Department of Computer Science and Engineering

Global Campus, Jakkasandra Post, Kanakapura Taluk, Ramanagara District, Pin Code: 562 112

2022-2023

A Project Report on

"Bus Tracking System using GPS"

Submitted in partial fulfilment for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

SOFTWARE ENGINEERING

Submitted by

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CERTIFICATE

This is to certify that the project work titled **"Bus Tracking System using GPS"** is carried out by **Ali Rafeek Abboud (19BTRSE052), Bisher Ali Merhge (19BTRSE056), Nure Jannati Rahman (19BTRSE067),** a bonafide students of Bachelor of Technology at the Faculty of Engineering & Technology, Jain (Deemed-to-be) University, Bangalore in partial fulfillment for the award of degree in Bachelor of Technology in **Software Engineering**, during the year **2022-2023**

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Name of the Examiner Signature of Examiner

1.

2.

DECLARATION

We, **Ali Rafeek Abboud (19BTRSE052), Bisher Ali Merhge (19BTRSE056), Nure Jannati Rahman (19BTRSE067),** are students of eighth semester B.Tech in Software Engineering, at Faculty of Engineering & Technology, Jain (Deemed-to-be) University, hereby declare that the project titled **"Bus Tracking System using GPS"** has been carried out by usand submitted in partial fulfilment for the award of degree in Bachelor of Technology in Software Engineering during the academic year 2022-2023. Further, the matter presented in the project has not been submitted previously by anybody for the award of any degree or anydiploma to any other University, to the best of our knowledge and faith.

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LIST OF ABREVATIONS

ALU..... Arithmetic and Logic Unit

CPU..... Central Processing Unit

DC..... Direct Current

ESD..... Electro Static Discharge

VCC..... Digital power supply

GND..... Ground

IE..... Interrupt Enable

IP..... Interrupt priority

ISP..... In-System Programmable IEEE…

..... Institute of Electrical and Electronics Engineers

INT…..... Interrupt

I/O..... Input/output

μC..... Microcontroller

MCU..... Microcontroller unit

ALE..... Address latch enable

SFR..... Special function registers

PCON..... Power control register

TCON..... Timer control registers

TMOD..... Timer mode

ROM..... Read only memory

RAM..... Random access memory

UART..... Universal asynchronous receiver/transmitter

ABSTRACT

The present generation requires the information time to time.The use of technogology have been increasing day by day.So we are planning for the combination of present technology with the requirement of information transmission, we planned for the creative approach of “Vehicle Tracking System using GPS and GSM”.To overcome the drawbacks of the previous methods of paper based and we introduce a project to track a **vehicle using GPS and GSM**. This **Vehicle Tracking System** can also be used for Accident Detection Alert System, Soldier Tracking System and many more, by just making few changes in hardware andsoftware and widely in tracking Cabs/Taxis, stolen vehicles, school/colleges buses etc.

CHAPTER 1

INTRODUCTION

1.1 OBJECTIVE

College bus Tracking System (VTS) is the technology used to determine the location of a vehicle using different methods like GPS and other radio navigation systems operating through satellites and ground based stations. By following triangulation or trilateration methods the tracking system enables to calculate easy and accurate location of the vehicle. Vehicle information like location details, speed, distance traveled etc. can be viewed on a digital mapping with the help of a software via Internet. Even data can be stored and downloaded to a computer from the GPS unit at a base station and that can later be used for analysis. This system is an important tool for tracking each vehicle at a given period of time and now it is becoming increasingly popular for people having expensive cars and hence as a theft prevention and retrieval device.

i. The system consists of modern hardware and software components enabling one to track their vehicle online or offline. Any vehicle tracking system consists of mainly three parts mobile vehicle unit, fixed based station and, database and software system.

ii. Vehicle Unit: It is the hardware component attached to the vehicle having either a GPS/GSM modem. The unit is configured around a primary modem that functions with the tracking software by receiving signals from GPS satellites or radio station points with the help of antenna. The controller modem converts the data and sends the vehicle location data to the server.

iii. Fixed Based Station: Consists of a wireless network to receive and forward the data to the data center. Base stations are equipped with tracking software and geographic map useful for determining the vehicle location. Maps of every city and landmarks are available in the based station that has an in-built Web Server.

iv. Database and Software: The position information or the coordinates of each visiting points are stored in a database, which later can be viewed in a display screenusing digital maps. However, the users have to connect themselves to the web server with

the respective vehicle ID stored in the database and only then she/he can view the location of vehicle traveled.

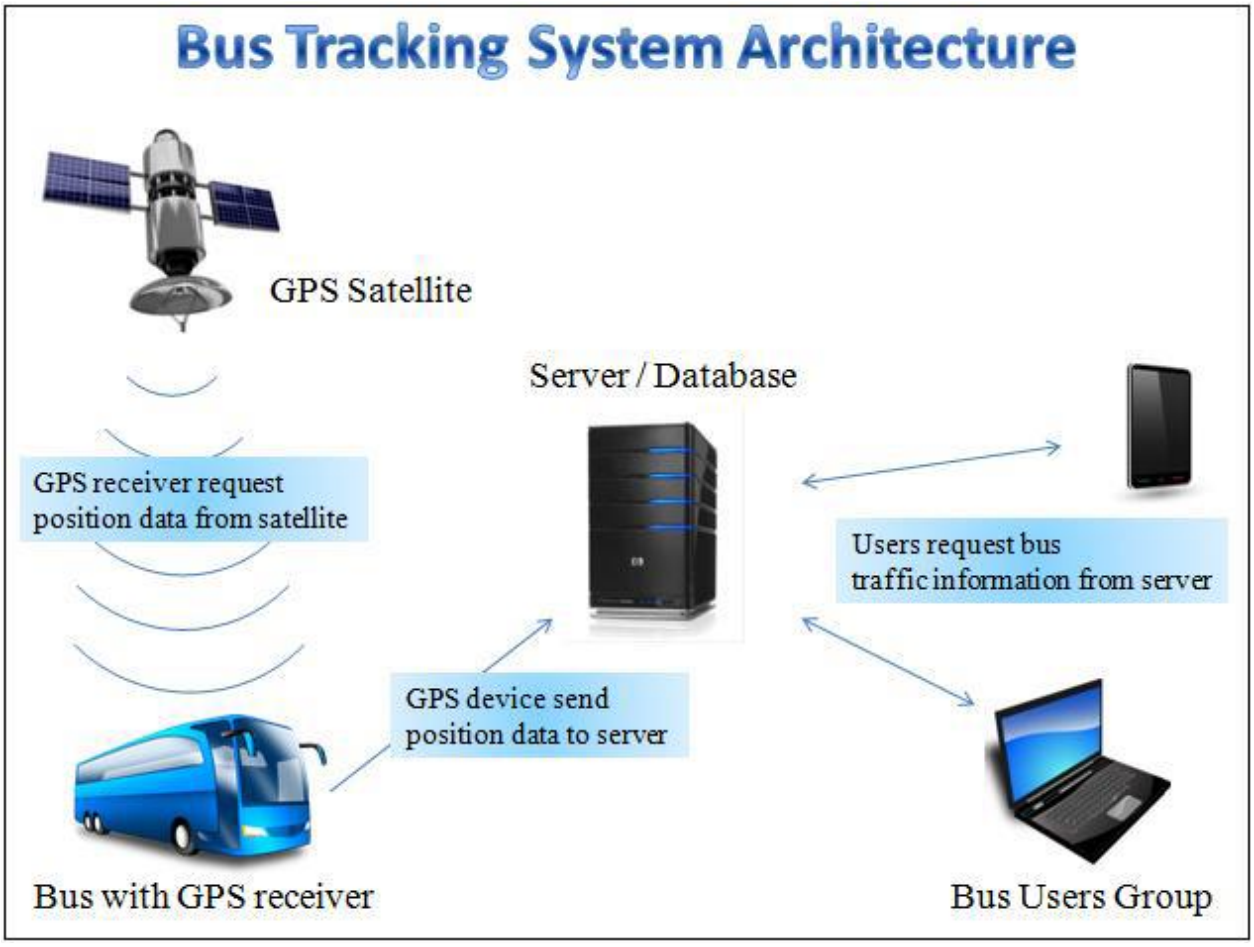


Fig:Bus tracking System Architecture

1.2 INTRODUCTION TO EMBEDDED SYSTEMS

The microprocessor-based system is built for controlling a function or range of functions and is not designed to be programmed by the end user in the same way a PC is defined as an embedded system. An embedded system is designed to perform one particular task albeit with different choices and options.

Embedded systems contain processing cores that are either microcontrollers or digital signal processors. Microcontrollers are generally known as "chip", which may itself be packaged with other microcontrollers in a hybrid system of Application Specific Integrated Circuit (ASIC). In general, input always comes from a detector or sensors in more specific word and meanwhile the output goes to the activator which may start or stop the operation of the machine or the operating system.

An embedded system is a combination of both hardware and software, each embedded system is unique and the hardware is highly specialized in the application domain. Hardware consists of processors, microcontroller, IR sensors etc. On the other hand, Software is just like a brain of the whole embedded system as this consists of the programming languages used which makes hardware work. As a result, embedded systems programming can be a widely varying experience.

An embedded system is combination of computer hardware and software, either fixed incapability or programmable, that is specifically designed for particular kind of application device. Industrial machines, automobiles, medical equipment, vending machines and toys (as well as the more obvious cellular phone and PDA) are among the myriad possible hosts of an embedded system. Embedded systems that are programmable are provided with a programming interface, and embedded systems programming id specialized occupation.

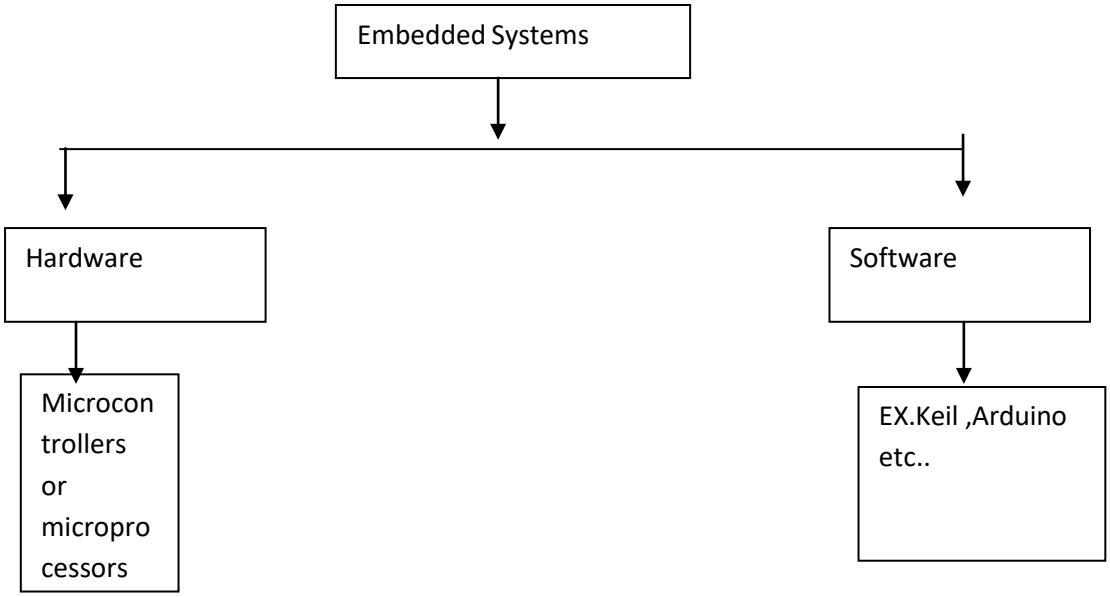


Figure 1.1 Block diagram of embedded system

Figure2.1 illustrate the Block diagram of Embedded System (ES consists of hardware and software part which again consists of programming language and physical peripherals respectively*).*

On the other hand, the microcontroller is a single silicon chip consisting of all input, output and peripherals on it. A single microcontroller has the following features:

1. Arithmetic and logic unit
2. Memory for storing program
3. EEPROM for nonvolatile and special function registers
4. Input/output ports
5. Analog to digital converter
6. Circuits
7. Serial communication ports

1.3 APPLICATIONS OF EMBEDDED SYSTEM

We are living in the embedded world. You are surrounded with many embedded products and your daily life largely depends on the proper functioning's of thesegadgets, television, radio, CD layer of your living room, washing machines or microwave

oven in your kitchen, card readers, access controllers ,palm devices of your work space enable to do many of your tasks very effectively. Apart from all these, many controllers embedded in your car take care of your car operation between the bumper and most of the times tend to ignore all these controllers.

In recent days you are showered with variety of information about these embedded controllers in many places. All kind of magazines and journals regularly dish out details about latest technologies, new devices: fast applications which make you believe that your basic survival is controlled by these embedded products. Now you can agree to that fact these embedded products have successfully invaded into our world. you must be wandering about these embedded controllers or systems.

The computer you use to compose your mails, or create a document or analyze the database is known as standard desktop computer. These desktop computers are manufactured to serve many purpose and applications.

1.3.1 MILITARY AND AEROSPACE SOFTWARE APPLICATIONS

From in-orbit embedded system to jumbo jets to vital battlefield networks, designer's performance, scalability, and high-availability facilities consistently turn to the Linux OS, RTOS and LinuxOS-178RTOs for software certification to DO-178B rich in system resources and networking serviced, Linux OS provides an off-the-shelf software platform with hard real-time response backed by powerful distributed computing (COBRA), high reliability's software certification, and long term support options.

1.3.2 COMMUNICATIONS APPLICATIONS

Five-nine" availability, compact PCI hot swap support, and hard real-time response Linux OS delivers on these key requirements and more for today's carrier-class systems. Scalable kernel configurations, distributed computing capabilities, intergraded communications stacks, and fault-management facilities make Linux OS the ideal choice for companies looking for single operating system for all embedded telecommunication applications from complex central to single line/trunk cards.

1.3.3 ELECTRONICS APPLICATIONS AND CONSUMER DEVICES

As the number of powerful embedded processor in consumer devices continues to rise, the blue cat Linux operating system provides a highly reliable and royalty-free option for system designers. And as the wireless appliance revolution rolls on, web enabled navigation systems, radios, personal communication devices, phones and PDAs all benefit from the cost-effective dependability, proven stability and full product life cycle support opportunities associated with blue cat embedded Linux. Blue cat hasteamed uo with industry leaders to make it easier to build Linux mobile phones with java integration.

1.4 INDUSTRIAL AUTOMATION AND PROCESS CONTROL SOFTWARE

Designers of industrial and process control systems know from experience that Linux works operating system provide the security and reliability that their industrial applications require. From ISO 9001 certification to fault-tolerance, secure portioning and high availability, we've got it all. The advantage of our 20 years of experience with the embedded system. Now a day's embedded system widely using in the industrial areas to reduce to tike perform the particular task .This replacing the less work and also more efficient gives the accurate result.

CHAPTER 2

BLOCK DIAGRAM AND DESCRIPTION

2.1 BLOCK DIAGRAM OF THE PROJECT

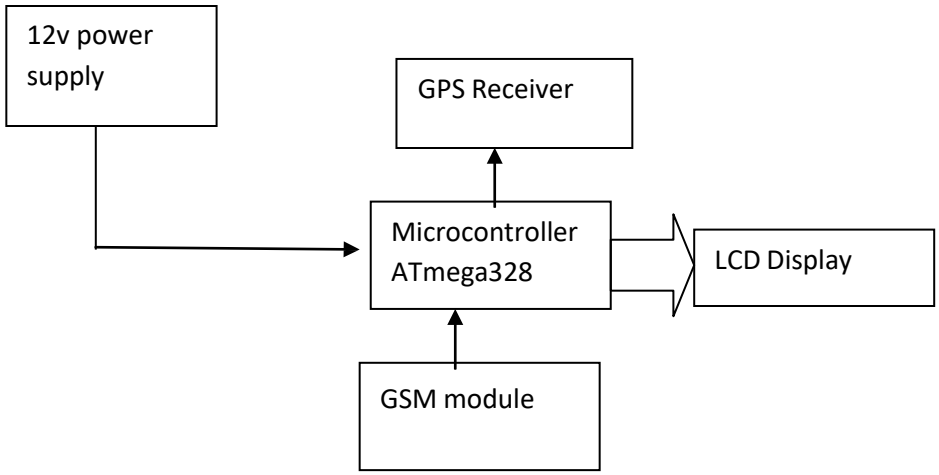


Fig:2.1.Block diagram

2.2 FUNCTIONS OF EACH BLOCK

2.2.1 POWER SUPPLY:

The primary function of a power supply is to convert one form of electrical energy into another and, as a result power supplies.

2.2.2 MICROCONTROLLER:

The microcontroller is used to manipulate the serial operation based the program present in the output is taken from one of the four ports.

2.2.3 LCD DISPLAY:

LCDs are available to display arbitrary images which can be displayed or hidden, such as preset words, digits and 7 segment displays as in a digital clock. They use some basic technology, except that arbitrary images are made up of a large number of pixels, while other displays have larger elements.

2.2.4 CRYSTAL OSCILLATOR:

Crystal oscillator is used to produce oscillated pulses which is given to the microcontroller.

2.2.5 GSM MODEM:

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900MHz.

2.2.6 GPS RECEIVER:

GPS, in full Global Positioning System, space-based radio-navigation system that broadcasts highly accurate navigation pulses to users on or near the Earth. In the United States' Navstar GPS, 24 main satellites in 6 orbits circle the Earth every 12 hours. In addition, Russia maintains a constellation called GLONASS (Global Navigation Satellite System).

CHAPTER 3
TECHNOLOGIES USED

3.1 GSM TECHNOLOGY

3.1.1 DEFINITION OF GSM

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz.

3.1.2 HISTORY OF GSM

Global system for mobile communication is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz It is estimated that many countries outside of Europe will join the GSM partnership.GSM, the Global System for Mobile communications, is a digital cellular communications system, which has rapidly gained acceptance and market share worldwide, although it was initially developed in a European context. In addition to digital transmission, GSM incorporates many advanced services and features, including ISDN compatibility and worldwide roaming in other GSM networks. The advanced services and architecture of GSM have made it a model for future third generation cellular systems, such as UMTS. This will give an overview of the services offered by GSM, the system architecture, the radio transmission

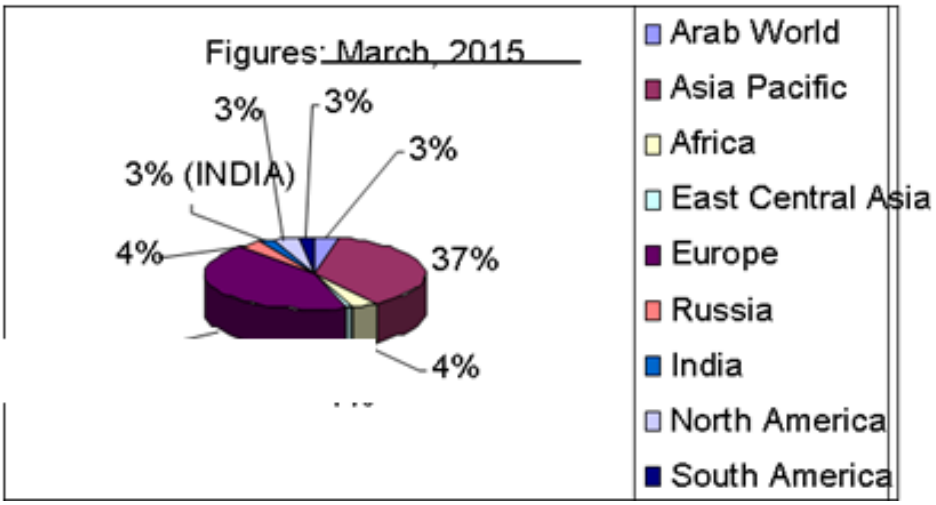


Figure3.2 Graph for GSM module

3.1.1 GSM Services

- Tele-services
- Bearer or Data Services
- Supplementary services

Tele-services:

Telecommunication services that enable voice communication via mobile phones Offered services, Mobile telephony, Emergency calling

Bearer or Data Services:

Include various data services for information transfer between GSM and other networks like PSTN, ISDN etc at rates from 300 to 9600 bps ,Short Message Service (SMS) up to 160 character alphanumeric data transmission to/from the mobile terminal Unified, Messaging Services(UMS),Group 3 fax, Voice mailbox, Electronic mail

Supplementary services

Call related services like Call Waiting- Notification of an incoming call while on the handset, Call Hold- Put a caller on hold to take another call, Call Barring- All calls, outgoing calls, or incoming calls, Call Forwarding- Calls can be sent to various numbers defined by the user, Multi Party Call Conferencing - Link multiple calls together

- CLIP – Caller line identification presentation
- CLIR – Caller line identification restriction

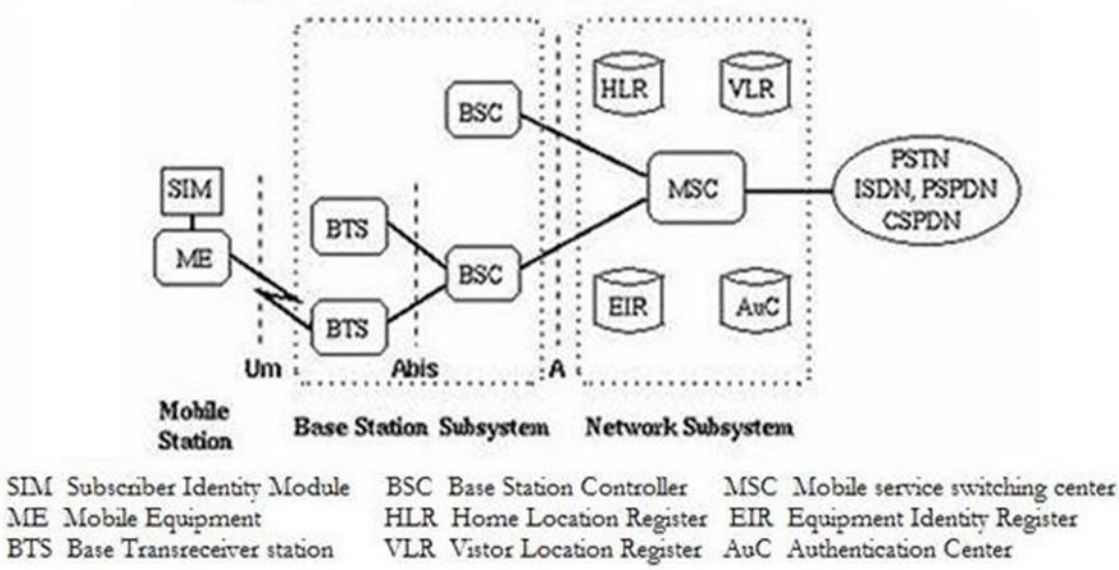


Figure3.3 GSM Network Architecture

3.1.3 Operation GSM

The basis of the GPS is a constellation of satellites that are continuously orbiting the earth. These satellites, which are equipped with atomic clocks, transmit radio signals that contain their exact location, time, and other information. The radio signals from the satellites, which are monitored and corrected by control stations, are picked up by the GPS receiver. A Global Positioning System receiver needs only three satellites to plot a rough, 2D position, which will not be very accurate.

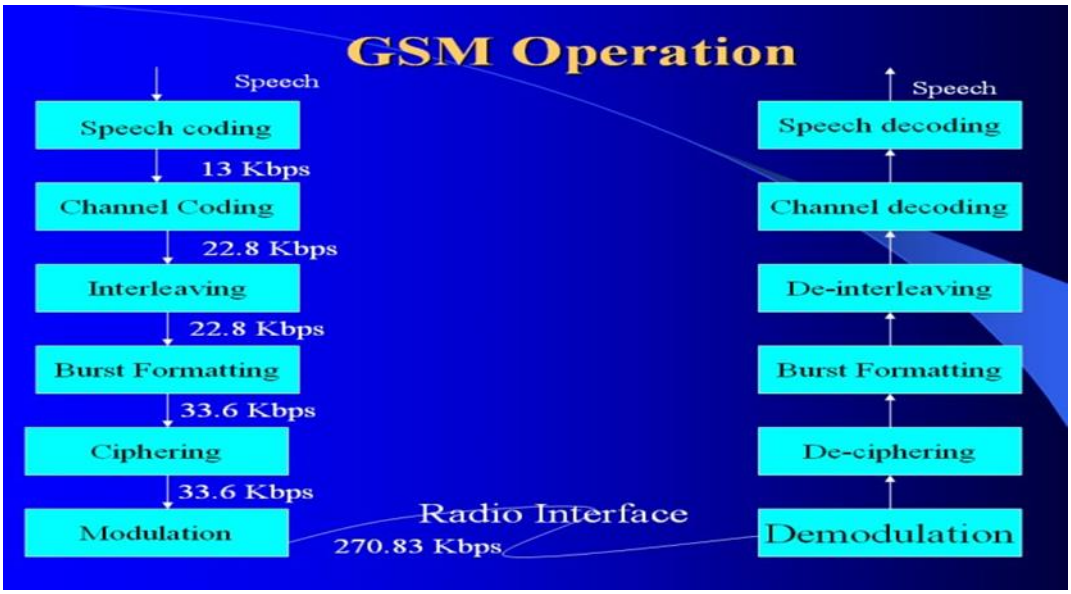


Figure3.4 GSM operation

3.1.4 Security in GSM

- On air interface, GSM uses encryption and TMSI instead of IMSI.
- SIM is provided 4-8 digit PIN to validate the ownership of SIM
- 3 algorithms are specified :

  - A3 algorithm for authentication

  - A5 algorithm for encryption

  - A8 algorithm for key generation

3.1.5 Characteristics of GSM Standard

- Fully digital system using 900,1800 MHz frequency band.
- TDMA over radio carriers(200 KHz carrier spacing.
- 8 full rate or 16 half rate TDMA channels per carrier.
- User/terminal authentication for fraud control.
- Encryption of speech and data transmission over the radio path.
- Full international roaming capability.
- Low speed data services (upto 9.6 Kb/s).
- Compatibility with ISDN.
- Support of Short Message Service (SMS).

3.1.6 Advantages of GSM over Analog system

- Capacity increases
- Reduced RF transmission power and longer battery life.
- International roaming capability.
- Better security against fraud (through terminal validation and user authentication).
- Encryption capability for information security and privacy.
- Compatibility with ISDN, leading to wider range of services.

3.1.7 GSM Applications

- Mobile telephony
- GSM-R
- Telemetry System

  - Fleet management

  - Automatic meter reading

  - Toll Collection

  - Remote control and fault reporting of DG sets

3.1.8 Future of GSM

- 2nd Generation
  - GSM -9.6 Kbps (data rate
- Generation (Future of GSM)
  - HSCSD (High Speed circuit Switched data) its data rate : 76.8 Kbps (9.6 x 8 kbps)
  - GPRS (General Packet Radio service) its data rate: 14.4 - 115.2 Kbps
  - EDGE (Enhanced data rate for GSM Evolution) its data rate: 547.2 Kbps (max)

CHAPTER 4

HARDWARE IMPLEMENTATION

4.1.1 ATMEGA328 Microcontroller Description

The Atmel AVR® core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in a single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers. The ATmega328/P provides the following features: 32Kbytes of In-System Programmable Flash with Read-While-Write capabilities, 1Kbytes EEPROM, 2Kbytes SRAM, 23 general purpose I/O lines, 32 general purpose working registers, Real Time Counter (RTC), three flexible Timer/Counters with compare modes and PWM, 1 serial programmable USARTs , 1 byte-oriented 2-wire Serial Interface (I2C), a 6- channel 10- bit ADC (8 channels in TQFP and QFN/MLF packages) , a programmable Watchdog Timer with internal Oscillator, an SPI serial port, and six software selectable power saving modes. The Idle mode stops the CPU while allowing the SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until thenext interrupt or hardware reset. In Power-save mode, the asynchronous timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except asynchronous timer and ADC to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator oscillator is running while the rest of the device is sleeping. This allows very fast start-up

combined with low power consumption. In Extended Standby mode, both the main oscillator and the asynchronous timer continue to run. Atmel offers the QTouch® library for embedding capacitive touch buttons, sliders and wheels functionality into AVR microcontrollers. The patented charge-transfer signal acquisition offers robust sensing and includes fully debounced reporting of touch keys and includes Adjacent Key Suppression® (AKS™) technology for unambiguous detection of key events. The easy- to-use QTouch

Suite toolchain allows you to explore, develop and debug your own touch applications. The device is manufactured using Atmel's high density non-volatile memory technology. The On-chip ISP Flash allows the program memory to be reprogrammed In-System through an SPI serial interface, by a conventional nonvolatile memory programmer, or by an On-chip Boot program running on the AVR core.

The Boot program can use any interface to download the application program in the Application Flash memory. Software in the Boot Flash section willcontinue to run while the Application Flash section is updated, providing true Read- While-Write operation. By combining an 8-bit RISC CPU with In-System Self- Programmable Flash on a monolithic chip, the Atmel ATmega328/P is a powerful microcontroller that provides a highly flexible and cost effective solution to many embedded control applications.

The ATmega328/P is supported with a full suite of program and system development tools including: C Compilers, Macro Assemblers, Program Debugger/Simulators, In-Circuit Emulators, and Evaluation kits.

4.1.2 FEATURES OF ATMEG

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB
- Clock Speed: 80 MHz
- USB-TTL based on CP2102 is included onboard, Enabling Plug n Play
- PCB Antenna
- Small Sized module to fit smartly inside your IoT projects

4.1.3 ADVANTAGES/ IMPROVEMENTS IN ATMEG328

1. Still runs on 5 V, so legacy 5 V stuff interfaces cleaner
2. Even though it's 5 V capable, newer parts can run to 1.8 V. This wide range is very rare.
3. Nice instruction set, very good instruction throughput compared to other processors (HCS08, PIC12/16/18).
4. High quality GCC port (no proprietary crappy compilers!)
5. "PA" variants have good sleep mode capabilities, in micro-amperes.
6. Well rounded peripheral set
7. QTouch capability

4.5.8. AREF

AREF is the analog reference pin for the A/D Converter.

4.1.5.9. ADC[7:6] (TQFP and VFQFN Package Only)

In the TQFP and VFQFN package, ADC[7:6] serve as analog inputs to the A/D converter.

These pins are powered from the analog supply and serve as 10-bit ADC channels.

4.1 Arduino Uno Borad Description

Arduino/Genuino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

FIG:4.2.Arduino UNO board

4.1.1 Power USB

Arduino board can be powered by using the USB cable from wer computer. All we need to do is connect the USB cable to the USB connection (1).

4.1.2 Power (Barrel Jack)

Arduino boards can be powered directly from the AC mains powersupply by connecting it to the Barrel Jack (2).

4.1.3 Voltage Regulator

The function of the voltage regulator is to control the voltage given to the Arduino board and stabilize the DC voltages used by the processor and other elements.

4.1.4 Crystal Oscillator

The crystal oscillator helps Arduino in dealing with time issues. How does Arduino calculate time? The answer is, by using the crystal oscillator. The number printed on top of the Arduino crystal is 16.000H9H. It tells us that the frequency is 16,000,000 Hertz or 16 MHz.

4.1.5 Arduino Reset

We can reset wer Arduino board, i.e., start wer program from the beginning. We can reset the UNO board in two ways. First, by using the reset button (17) on the board. Second, we can connect an external reset button to the Arduino pin labelled RESET (5).

4.1.6 Pins (3.3, 5, GND, Vin)

- 3.3V (6) − Supply 3.3 output volt
- 5V (7) − Supply 5 output volt
- Most of the components used with Arduino board works fine with 3.3 volt and 5 volt.

- GND (8)(Ground) − There are several GND pins on the Arduino, any of which can be used to ground wer circuit.

- Vin (9) − This pin also can be used to power the Arduino board from an external power source, like AC mains power supply.

4.1.7 Analog pins

- The Arduino UNO board has five analog input pins A0 through A5. These pins can read the signal from an analog sensor like the humidity sensor or temperature sensor and convert it into a digital value that can be read by the microprocessor.

4.2 LIQUID CRYSTAL DISPLAY (16 X 2)

LCD stands for **L**iquid **C**rystal **D**isplay. LCD is finding wide spread use replacing LEDs (seven segment LEDs or other multi segment LEDs) because of the following reasons:

1. The declining prices of LCDs.
2. The ability to display numbers, characters and graphics. This is in contrast to LEDs, which are limited to numbers and a few characters.
3. Incorporation of a refreshing controller into the LCD, thereby relieving the CPU of the task of refreshing the LCD. In contrast, the LED must be refreshed by the CPU to keep displaying the data.
4. Ease of programming for characters and graphics.

These components are "specialized" for being used with the microcontrollers, which means that they cannot be activated by standard IC circuits. They are used for writing different messages on a miniature LCD.

Fig 4.3 : LCD Display

A model described here is for its low price and great possibilities most frequently used in practice. It is based on the HD44780 microcontroller (*Hitachi*) and can display messages in two lines with 16 characters each. It displays all the alphabets, Greek letters, punctuation marks, mathematical symbols etc. In addition, it is possible to display symbols that user makes up on its own. Automatic shifting message on display (shift left and right), appearance of the pointer, backlight etc. are considered as useful characteristics.

4.2.1 Pins Functions

There are pins along one side of the small printed board used for connection to the microcontroller. There are total of 14 pins marked with numbers (16 in case the background light is built in). Their function is described in the table below:

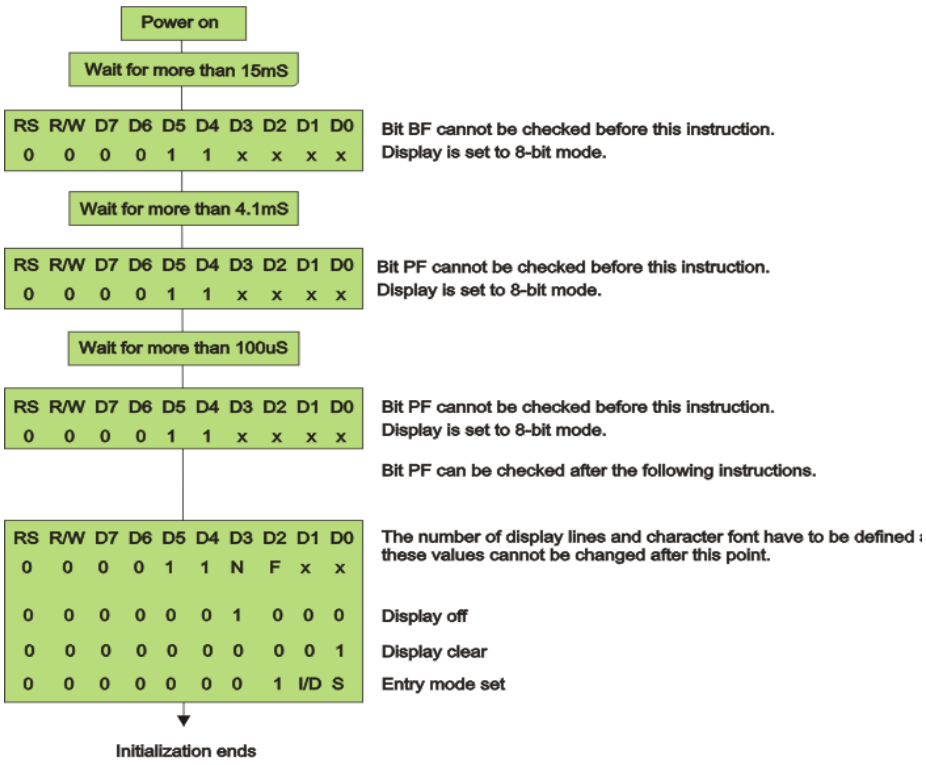


Figure 4.3.1: Procedure on 8-bit initialization.

4.2.2 LCD screen:

LCD screen consists of two lines with 16 characters each. Each character consists of 5x7 dot matrix. Contrast on display depends on the power supply voltage and whether messages are displayed in one or two lines. For that reason, variable voltage 0-Vdd is applied on pin marked as Vee. Trimmer potentiometer is usually used for that purpose. Some versions of displays have built in backlight (blue or green diodes). When used during operating, a resistor for current limitation should be used (like with any LE diode).

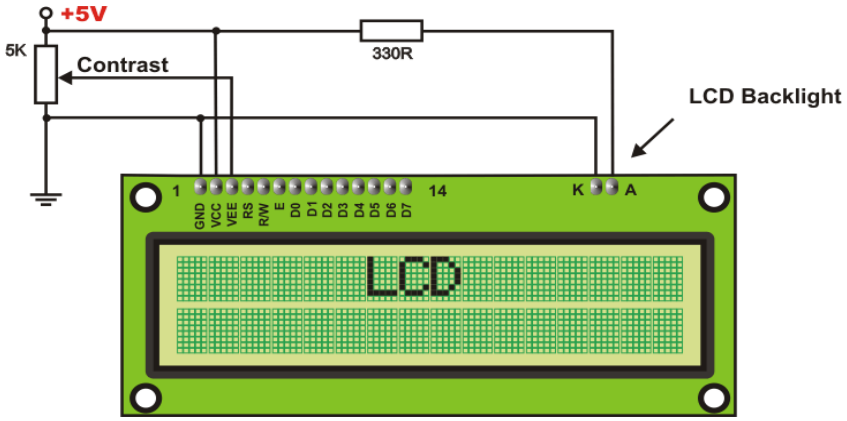


Figure 4.3.2: Internal Structure of LCD

4.2.3 LCD Basic Commands

All data transferred to LCD through outputs D0-D7 will be interpreted as commands or as data, which depends on logic state on pin RS:

RS = 1 - Bits D0 - D7 are addresses of characters that should be displayed. Built in processor addresses built in "map of characters" and displays corresponding symbols. Displaying position is determined by DDRAM address. This address is either previously defined or the address of previously transferred character is automatically incremented.

RS = 0 - Bits D0 - D7 are commands which determine display mode. List of commands which LCD recognizes are given in the table below**:**

Command	**RS**	**RW**	**D7**	**D6**	**D5**	**D4**	**D3**	**D2**	**D1**	**D0**	**Execution Time**
Clear display	0	0	0	0	0	0	0	0	0	1	1.64Ms
Cursor home	0	0	0	0	0	0	0	0	1	X	1.64mS
Entry mode set	0	0	0	0	0	0	0	1	I/D	S	40uS
Display on/off control	0	0	0	0	0	0	1	D	U	B	40uS

Cursor/Display Shift	0	0	0	0	0	1	D/C	R/L	x	X	40uS
Function set	0	0	0	0	1	DL	N	F	x	X	40uS
Set CGRAM address	0	0	0	1	CGRAM address						40uS
Set DDRAM address	0	0	1	DDRAM address							40uS
Read "BUSY" flag (BF)	0	1	BF	DDRAM address							-
Write to CGRAM or DDRAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	40uS
Read from CGRAM or DDRAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	40uS

Fig:4.3.1:LCDdiscription

4.4. POWER SUPPLY

In this project we have power supplies with +5V & -5V option normally +5V is enough for total circuit. Another (-5V) supply is used in case of OP amp circuit .Transformer primary side has 230/50HZ AC voltage whereas at the secondary winding the voltage is step downed to 12/50hz and this voltage is rectified using two full wave rectifiers .the rectified output is given to a filter circuit to fiter the unwanted ac in the signal After that the output is again applied to a regulator LM7805(to provide +5v) regulator. Whereas LM7905 is for providing –5V regulation.

z(+12V circuit is used for stepper motors, Fan and Relay by using LM7812 regulator same process like above supplies).

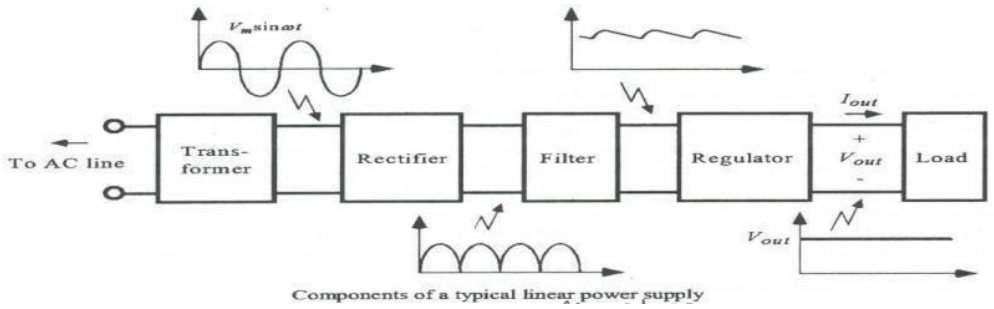


Fig 4.4: Block Diagram Of Power Supply

4.4.1 TRANSFORMER

Transformers are used to convert electricity from one voltage to another with minimal loss of power. They only work with AC (alternating current) because they require a changing magnetic field to be created in their core. Transformers can increase voltage (step-up) as well as reduce voltage (step-down).

Alternating current flowing in the primary (input) coil creates a continually changing magnetic field in the iron core. This field also passes through the secondary (output) coil and the changing strength of the magnetic field induces an alternating voltage in the secondary coil. If the secondary coil is connected to a load the induced voltage will make an induced current flow. The correct term for the induced voltage is 'induced electromotive force' which is usually abbreviated to induced e.m.f.

4.4.2 RECTIFIERS

The purpose of a rectifier is to convert an AC waveform into a DC waveform (OR) Rectifier converts AC current or voltages into DC current or voltage. There are two different rectification circuits, known as 'half-wave' and 'full-wave' rectifiers. Both use components called diodes to convert AC into DC.

4.4.3 FILTERS

A filter circuit is a device which removes the ac component of rectifier output but allows

the dc component to the load. The most commonly used filter circuits are capacitor filter, choke
input filter and capacitor input filter or pi-filter. We used capacitor filter here.

The capacitor filter circuit is extremely popular because of its low cost, small size,little weight and good characteristics. For small load currents this type of filter is preferred. it is commonly used in transistor radio battery eliminators.

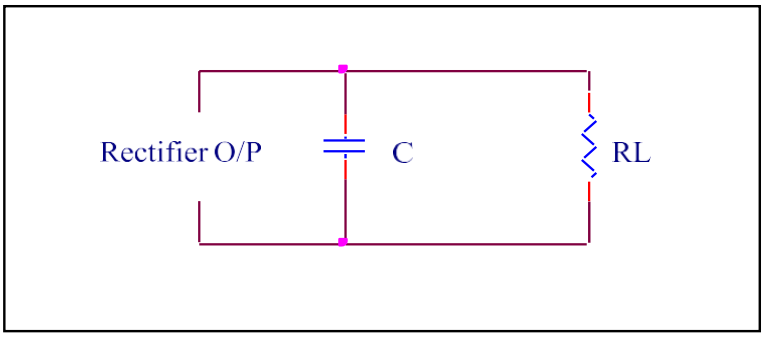


Fig 4.4.1: Block Diagram Of Capacitive Filter

4. 4 MESSAGE MANAGEMENT

4.4.1 Message Management General Description:

Playback and record operations are managed by on-chip circuitry. There areseveral available messaging modes depending upon desired operation.These message modes determine message management style, message length, and external parts count. Therefore, the designer must select the Appropriate operating mode before beginning the design. Operating modes do not affect voice quality; for information on factors affecting quality refer to the Sampling Rate & Voice Quality section.The device supports five message management modes (defined by the MSEL1, MSEL2 and /M8_OPTION pins shown in Figures 1 and 2):

- Random access mode with 2, 4, or 8 fixed-duration messages Tape mode, with multiple variable-duration messages, provides two options:

  - Auto rewind
  - Normal

Modes cannot be mixed. Switching of modes after the device has recorded an initial message is not recommended. If modes are switched after an initial recording has been made some unpredictable message fragments from the previous mode may remain present, and be audible on playback, in the new mode. These fragments will disappear after a Record operation in the newly selected mode. Table 1 defines the decoding necessary to choose the desired mode. An important feature of the APR9600 Message management capabilities is the ability to audibly prompt the user to change in the device'sstatus through the use of "beeps" superimposed on the device's output. This feature is enabled by asserting a logic high level on the BE pin. **Random Access Mode**

Random access mode supports 2, 4, or 8 Message segments of fixed duration. As suggested recording or playback can be made randomly in any of the selected messages.

The length of each message segment is the total recording length available (as defined by the selected sampling rate) divided by the total number of segments enabled (as decoded in Table1). Random access mode provides easy indexing to message segments.

4.4.2 Functional Description .

On power up, the device is ready to record or playback, in any of the enabled message segments. To playback,/CE must be set low to enable the device and /RE must be set high to disable recording & enable playback. You initiate playback by applying a high to low edge on the message trigger pin that represents the message segment you intend to playback. Playback will continue until the end of the message is reached. If a high to low edge occurs on the same message trigger pin during playback, playback of the current message stops immediately. If a different message trigger pin pulses during playback, playback of the current message stops immediately (indicated by one beep) andplayback of the new message segment begins. A delay equal to 8,400 cycles of the sample clock will be encountered before the device starts playing the new message. If a message trigger pin is held low, the selected message is played back repeatedly as long as

the trigger pin stays low. A period of silence, of duration equal to 8,400 cycles of the sampling clock, will be inserted during looping as an indicator to the user of the transition between the end and the beginning of the message.

Tape mode manages messages sequentially much like traditional cassette tape recorders. Within tape mode two options exist, auto rewind and normal. Auto rewind mode configures the device to automatically rewind to the beginning of the message immediately following recording or playback of the message. In tape mode, using either option, messages must be recorded or played back sequentially, much like a traditional cassette tape recorder.

A. Function Description of Recording in Tape Mode using the Auto Rewind Option On power up, the device is ready to record or playback, starting at the first address in the memory array. To record, /CE must be set low to enable the device and /RE must be set low to enable recording. A falling edge of the /M1_MESSAGE pin initiates voice recording (indicated by one beep).A subsequent rising edge of the /M1_MESSAGE pin during recording stops the recording (also indicated by one beep). If the M1_MESSAGE pin is held low beyond the end of the available memory, recording will stop automatically (indicated by two beeps). The device will then assert a logic low on the /M7_END pin until the /M1 Message pin is released. The device returns to standbymode when the /M1_MESSAGE pin goes high again. After recording is finished the device will automatically rewind to the beginning of the most recently recorded message and wait for the next user input. The auto rewind function is convenient because it allows the user to immediately playback and review the message without the need to rewind. However, caution must be practiced because a subsequent record operation will overwritethe last recorded message unless the user remembers to pulse the /M2_Next pin in orderto increment the device past the current message. A subsequent falling edge on the /M1_Message pin starts a new record operation, overwriting the previously existing message. You can preserve the previously recorded message by using the /M2_Next input to advance to the next available message segment. To perform this function, the /M2_NEXT pin must be pulled low for at least 400 cycles of the sample clock. The auto

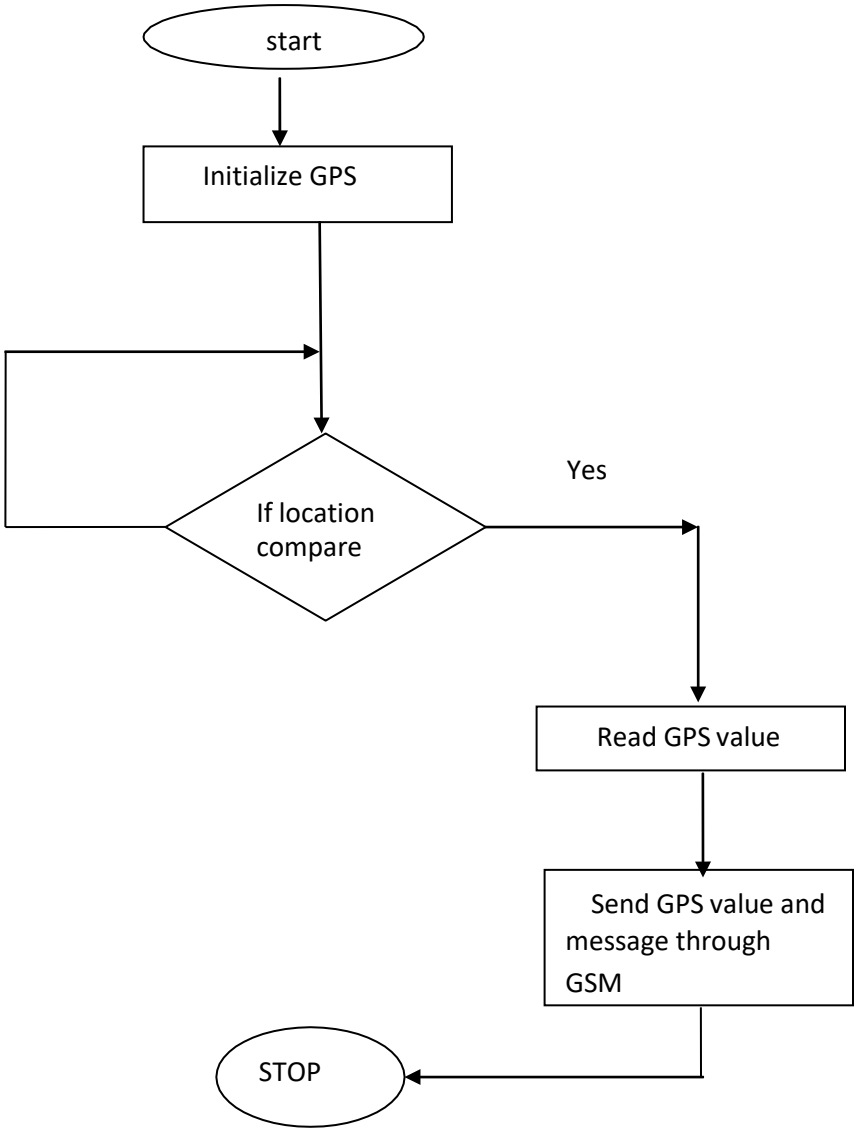
rewind mode allows the user to record over the just recorded message simply by initiating a record sequence without first toggling the /M2_NEXT pin.

To record over any other message however requires a different sequence. You must pulse the /CE pin low once to rewind the device to the beginning of the voice memory. The /M2_NEXT pin must then be pulsed low for the specified number of times to move to the start of the message you wish to overwrite. Upon arriving at the desired message a record sequence can be initiated to overwrite the previously recorded material. After you overwrite the message it becomes the last available message.

CHAPTER 5

FLOWCHART & WORKING PROCEDURE

5.1 FLOW CHART



5.2 WORKING PROCEDURE

This project clearly uses two main modules of GSM and a microcontroller. The user when sends the messages through his phones those reaches the GSM ,through theAT commands all those messages reaches the microcontroller. That microcontroller takesthe data in terms of bits through the Max232.Those information will be transmitted to the LCD display.

5.3.ALGORITHM

1.Initialize the LCD display.

2.Initialize the baurd rete at 38400.

3.By using the AT commands to read the SMS data.

4.Sent At+CMGR=1.

5. Read the data from the GSM modem.

6. The string should be scroll at the bottom line.

7.In top displays Phone number.

8.This action will continuous for all 30 SMS.

9.Once the SMS read that will be deleted.

10.If SMS is important, that will rotate those many time as we declares to rotate.

CHAPTER 6

SOFTWARE IMPLEMENTATION

6.1 CREATING PROJECT IN ARDUINO 1.7.11 VERSION.

Arduino uno Installation

In this we will get know of the process of installation of Arduino IDE and connecting Arduino uno to Arduino IDE.

Step 1

First we must have our Arduino board (we can choose our favorite board) and a USB cable. In case we use Arduino UNO, Arduino Duemilanove, Nano, Arduino Mega 2560, or Diecimila, we will need a standard USB cable (A plug to B plug), t

In case we use Arduino Nano, we will need an A to Mini-B cable..

Step 2 − Download Arduino IDE Software. We can get different versions of Arduino IDE from the Download page on the Arduino Official website. We must select software, which is compatible with operating system (Windows, IOS, or Linux). After file download is complete, unzip the file.

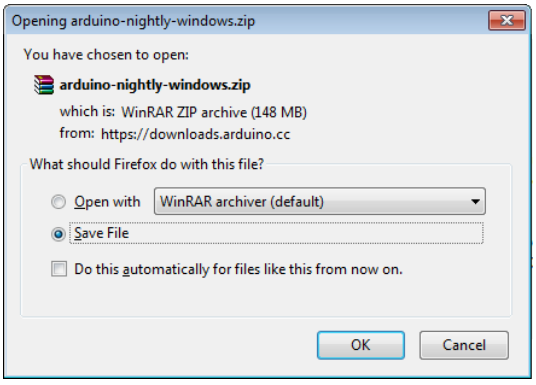


Fig 6.1

Step 3 − Power up our board.

The Arduino Uno, Mega, Duemilanove and Arduino Nano automatically draw power from either, the USB connection to the computer or an external power supply. If we are using an Arduino Diecimila, we have to make sure that the board is configured to draw power from the USB connection. The power source is selected with a jumper, a small piece of plastic that fits onto two of the three pins between the USB and power jacks. Check that it is on the two pins closest to the USB port.

Connect the Arduino board to computer using the USB cable. The green power LED (labeled PWR) should glow.

Step 4 − Launch Arduino IDE.

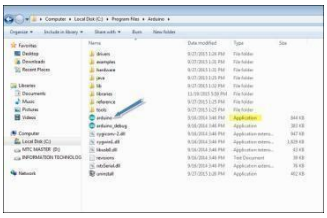


Fig 6.2

After our Arduino IDE software is downloaded, we need to unzip the folder. Inside the folder, we can find the application icon with an infinity label (application.exe). Double-click the icon to start the IDE.

Step 5 − Open our first project.

Once the software starts, we have two options

* Create a new project

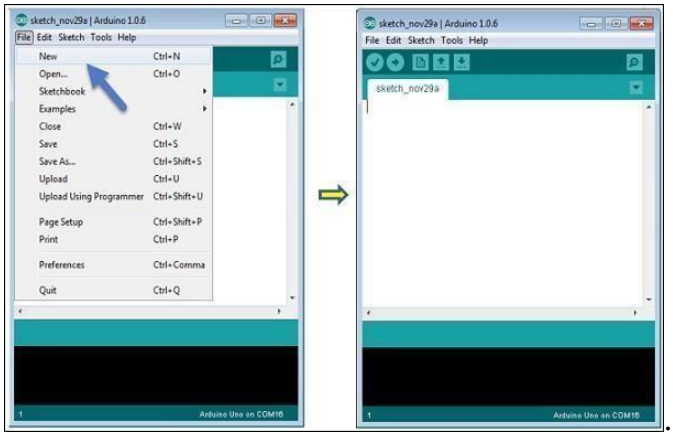


Fig 6.3

* Open an existing project example.

To create a new project, select File → New.

To open an existing project example, select File → Example → Basics → Blink.

Here, we are selecting just one of the examples with the name Blink. It turns the LED on and off with some time delay. We can select any other example from the list.

Step 6 − Select our Arduino board.

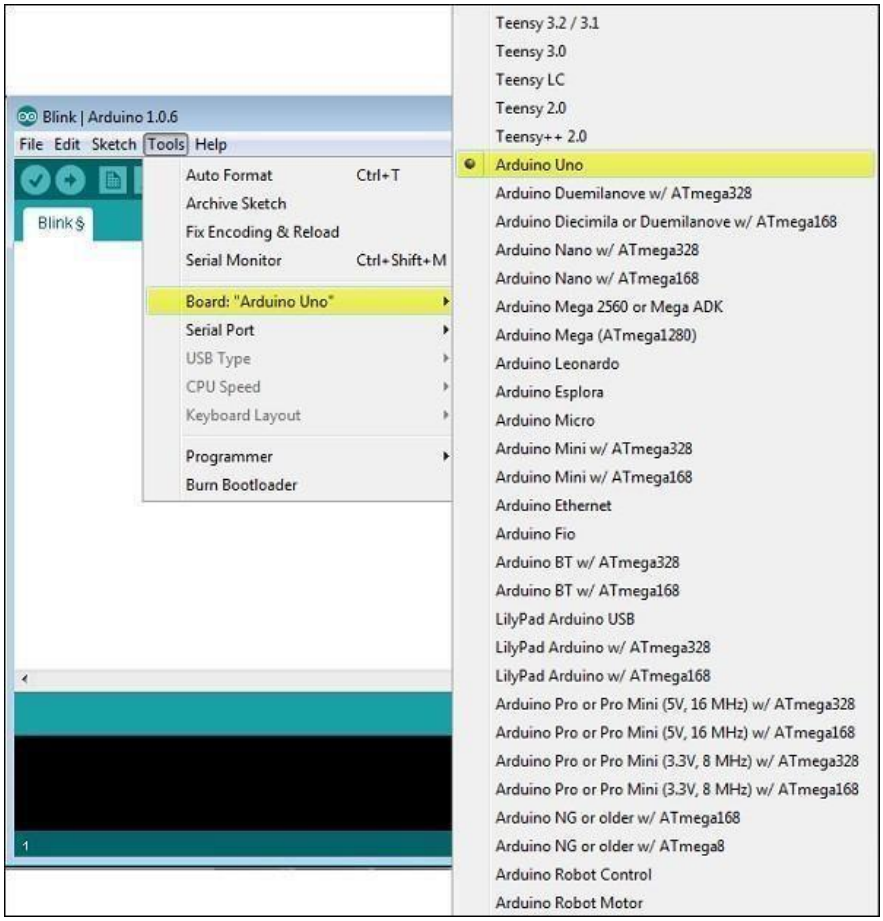


Fig 6.4

To avoid any error while uploading program to the board, we must select the correct Arduino board name, which matches with the board connected to wer computer.

Go to Tools → Board and select board.

Here, we have selected Arduino Uno board according to our tutorial, but we must select the name matching the board that we are using.

Step 7 − Select wer serial port.

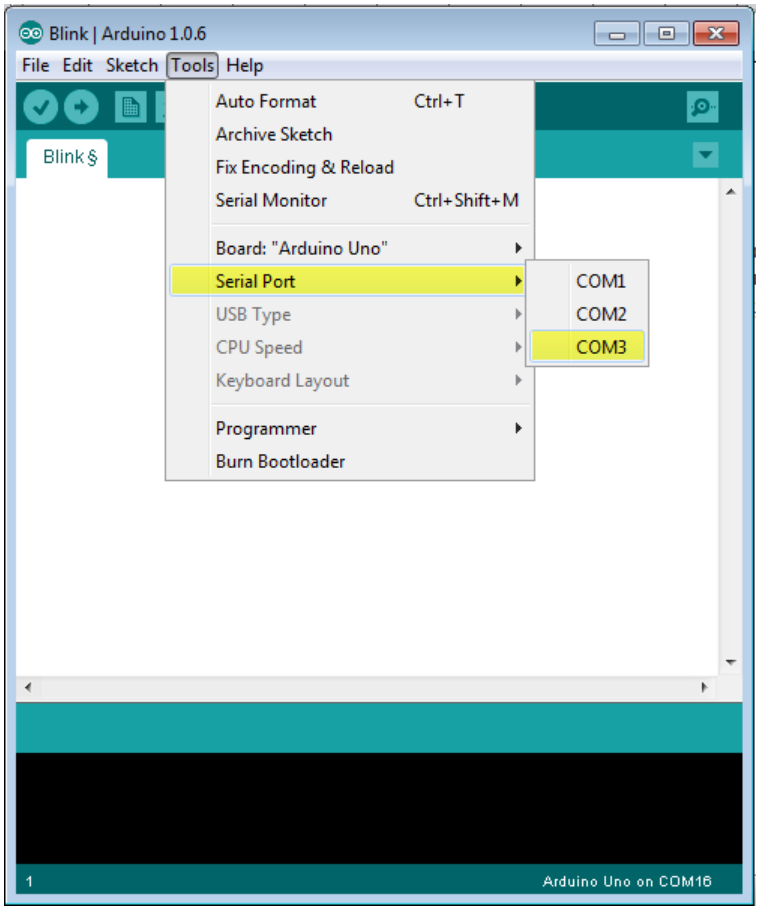


Fig 6.5

Select the serial device of the Arduino board. Go to Tools → Serial Port menu. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports). To find out, we can disconnect wer Arduino board and re-open the menu, the entry that disappears should be of the Arduino board. Reconnect the board and select that serial port.

Step 8 − Upload the program to wer board.

Before explaining how we can upload our program to the board, we must demonstrate the function of each symbol appearing in the Arduino IDE toolbar.

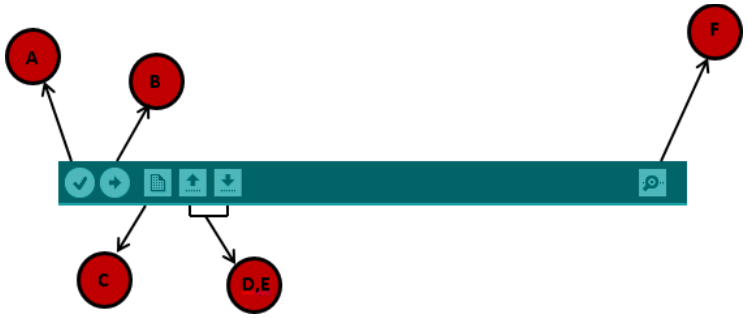


Fig 6.6

A − Used to check if there is any compilation error.

B − Used to upload a program to the Arduino board.

C − Shortcut used to create a new sketch.

D − Used to directly open one of the example sketch.

E − Used to save wer sketch.

F − Serial monitor used to receive serial data from the board and send the serial data to the board.

Now, simply click the "Upload" button in the environment. Wait a few seconds; we will see the RX and TX LEDs on the board, flashing. If the upload is successful, the message "Done uploading" will appear in the status bar.

Note − If we have an Arduino Mini, NG, or other board, we need to press the reset button physically on the board, immediately before clicking the upload button on the Arduino Software.

CHAPTER 7

SOURCE CODE &RESULT

7.1 SOURCE CODE

```
 #include <TinyGPS++.h>
#include <SoftwareSerial.h>
#include <ESP8266WiFi.h>
TinyGPSPlus gps; // The TinyGPS++ object
SoftwareSerial ss(4, 5); // The serial connection to the GPS device
const char* ssid = "Ali";
const char* password = "12345678";
float latitude , longitude;
int year , month , date, hour , minute , second;
String date_str , time_str , lat_str , lng_str;
int pm;
WiFiServer server(80);
void setup()
{
Serial.begin(115200);
ss.begin(9600);
Serial.println();
Serial.print("Connecting to ");
Serial.println(ssid);
WiFi.begin(ssid, password);
while (WiFi.status() != WL_CONNECTED)
{
delay(500);
Serial.print(".");
}
Serial.println("");
Serial.println("WiFi connected");
server.begin();
Serial.println("Server started");
// Print the IP address
Serial.println(WiFi.localIP());
}
void loop()
{
while (ss.available() > 0)
if (gps.encode(ss.read()))
{
if (gps.location.isValid())
{
latitude = gps.location.lat();
lat_str = String(latitude , 6);
longitude = gps.location.lng();
```

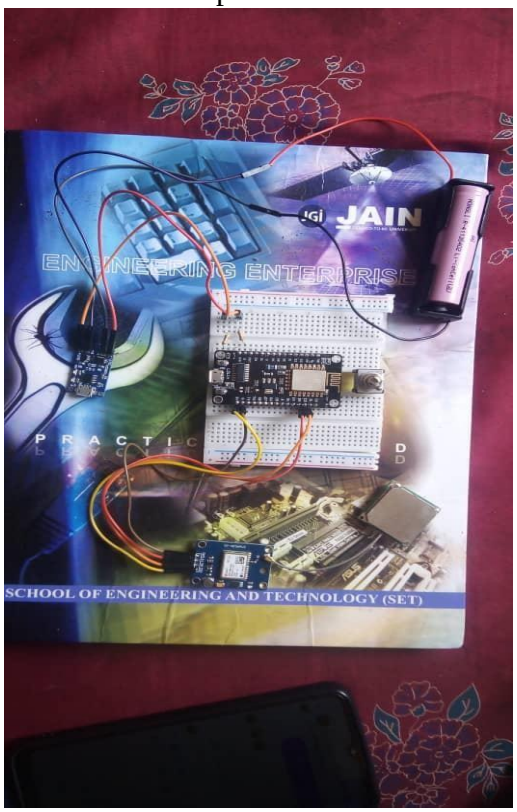
```
lng_str = String(longitude , 6);
}
if (gps.date.isValid())
{
date_str = "";
date = gps.date.day();
month = gps.date.month();
year = gps.date.year();
if (date < 10)
date_str = '0';
date_str += String(date);
date_str += " / ";
if (month < 10)
date_str += '0';
date_str += String(month);
date_str += " / ";
if (year < 10)
date_str += '0';
date_str += String(year);
}
if (gps.time.isValid())
{
time_str = "";
hour = gps.time.hour();
minute = gps.time.minute();
second = gps.time.second();
minute = (minute + 30);
if (minute > 59)
{
minute = minute - 60;
hour = hour + 1;
}
hour = (hour + 5) ;
if (hour >  23)
hour = hour - 24;
if (hour >=  12)
pm = 1;
else
pm = 0;
hour = hour % 12;
if (hour < 10)
time_str = '0';
time_str += String(hour);
```

```
time_str += " : ";
if (minute < 10)
time_str += '0';
time_str += String(minute);
time_str += " : ";
if (second < 10)
time_str += '0';
time_str += String(second);
if (pm == 1)
time_str += " PM ";
else
time_str += " AM ";
}
}
// Check if a client has connected
WiFiClient client = server.available();
if (!client)
{
return;
}
// Prepare the response
String s = "HTTP/1.1 200 OK\r\nContent-Type: text/html\r\n\r\n <!DOCTYPE html> <html> <head>
<title>TAMIL TECH TALKIES</title> <style>";
s += "a:link {background-color: YELLOW;text-decoration: none;}";
s += "table, th, td {border: 1px solid black;} </style> </head> <body> <h1 style=";
s += "font-size:300%;";
s += " ALIGN=CENTER>TAMIL TECH TALKIES</h1>";
s += "<p ALIGN=CENTER style=""font-size:150%;""";
s += "> <b>Location Details</b></p> <table ALIGN=CENTER style=";
s += "width:50%";
s += "> <tr> <th>Latitude</th>";
s += "<td ALIGN=CENTER >";
s += lat_str;
s += "</td> </tr> <tr> <th>Longitude</th> <td ALIGN=CENTER >";
s += lng_str;
s += "</td> </tr> <tr> <th>Date</th> <td ALIGN=CENTER >";
s += date_str;
s += "</td></tr> <tr> <th>Time</th> <td ALIGN=CENTER >";
s += time_str;
s += "</td> </tr> </table> ";
if (gps.location.isValid())
{
```

```
s += "<p align=center><a style=""color:RED;font-size:125%;""
href=""http://maps.google.com/maps?&z=15&mrt=yp&t=k&q=";
s += lat_str;
s += "+";
s += lng_str;
s += """ target=""_top"">Click here!</a> To check the location in Google maps.</p>";
}
s += "</body> </html> \n";
client.print(s);
delay(100);
}
```

7.2 RESULT

These are the outputs which are observed for our project while under working.



CHAPTER 8
CONCLUSION & FUTURE ENHANCEMENT

CONCLUSION

The project titled "tracing down the vehicle using GSM and satellite communication" is a model for vehicle tracking unit with the help of gps receivers and GSM modem. Vehicle Tracking System resulted in improving overall productivity with better fleet management that in turn offers better return on your investments. Better scheduling or route planning can enable you handle larger jobs loads within a particular time. Vehicle tracking both in case of personal as well as business purpose improves safety and security, communication medium, performance monitoring and increases productivity. So in the coming year, it is going to play a major role in our day-to-day living.

We have completed the project as per the requirements of our project. Finally the aim of the project i.e. to trace the bus is successfully achieved.

FUTURE SCOPE

- We can use the EEPROM to store the previous Navigating positions up to 256
- locations and we can navigate up to N number of locations by increasing its
- memory.
- We can reduce the size of the kit by using GPS+GSM on the same module.
- We can increase the accuracy up to 3m by increasing the cost of the GPS receivers.
- We can use our kit for detection of bomb by connecting to the bomb detector.
- With the help of high sensitivity vibration sensors we can detect the accident.
- Whenever vehicle unexpectedly had an accident on the road with help of vibration
- sensor we can detect the accident and we can send the location to the owner,
- hospital and police.
- We can use our kit to assist the traffic. By keeping the kits in the entire vehicles and by knowing the locations of all the vehicles.

- If anybody steals our car we can easily find our car around the globe.

- Enhanced Real-Time Tracking: Future systems can offer more accurate and reliable real-time tracking of buses. This could involve the use of advanced GPS technologies, such as high-precision positioning systems or integration with other location-based technologies like GLONASS or Galileo, to provide more precise bus location information.

- Predictive Analytics: Bus tracking systems can incorporate predictive analytics algorithms to estimate and display accurate arrival times for buses at various stops. By analyzing historical data, traffic patterns, and other factors, the system can provide passengers with more accurate arrival time predictions, reducing waiting times and improving overall efficiency.

- Integration with Mobile Apps: Mobile apps can play a crucial role in the future of bus tracking systems. Passengers can use dedicated mobile apps to view real-time bus locations, estimated arrival times, and other relevant information. Additionally, app integration can enable features like personalized notifications, alerts for route changes or delays, and the ability to provide feedback on bus services.

- Integration with Smart City Infrastructure: Bus tracking systems can integrate with other smart city infrastructure components. For example, they can be connected to traffic management systems to optimize bus routes based on real-time traffic conditions. Integration with smart traffic signals can also prioritize buses at intersections, improving the overall flow of public transportation.

- IoT Integration: The Internet of Things (IoT) can enhance bus tracking systems by connecting various sensors and devices on buses. This integration can enable monitoring of important parameters such as vehicle health, fuel consumption, passenger load, and environmental conditions. The data collected can be used for predictive maintenance, optimizing operations, and improving the overall efficiency of the bus fleet.

- Advanced Data Analytics: Future bus tracking systems can leverage advanced data analytics techniques to derive meaningful insights from the collected data. By

analyzing the data on bus routes, passenger patterns, and demand, transportation authorities can make informed decisions regarding service improvements, route optimization, fleet management, and resource allocation.

- Integration with Multi-Modal Transportation: Bus tracking systems can be integrated with other modes of transportation, such as trains, trams, or subways. This integration can provide passengers with a seamless experience when transferring between different modes of transportation, with real-time updates and synchronized schedules across the entire transportation network.
- Sustainability and Eco-Friendly Features: Future bus tracking systems can incorporate sustainability and eco-friendly features. For example, they can provide information on bus emissions, encourage the use of electric or hybrid buses, and promote greener transportation alternatives. Such features can contribute to reducing carbon footprints and promoting environmentally friendly practices.

CHAPTER 9

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APPENDIX – I

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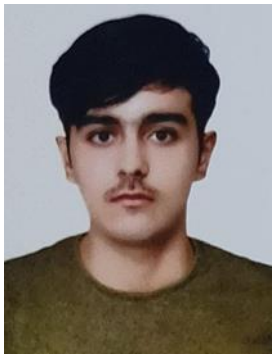
Bisher Ali Merhge 19BTRSE056	**19btrse056@ jainuniversity.ac.in**	
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