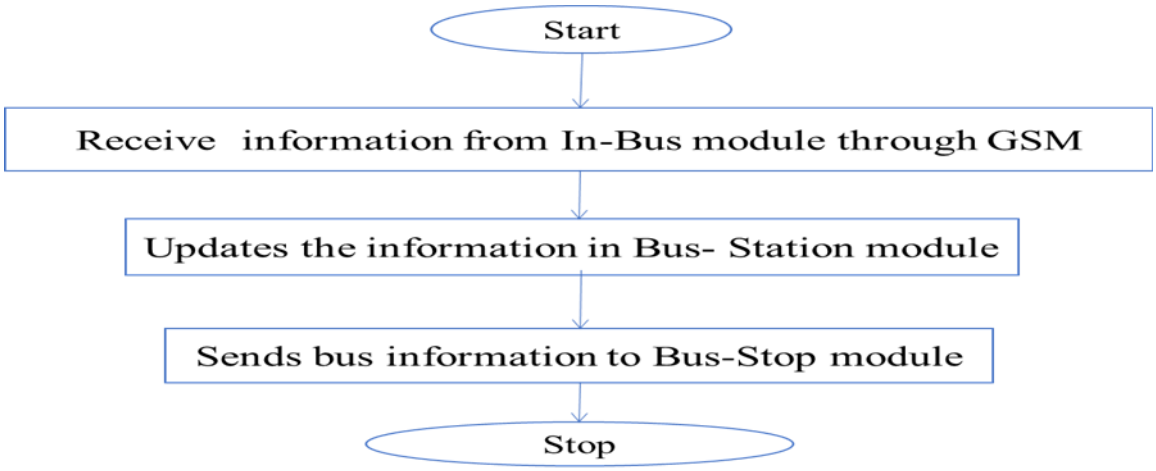


**Fig 3: Flow Chart for Bus-Station module**

### 2.1.2 In-Bus Module:

In-Bus module is installed in the inside of every bus consists of a GPS receiver, a GSM modem and a RS232 communication cable; all interfaced to ARM7 microcontroller. This module is used to send the bus coordinates to the Bus-Station module. The block diagram of the In-Bus module is shown in Fig 4, while the flow chart of this module is shown in Fig 5.

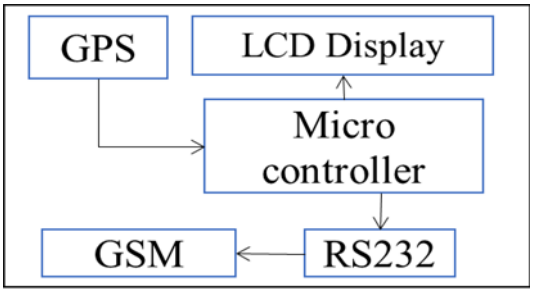


**Figure 4: Block Diagram of In-Bus Module**

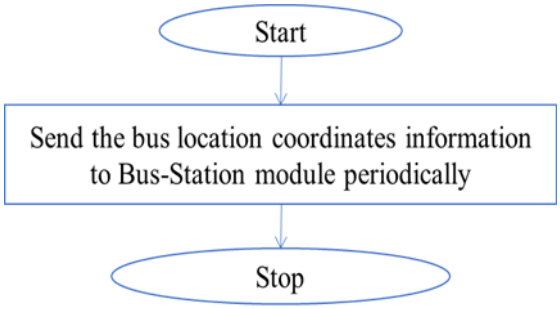


**Figure 5: Flow Chart for In-Bus Module**

### 2.1.3Bus Stop Module:

Bus-Stop module is installed at every bus stop to know about the location of buses coming towards that stop. The block diagram of this module is shown in Fig 6, while the flow chart of this subsystem is shown in Fig 7.

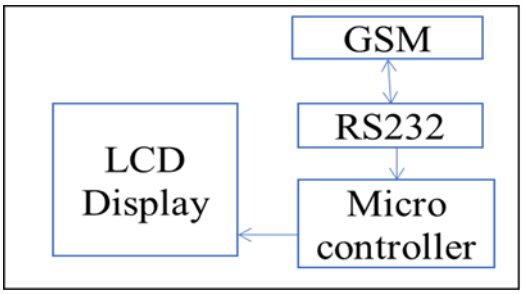


**Figure 6: Block Diagram of Bus-Stop Module**

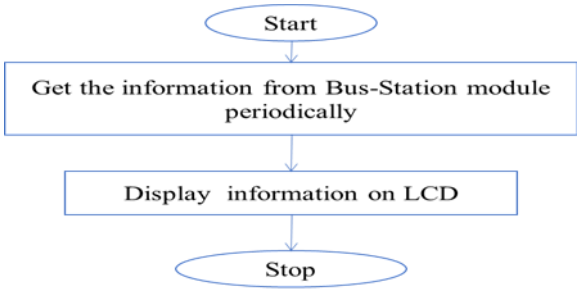


**Figure 7: Flow Chart for Bus-Stop Module**

## 2.2 Technical Specifications:

### 2.2.1 ARM7:

**Introduction**

ARM7 LPC2148 Microcontroller Socket is used with LPC2148 Pro Development Board. It is a standalone board for LPC2148 microcontroller. It has 12MHz crystal for system clock and 32 KHz crystal for RTC. It has power on reset circuit with MCP130T brownout monitoring chip and power decoupling capacitors. This board can be used for LPC2148 based generic development.

**Technical Specifications:**

- Microcontroller : LPC2148 with 512K on chip memory
- Crystal for LPC2148 : 12Mhz
- Crystal for RTC : 32.768KHz

- Operating Supply : 3.3V
- Power on reset circuit with MCP 130T brownout detection

**LPC2148 Features:**

- 16-bit/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package.
- 40 kB of on-chip static RAM and 512 kB of on-chip flash memory.
- In-System Programming/In-Application Programming (ISP/IAP) via on-chip boot loader software.
- Embedded ICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip Real Monitor software and high-speed tracing of instruction execution.
- USB 2.0 Full-speed compliant device controller with 2 kB of endpoint RAM.
- Two 10-bit ADCs provide a total of 14 analog inputs
- Single 10-bit DAC provides variable analog output
- Two 32-bit timers/external event counters (with four captures and four compare channels each), PWM unit (six outputs) and watchdog.
- Low power Real-Time Clock (RTC) with independent power and 32 kHz clock input.
- Multiple serial interfaces including two UARTs, two Fast I²C-bus (400 kbit/s), SPI and SSP with buffering and variable data length capabilities.

**2.2.2 Global System for Mobile communications (GSM):**

- Bandwidth: The range of a channel's limits; the broader the bandwidth, the faster data can be sent
- Bits per second (bps): A single on-off pulse of data; eight bits are equivalent to one byte
- 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: It 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.

### 2.2.3 Global Positioning System (GPS)

- Ultra high sensitivity: -165dBm
- 22 tracking/66 acquisition-channel receiver
- WAAS/EGNOS/MSAS/GAGAN support
- AGPS support
- NMEA protocols (default speed: 9600bps)
- One serial port Embedded patch antenna 12*12*4 mm
- Operating temperature range: -40 to 85
- RoHS compliant (Lead-free)
- Tiny form factor : 20.5mm x12.8mm x 7.8mm

### 2.2.4 Liquid Crystal Display (LCD)

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

### 2.2.5 P89V51RD2:

- Microcontroller: P89V51RD2 with 11.0592MHz crystal
- Double side high quality PTH PCB board to provide extra strength to the connector joints for increased reliability.
- Power: 7 to 15V, AC or DC, Heat sink on 7805 for better current rating
- Reverse polarity protected
- Switches: Reset, Power
- RS232 serial interface
- 10 pin FRC connectors and soldering pads on all ports
- Compatible with General purpose prototyping board for development board for stackable design

### 2.2.6 MAX232 IC:

- Meets or Exceeds TIA/EIA-232-F and ITU Recommendation V.28
- Operates From a Single 5-V Power Supply With 1.0- F Charge-Pump Capacitors
- Operates Up To 120 kbit/s
- Two Drivers and Two Receivers
- ±30-V Input Levels
- Low Supply Curren 8 mA Typical
- ESD Protection Exceeds JESD 22 − 2000-V Human-Body Model (A114-A)
- Upgrade With Improved ESD (15-kV HBM) and 0.1-F Charge-Pump Capacitors is Available With the MAX202

### 2.3 Budget:

| S.No. | Name of the equipment | Specification | Quantity | Unit Cost | Total Cost |
|---|---|---|---|---|---|
| 1 | ARM7 | LPC2148 | 2 | 2500 | 5000 |
| 2 | GSM Module | SIM800 | 2 | 1290 | 2580 |
| 3 | GPS Module | L80 GPS | 1 | 400 | 2234 |
| 4 | Feature Phone | MAX232, P89V51D2 | 2 | 1000 | 2000 |
| 5 | Feature Phone | HX711 | 1 | 2000 | 2000 |
| Grand Total | | | | | 13184/- |

**3.1 CONCLUSION:**

A GSM-GPS based automatic vehicle locating system for bus transit is developed which is accurate, reliable, and flexible and has less manual operations. The system provides a better service for the needy. User can easily adjust his schedule according to the current location information of the required bus. It saves much time to the users. This service therefore reduces the waiting time at the bus-stops and bus-stands.

The subsystems of developed system are linked with GSM modem to provide cost effective short message service (SMS). Passengers who are not utilizing the mobile service, the displays are installed at bus stop to let them know the buses location coming towards that stop. The developed system is cheaper and easy to implement for the Transportation system.

An automatic route guider display can be installed in buses to better update the alternative route in case of serious road congestions.