SMS BASED VOTING MACHINE

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Submitted in partial fulfillment of the

requirement for the degree of

Bachelor of Technology

DEPARTMENT OF ELECTRONICS AND COMMUNICATION

ENGINEERING

CERTIFICATE

This is to certify that the project report entitled **SMS BASED VOTING MACHINE**, submitted by **AMAN GARG** and **AAKASH CHHABRA** in partial fulfillment for the award of degree of Bachelor of Technology in Electronics and Communication Engineering to Jaypee University of Information Technology, Waknaghat, Solan has been carried out under my supervision. This work has not been submitted partially or wholly to any other University or Institute for the award of this or any other degree or diploma.

Signature of Supervisor ..... N Sharma

Name of Supervisor ..... Neeru Sharma

Designation ..... Sr. Lecturer

Date 23-05-2011

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Finally, we take this opportunity to extend our deep appreciation to our family and friends, for all that they meant to us during the crucial times of the completion of our project.

Signature of the student ..... Aman Garg

Name of Student ..... Aman Garg & Aakash Chabra

Date ..... 24th May 2011

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LIST OF ABBREVIATIONS

AC	–	Alternating Current
ADO	–	ActiveX Data Objects
AT	–	Attention
CD	–	Carrier Detect
CR	–	Carriage Return
CTS	–	Clear To Send
DCE	–	Data Communication Equipment
DD	–	Demand Draft
DSR	–	Data Set Ready
DTE	–	Data Terminal Equipment
DTR	–	Data Terminal Ready
GPRS	–	Ground Packet Radio Service
GSM	–	Global System for Mobiles
IMEI	–	International Mobile Equipment Identity
IMSI	–	International Mobile Subscriber Identity
MMS	–	Multimedia Message Service
PC	–	Personal Computer
SCI	–	Serial Communications Interfaces
SIM	–	Subscriber Identification Module
SMS	–	Short Message Service
RI	–	Ring Indicator
RS-232	–	Recommended Standard no. 232
RTS	–	Request To Send
RXD	–	Receive Data
TXD	–	Transmit Data
USB	–	Universal Serial Bus
VB	–	Visual Basic

ABSTRACT

The project is aimed to develop SMS based password protected voting machine. Voters can participate in the voting by sending their choice through SMS. If the mobile user is not registered than it will decline the vote. For registered users it will ask for password through sms and after verifying the password it will accept the vote revert back an acknowledgement sms to the voter for successful or unsuccessful of vote.

As the world goes mobile at an exponential rate, especially after the technological advancements making internet applications possible on handsets, the need to provide services on mobile through internet, SMSs and other modes of secure data and information transfer has also grown rapidly.

Therefore there is a pressing need for low cost yet flexible and secure applications for various financial and other security sensitive transactions via mobile. One of these applications related directly to us, is the SMS BASED VOTING SYSTEM. In this project we have successfully shown a functioning model for this system. Our model provides ideal solution to the problems faced by traditional VOTING SYSTEM

The system is wireless, hence more adaptable and cost-effective. Also, it uses GSM technology, providing ubiquitous access to the student. The model has a futuristic scope as well.

Our model is based on the principle of SMS through GSM modem. As, the short message service (SMS) technology is one of the most stable mobile technologies around and most of the civilians carry mobile phones with SMS facilities, this can be exploited for registration. A text message is generated and sent to GSM modem in form of SMS. On receipt of SMS, GSM modem informs computer which performs specified task. The system alerts user in case of occurrence of any abnormal conditions like invalid format, wrong information etc.

CHAPTER 1

INTRODUCTION

This project is designed with an idea to use the concept of anytime, anywhere in order to ease the voting process around the globe, also making it time and cost efficient. The mobile sets are nowadays used most widely and very commonly. An SMS can be sent to any mobile user of any service provider with no or a minimum charge. This system is designed using a GSM modem. The GSM modem is configured as a receiver which receives the SMS from the user and forwards the information to the system of the voting machine after receiving it completely. The SMS sent by the user is written in a particular format. The system receives the message and decodes it and saves it in its database.

Our application needs one or more of the following features, hence GSM will be more cost-effective than other communication systems.

1. Short Data Size: Data size per transaction is small like 1-3 lines, e.g. roll number, DD number, DD Date, Bank Name updates. These small but important transaction data can be sent through SMS which cost even less then a local telephone call or sometimes free of cost worldwide. We can also transfer faxes, large data through GSM but this will be as or more costly compared to landline networks.

2. High uptime: Our project requires high uptime and availability of GSM is best suited for us as GSM mobile networks have high uptime compared to landline, internet and other communication mediums.

3. **Large transaction volumes:** GSM SMS messaging can handle large number of transactions in a very short time. We can receive large number SMS on our server like e-mails without internet connectivity. E-mails normally get delayed a lot but SMS are almost instantaneous. Consider situation like students doing registration with GSM technology instead of conventional methods. Here GSM connection is enough to handle hundreds of transaction per minute.

4. **Mobility, Quick installation:** GSM technology allows mobility, GSM terminals, modems can be just picked and installed at any location unlike telephone lines. Also we can be mobile with GSM terminals and can also communicate with server using mobile phone. We have to just purchase the GSM hardware like modems, terminals and mobile handsets, insert SIM cards, configure software and are ready for GSM communication.

1.1 BACKGROUND OF THE PROJECT

In democratic societies, voting is an important tool to collect and reflect people's opinions. Traditionally, voting is conducted in centralised or distributed places called voting booths. Voters go to voting booths and cast their votes under the supervision of authorised parties.

The votes are then counted man-ually once the election has finished.
With the rapid development of computer technology and cryptographic methods, electronic voting systems can be employed that replace the inefficient and most importantly error-prone human component. To increase the efficiency and accuracy of voting procedures, computerised voting systems were developed to help collecting and countingthe votes. These include Lever Voting Machines, Punched Cards for Voting.

For a variety of reasons, voters may be unable to attend voting booths physically, but need to vote remotely, for example, from home or while travelling abroad. Hence, there is great demand for remote voting procedures that are easy, transparent, and, most importantly, secure. Today, the most common way for remote voting is postal voting, where voters cast their votes by post.

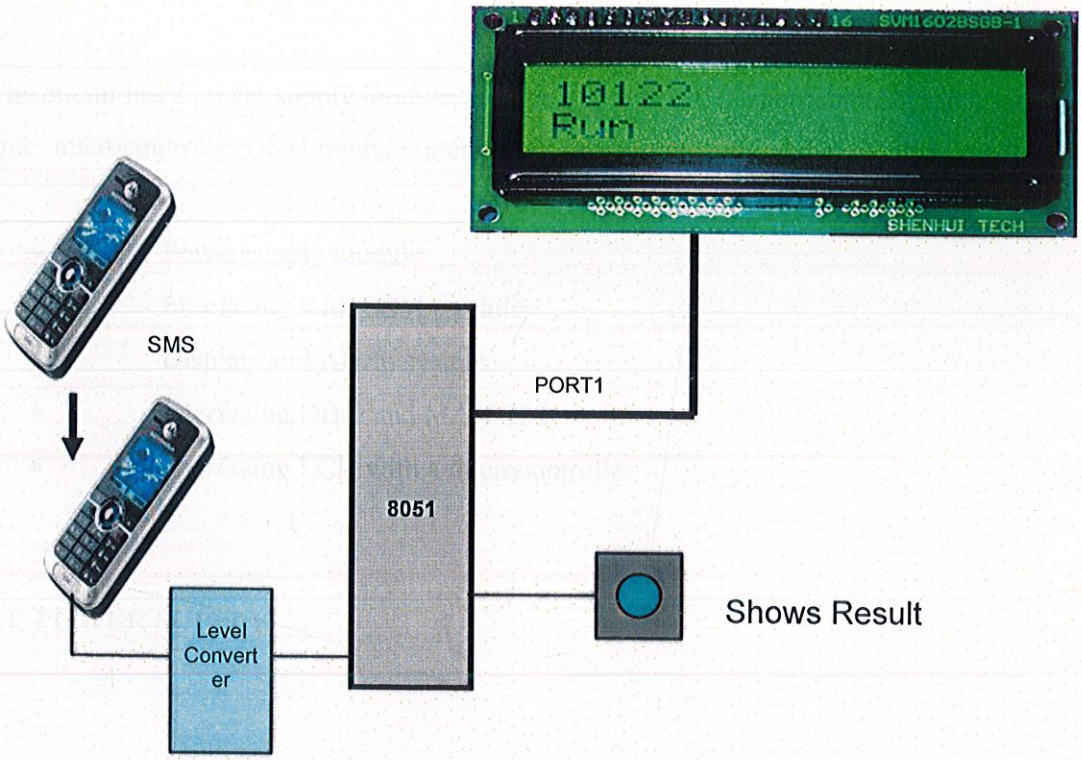
However, it lacks proper authentication and involves a time-consuming procedure. Internet voting was introduced to provide more flexibility. Because of the inherited security vulnerabilities of the Internet and computerised systems in general, Internet voting incurred a wide range of criticism. we endeavour to improve mobility and address security problems of remote voting procedures and systems.

We present an electronic voting scheme using GSM. With more than one billion users, the GSM authentication infrastructure is the most widely deployed authentication mechanism by far. We make use of this well-designed GSM authentication infrastructure to improve mobility and security of mobile voting procedures.

1.2 PROJECT DESCRIPTION

In this project we interfaced 8051 microcontroller with Motorola's C168 GSM mobile phone to decode the received message and do the required action. The protocol used for the communication between the two is AT command.

The microcontroller pulls the SMS received by phone, decode it, recognizes the Mobile no. and then switches on the relays attached to its port to control the appliances. After successful operation, controller sends back the acknowledgement to the user's mobile through SMS.


10122
Run
SHENHUI TECH
SMS
PORT1
8051
Level
Convert
er
Shows Result

CHAPTER 2

CIRCUIT MODELLING

The circuit has a power supply module, a circuit module, LCD microcontroller interfacing and microcontroller GSM module interfacing. The components of the circuit are as follows :

- Power supply module
- Interfacing with GSM module
- Display and Alarm system
- Interfacing DB-9 and MAX-232
- Interfacing LCD with a microcontroller

2.1 POWER SUPPLY

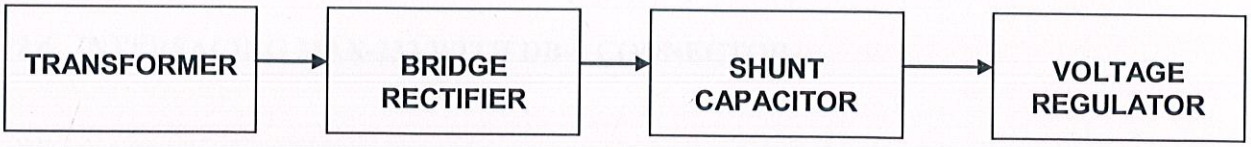


Figure 2.1 BLOCK DIAGRAM OF POWER SUPPLY

The transformer steps down the 220 V a/c. into 12 V a/c. The transformer work on the principle of magnetic induction, where two coils: primary and secondary are wound around an iron core. The two coils are physically insulated from each other in such a way that passing an a/c. current through the primary coil creates a changing voltage in the primary coil and a changing magnetic field in the core. This in turn induces a varying a/c. voltage in the secondary coil.The a/c. voltage is then fed to the bridge rectifier.

The rectifier circuit is used in most electronic power supplies is the single-phase bridge rectifier with capacitor filtering, usually followed by a linear voltage regulator. A rectifier circuit is necessary to convert a signal having zero average value into a non-zero average value. A rectifier transforms alternating current into direct current by limiting or regulating the direction of flow of current. The output resulting from a rectifier is a pulsating D.C. voltage. This voltage is not appropriate for the components that are going to work through it.

2.2 INTERFACING WITH GSM MODULE

The microcontroller output is not compatible with the GSM module. To make it compatible , we require the DB-9 connector and MAX-232 IC. This will enable the microcontroller to send a message to a predefined phone number.

2.3 DISPLAY AN ALARM SYSTEM

The system also consists of a display system and a alarm system. When the SMS will be received , LCD will display a message that the vote has been received and displays it. The buzzer will also buzz indicating the same.

2.4 INTERFACING MAX-232 WITH DB-9 CONNECTOR

When communicating with various microprocessors , one needs to convert RS-232 levels down to lower levels, typically 3.3 or 5 volts. Here is a cheap and simple way to do that. Serial RS-232 communication works with the voltages -15 volts to +15 volts for high and low respectively. On the other hand, TTL logic operates between 0 to +5 volts. Modern low power consumption logic operates in the range of 0 volts and +3.3 volts or even lower.

RS -232	TTL	LOGIC
-15V……..-3V	+2V……+5V	HIGH
+3V……+15V	0V……+.8V	LOW

Thus the RS-232 signal levels are far too high TTL electronics, and the negative RS-232 voltage for HIGH cannot be handled at all by computer logic. This level converter uses a MAX-232 and capacitors.

2.5 INTERFACING LCD WITH MICROCONTROLLER

LCD module has a 8-bit data interface and control pins. One can send data as 8-bit or in a pair of two 4-bit nibbles. To display any character on LCD microcontroller has to send its ASCII value to the data bus of the LCD.

Eg. To display 'AB 'microcontroller has to send 2 hex bytes 41h and 42 h respectively. LCD display used here is having 16X2 size. It means 2 lines each with 16 characters.

CHAPTER 3

HARDWARE DESCRIPTION

Each component is explained with its basic theory which helps us get a basic detail inside of as to how that particular component is working and its use in this particular project. Hence a defined role of each and every component is contained in this chapter. The basic components are as follows :

- POWER SUPPLY
- MICROCNTROLLER
- LCD
- GSM MODEM
- MAX-232 IC
- DB-9 CONNECTOR

3.1 POWER SUPPLY

The transformer steps down the 220 V a/c. into 12 V a/c. The transformer work on the principle of magnetic induction, where two coils: primary and secondary are wound around an iron core. The two coils are physically insulated from each other in such a way that passing an a/c. current through the primary coil creates a changing voltage in the primary coil and a changing magnetic field in the core. This in turn induces a varying a/c. voltage in the secondary coil.

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A rectifier transforms alternating current into direct current by limiting or regulating the direction of flow of current. The output resulting from a rectifier is a pulsating D.C. voltage. This voltage is not appropriate for the components that are going to work through it.

The ripple of the D.C. voltage is smoothened using a filter capacitor of 1000 microF 25V. The filter capacitor stores electrical charge. If it is large enough the capacitor will store charge as the voltage rises and give up the charge as the voltage falls. This has the effect of smoothing out the waveform and provides steadier voltage output. A filter capacitor is connected at the rectifier output and the d.c voltage is obtained across the capacitor. When this capacitor is used in this project, it should be twice the supply voltage.

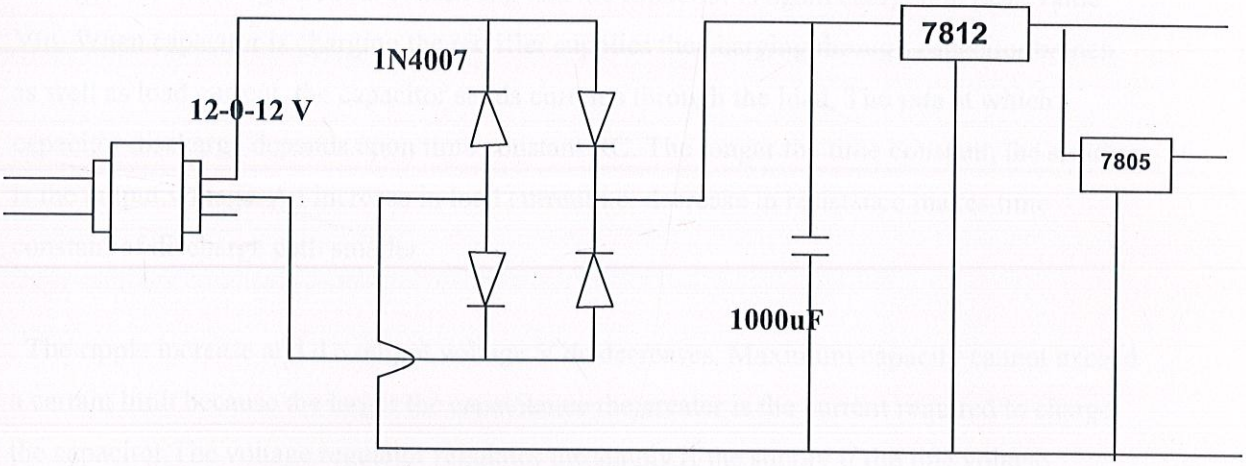


Figure 2.1 POWER SUPPLY

When the filter is used, the RC charge time of the filter capacitor must be short and the RC discharge time must be long to eliminate ripple action. In other words the capacitor must charge up fast, preferably with no discharge.

When the rectifier output voltage is increasing, the capacitor charges to the peak voltage Vm. Just past the positive peak, the rectifier output voltage starts to fall but at this point the capacitor has +Vm voltage across it. Since the source voltage becomes slightly less than Vm, the capacitor will try to send current back through the diode of rectifier.

This reverse biases the diode. The diode disconnects or separates the source the source form load. The capacitor starts to discharge through load. This prevents the load voltage from falling to zero.

The capacitor continues to discharge until source voltage becomes more than capacitor voltage. The diode again starts conducting and the capacitor is again charged to peak value Vm. When capacitor is charging the rectifier supplies the charging through capacitor branch as well as load current, the capacitor sends currents through the load. The rate at which capacitor discharge depends upon time constant RC. The longer the time constant, the steadier is the output voltage. An increase in load current i.e. decrease in resistance makes time constant of discharge path smaller

. The ripple increase and d.c output voltage V dc decreases. Maximum capacity cannot exceed a certain limit because the larger the capacitance the greater is the current required to charge the capacitor.The voltage regulator regulates the supply if the supply if the line voltage increases or decreases. The series 78xx regulators provide fixed regulated voltages from 5 to 24 volts. An unregulated input voltage is applied at the IC Input pin i.e. pin 1 which is filtered by capacitor. The out terminal of the IC i.e. pin 3 provides a regular output. The third terminal is connected to ground.

While the input voltage may vary over some permissible voltage range, and the output voltage remains constant within specified voltage variation limit. The 78xx IC's are positive voltage regulators whereas 79xx IC's are negative voltage regulators.
These voltage regulators are integrated circuits designed as fixed voltage regulators for a wide variety of applications. These regulators employ current limiting, thermal shutdown and safe area compensation.

With adequate heat sinking they can deliver output currents in excess of 1 A. These regulators have internal thermal overload protection. It uses output transistor safe area compensation and the output voltage offered is in 2% and 4% tolerance.

3.2 MICROCONTROLLER

3.2.1 What is a microcontroller ?

A **microcontroller** is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals.Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications.

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, and toys.

By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems.

Some microcontrollers may use Four-bit words and operate at clock rate frequencies as low as 4 kHz, for low power consumption (milliwatts or microwatts). They will generally have the ability to retain functionality while waiting for an event such as a button press or other interrupt; power consumption while sleeping (CPU clock and most peripherals off) may be just nanowatts, making many of them well suited for long lasting battery applications. Other microcontrollers may serve performance-critical roles, where they may need to act more like a digital signal processor (DSP), with higher clock speeds and power consumption.

Microcontrollers must provide real time response to events in the embedded system they are controlling. When certain events occur, an interrupt system can signal the processor to suspend processing the current instruction sequence and to begin an interrupt service routine. The ISR will perform any processing required based on the source of the interrupt before returning to the original instruction sequence.

Possible interrupt sources are device dependent, and often include events such as an internal timer overflow, completing an analog to digital conversion, a logic level change on an input such as from a button being pressed, and data received on a communication link. Where power consumption is important as in battery operated devices, interrupts may also wake a microcontroller from a low power sleep state where the processor is halted until required to do something by a peripheral event.

3.2.2 MICROCONTROLLER PROGRAMMING

Microcontroller programs must fit in the available on-chip program memory, since it would be costly to provide a system with external, expandable, memory. Compilers and assemblers are used to convert high-level language and assembler language codes into a compact machine code for storage in the microcontroller's memory. Depending on the device, the program memory may be permanent, read-only memory that can only be programmed at the factory, or program memory may be field-alterable flash or erasable read-only memory.

3.2.3 OTHER MICROCONTROLLER FEATURES

Microcontrollers usually contain from several to dozens of general purpose input/output pins (GPIO). GPIO pins are software configurable to either an input or an output state. When GPIO pins are configured to an input state, they are often used to read sensors or external signals. Configured to the output state, GPIO pins can drive external devices such as LEDs or motors.

Many embedded systems need to read sensors that produce analog signals. This is the purpose of the analog-to-digital converter (ADC). Since processors are built to interpret and process digital data, i.e. 1s and 0s, they are not able to do anything with the analog signals that may be sent to it by a device. So the analog to digital converter is used to convert the incoming data into a form that the processor can recognize. A less common feature on some microcontrollers is a digital-to-analog converter (DAC) that allows the processor to output analog signals or voltage levels.In addition to the converters, many embedded microprocessors include a variety of timers as well.

One of the most common types of timers is the Programmable Interval Timer (PIT). A PIT may either count down from some value to zero, or up to the capacity of the count register, overflowing to zero. Once it reaches zero, it sends an interrupt to the processor indicating that it has finished counting. This is useful for devices such as thermostats, which periodically test the temperature around them to see if they need to turn the air conditioner on, the heater on, etc.

Time Processing Unit (TPU) is a sophisticated timer. In addition to counting down, the TPU can detect input events, generate output events, and perform other useful operations.A dedicated Pulse Width Modulation (PWM) block makes it possible for the CPU to control power converters, resistive loads, motors, etc., without using lots of CPU resources in tight timer loops.Universal Asynchronous Receiver/Transmitter (UART) block makes it possible to receive and transmit data over a serial line with very little load on the CPU.

Dedicated on-chip hardware also often includes capabilities to communicate with other devices (chips) in digital formats such as I2C and Serial Peripheral Interface (SPI).

3.2.4 DIFFERENCE BETWEEN MICROCONTROLLER AND MICROPROCESSOR

The microprocessors (such as 8086,80286,68000 etc.) contain no RAM, no ROM and no I/O ports on the chip itself. For this reason they are referred as general- purpose microprocessors. A system designer using general- purpose microprocessor must add external RAM, ROM, I/O ports and timers to make them functional. Although the addition of external RAM, ROM, and I/O ports make the system bulkier and much more expensive, they have the advantage of versatility such that the designer can decide on the amount of RAM, ROM and I/o ports needed to fit the task at hand. This is the not the case with microcontrollers. A microcontroller has a CPU (a microprocessor) in addition to the fixed amount of RAM, ROM, I/O ports, and timer are all embedded together on the chip: therefore, the designer cannot add any external memory, I/O, or timer to it. The fixed amount of on chip RAM, ROM, and number of I/O ports in microcontrollers make them ideal for many applications in which cost and space are critical. In many applications, for example a TV remote control, there is no need for the computing power of a 486 or even a 8086 microprocessor. In many applications, the space it takes, the power it consumes, and the price per unit are much more critical considerations than the computing power.

These applications most often require some I/O operations to read signals and turn on and off certain bits. It is interesting to know that some microcontrollers manufactures have gone as far as integrating an ADC and other peripherals into the microcontrollers

3.2.5 MICROCONTROLLER FOR EMBEDDED SYSTEMS

A microcontroller can be considered a self-contained system with a processor, memory and peripherals and can be used as an embedded system. The majority of microcontrollers in use today are embedded in other machinery, such as automobiles, telephones, appliances, and peripherals for computer systems. These are called embedded systems. While some embedded systems are very sophisticated, many have minimal requirements for memory and program length, with no operating system, and low software complexity. Typical input and output devices include switches, relays, solenoids, LEDs, small or custom LCD displays, radio frequency devices, and sensors for data such as temperature, humidity, light level etc. Embedded systems usually have no keyboard, screen, disks, printers, or other recognizable I/O devices of a personal computer, and may lack human interaction devices of any kind.

3.2.6 AT89C51

This popular 8051 chip has on-chip ROM in the form of flash memory. This is ideal for fast development since flash memory can be erased in seconds compared to twenty minutes or more needed for the earlier versions of the 8051. To use the AT89C51 to develop a microcontroller-based system requires a ROM burner that supports flash memory: However, a ROM eraser is not needed. Notice that in flash memory you must erase the entire contents of ROM in order to program it again. The PROM burner does this erasing of flash itself and this is why a separate burner is not needed. To eliminate the need for a PROM burner Atmel is working on a version of the AT89C51 that can be programmed by the serial COM port of the PC.

FEATURES OF AT89C51

- 4K on-chip ROM
- 128 bytes internal RAM (8-bit)
- 32 I/O pins
- Two 16-bit timers
- Six Interrupts
- Serial programming facility
- 40 pin Dual-in-line Package

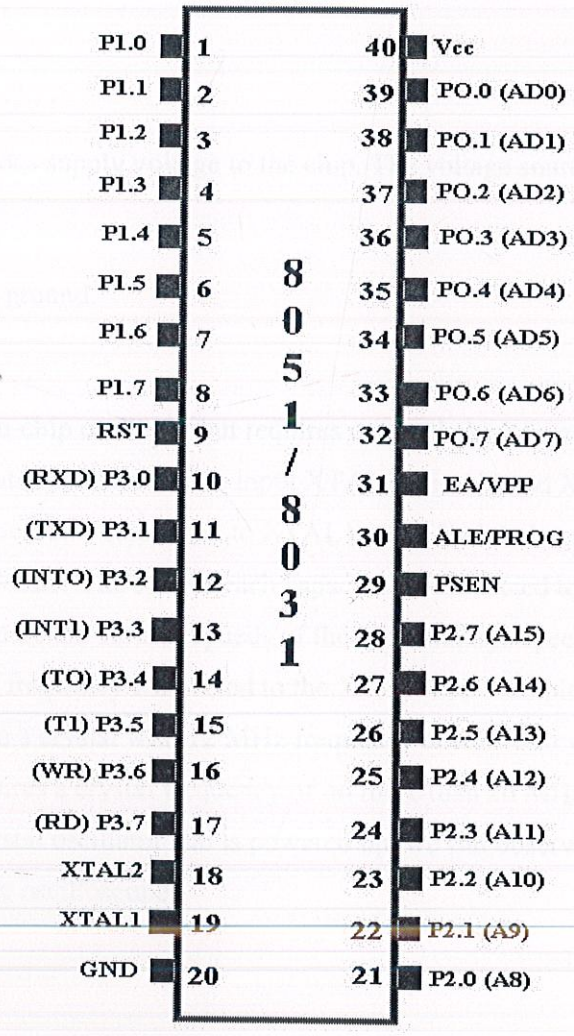


Figure 3.1 PIN DIAGRAM OF 8051

3.2.6.1 PIN DESCRIPTION

The 89C51 have a total of 40 pins that are dedicated for various functions such as I/O, RD, WR, address and interrupts. Out of 40 pins, a total of 32 pins are set aside for the four ports P0, P1, P2, and P3, where each port takes 8 pins. The rest of the pins are designated as Vcc, GND, XTAL1, XTAL, RST, EA, and PSEN. All these pins except PSEN and ALE are used by all members of the 8051 and 8031 families. In other words, they must be connected in order for the system to work, regardless of whether the microcontroller is of the 8051 or the 8031 family. The other two pins, PSEN and ALE are used mainly in 8031 based systems.

Vcc

- Pin 40 provides supply voltage to the chip. The voltage source is +5 V.

GND

- Pin 20 is the ground.

XTAL1 and XTAL2

- The 8051 have an on-chip oscillator but requires external clock to run it. Most often a quartz crystal oscillator is connected to input XTAL1 (pin 19) and XTAL2 (pin 18). The quartz crystal oscillator connected to XTAL1 and XTAL2 also needs two capacitors of 30 pF value. One side of each capacitor is connected to the ground. It must be noted that there are various speeds of the 8051 family. Speed refers to the maximum oscillator frequency connected to the XTAL. For example, a 12 MHz chip must be connected to a crystal with 12 MHz frequency or less. Likewise, a 20 MHz microcontroller requires a crystal frequency of no more than 20 MHz. When the 8051 is connected to a crystal oscillator and is powered up, we can observe the frequency on the XTAL2 pin using oscilloscope.

RST

- Pin 9 is the reset pin. It is an input and is active high (normally low). Upon applying a high pulse to this pin, the microcontroller will reset and terminate all activities. This is often referred to as a power –on reset. Activating a power-on reset will cause all values in the registers to be lost. Notice that the value of Program Counter is 0000 upon reset, forcing the CPU to fetch the first code from ROM memory location 0000. This means that we must place the first line of source code in ROM location 0000 that is where the CPU wakes up and expects to find the first instruction. In order to RESET input to be effective, it must have a minimum duration of 2 machine cycles. In other words, the high pulse must be high for a minimum of 2 machine cycles before it is allowed to go low.

EA

- All the 8051 family members come with on-chip ROM to store programs. In such cases, the EA pin is connected to the Vcc. For family members such as 8031 and 8032 in which there is no on-chip ROM, code is stored on an external ROM and is fetched by the 8031/32. Therefore for the 8031 the EA pin must be connected to ground to indicate that the code is stored externally. EA, which stands for "external access," is pin number 31 in the DIP packages. It is input pin and must be connected to either Vcc or GND. In other words, it cannot be left unconnected.

PSEN

- This is an output pin. PSEN stands for "program store enable." It is the read strobe to external program memory. When the microcontroller is executing from external memory, PSEN is activated twice each machine cycle.

ALE

- ALE (Address latch enable) is an output pin and is active high. When connecting a microcontroller to external memory, potr 0 provides both address and data. In other words the microcontroller multiplexes address and data through port 0 to save pins. The ALE pin is used for de-multiplexing the address and data by connecting to the G pin of the 74LS373 chip.

I/O port pins and their functions

- The four ports P0, P1, P2, and P3 each use 8 pins, making them 8-bit ports. All the ports upon RESET are configured as output, ready to be used as output ports. To use any of these as input port, it must be programmed.

Port 0

- Port 0 occupies a total of 8 pins (pins 32 to 39). It can be used for input or output.

  To use the pins of port 0 as both input and output ports, each pin must be connected externally to a 10K-ohm pull-up resistor. This is due to fact that port 0 is an open drain, unlike P1, P2 and P3. With external pull-up resistors connected upon reset, port 0 is configured as output port. In order to make port 0 an input, the port must be programmed by writing 1 to all the bits of it. Port 0 is also designated as AD0-AD7, allowing it to be used for both data and address. When connecting a microcontroller to an external memory, port 0 provides both address and data. The microcontroller multiplexes address and data through port 0 to save pins. ALE indicates if P0 has address or data. When ALE=0, it provides data D0-D7, but when ALE=1 it has address A0-A7. Therefore, ALE is used for de-multiplexing address and data with the help of latch 74LS373.

Port 1

- Port 1 occupies a total of 8 pins (pins 1 to 8). It can be used as input or output. In contrast to port 0, this port does not require pull-up resistors since it has already pull-up resistors internally. Upon reset, port 1 is configures as an output port. Similar to port 0, port 1 can be used as an input port by writing 1 to all its bits.

Port 2

- Port 2 occupies a total of 8 pins (pins 21 to 28). It can be used as input or output. Just like P1, port 2 does not need any pull-up resistors since it has pull-up resistors internally. Upon reset port 2 is configured as output port. To make port 2 input, it must be programmed as such by writing 1s to it.

Port 3

- Port 3 occupies a total of 8 pins (pins 10 to 17). It can be used as input or output. P3 does not need any pull-up resistors, the same as P1 and P2 did not. Although port 3 is configured as output port upon reset, this is not the way it is most commonly used. Port 3 has an additional function of providing some extremely important signals such as interrupts. Some of the alternate functions of P3 are listed below:

P3.0 RXD (Serial input)

P3.1 TXD (Serial output)

P3.2 INT0 (External interrupt 0)

P3.3 INT1 (External interrupt 1)

P3.4 T0 (Timer 0 external input)

P3.5 T1 (Timer 1 external input)

P3.6 WR (External memory write strobe)

P3.7 RD (External memory read strobe)

3.3 LCD

3.3.1 LCD Display

Liquid crystal displays (LCD) are widely used in recent years as compares to LEDs. This is due to the declining prices of LCD, the ability to display numbers, characters and graphics, incorporation of a refreshing controller into the LCD, their by relieving the CPU of the task of refreshing the LCD and also the ease of programming for characters and graphics. HD 44780 based LCDs are most commonly used.

3.3.2 LCD PIN DESCRIPTION

The LCD discuss in this section has the most common connector used for the Hitatchi 44780 based LCD is 14 pins in a row and modes of operation and how to program and interface with microcontroller is describes in this section.

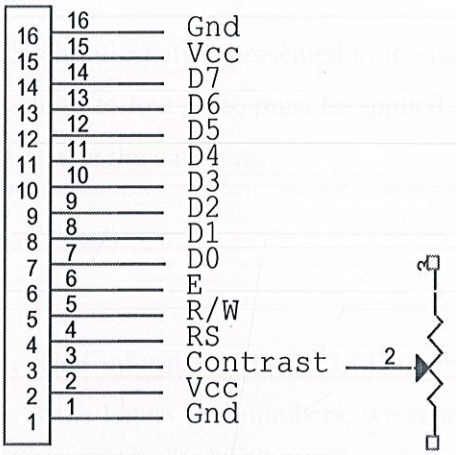


Figure 3.1 PIN DESCRIPTION DIAGRAM

V_{CC}, V_{SS}, V_{EE}

The voltage V_{CC} and V_{SS} provided by +5V and ground respectively while V_{EE} is used for controlling LCD contrast. Variable voltage between Ground and Vcc is used to specify the contrast (or "darkness") of the characters on the LCD screen.

RS (register select)

There are two important registers inside the LCD. The RS pin is used for their selection as follows. If RS=0, the instruction command code register is selected, then allowing to user to send a command such as clear display, cursor at home etc.. If RS=1, the data register is selected, allowing the user to send data to be displayed on the LCD.

R/W (read/write)

The R/W (read/write) input allowing the user to write information from it. R/W=1, when it read and R/W=0, when it writing.

EN (enable)

The enable pin is used by the LCD to latch information presented to its data pins. When data is supplied to data pins, a high power, a high-to-low pulse must be applied to this pin in order to for the LCD to latch in the data presented at the data pins.

D0-D7 (data lines)

The 8-bit data pins, D0-D7, are used to send information to the LCD or read the contents of the LCD's internal registers. To displays the letters and numbers, we send ASCII codes for the letters A-Z, a-z, and numbers 0-9 to these pins while making RS =1. There are also command codes that can be sent to clear the display or force the cursor to the home position or blink the cursor.

We also use RS =0 to check the busy flag bit to see if the LCD is ready to receive the information. The busy flag is D7 and can be read when R/W =1 and RS =0, as follows: if R/W =1 and RS =0, when D7 =1(busy flag =1), the LCD is busy taking care of internal operations and will not accept any information. When D7 =0, the LCD is ready to receive new information.

3.4 GSM MODEM

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.

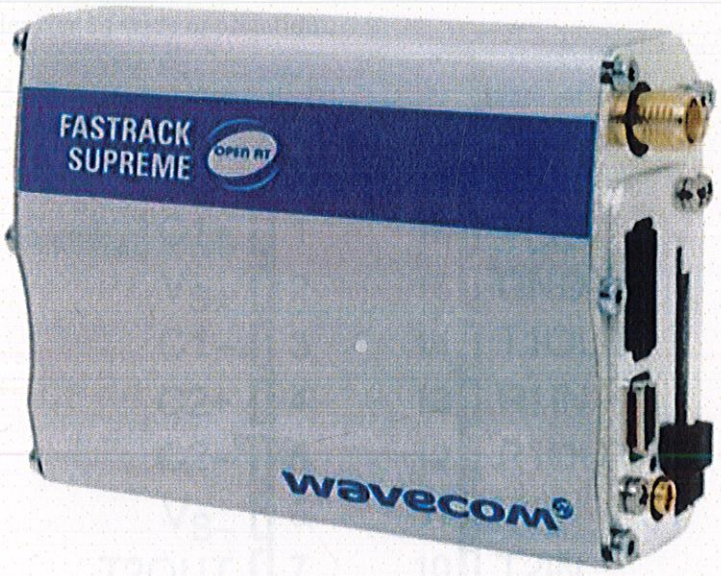


Figure 3.4 GSM MODEM

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it may be a mobile phone that provides GSM modem capabilities. Both GSM modems and dial-up modems support a common set of standard AT commands. You can use a GSM modem just like a dial-up modem.

3.5 MAX-232

To communicate, we just need three basic signals which are namely, RXD (receive), TXD (transmit), GND (common ground). So to interface MAX232 with any microcontroller (AVR, ARM, 8051, PIC etc..) we just need the basic signals. RS 232 is not compatible with microprocessors and microcontrollers ,we need a line driver to convert the RS 232 signal to TTL voltage level that will be acceptable to the microcontroller's transmission and receiver pin. MAX232 is purposed for application in high-performance information processing systems and control devices of wide application.

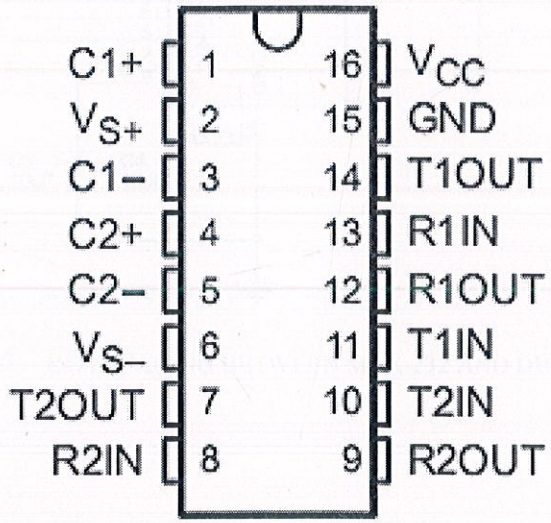


Figure 3.5.1 MAX-232 PIN DIAGRAM

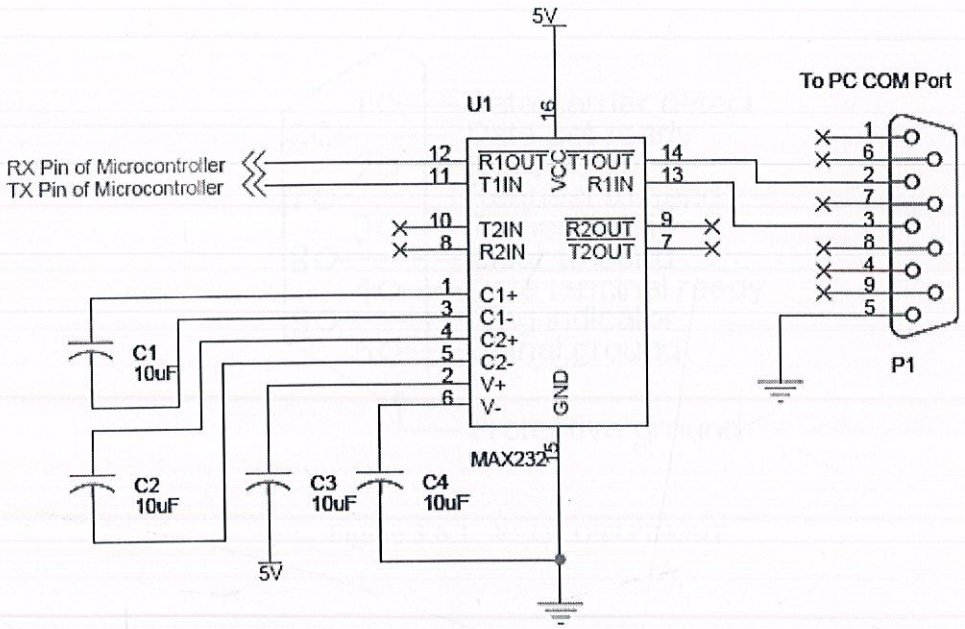


Figure 3.5.2 INTERFACING BETWEEN MAX-232 AND DB-9

3.6 DB-9 CONNECTOR

A db9 connector is a type of connector that has to be used to integrate a device or hardware with another one or with a computer. Normally these connectors are used in computers and that is why we are going to give examples of those devices that are related to computers. A db9 connector will have 9 connecting points in total that will help to attach or plug another connector in them. If you have a male connector then you will need a female connector to attach your device and if you have a female connector then you will need a make connector to attach your device .

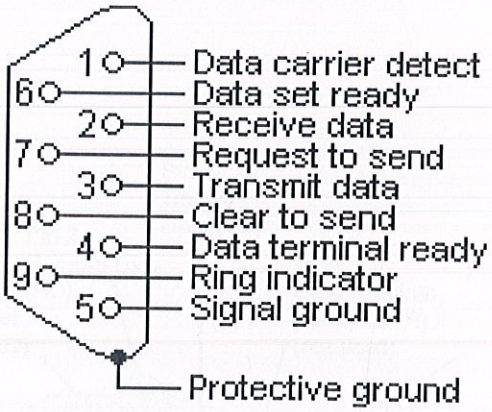


Figure 3.6.1 RS232 DB9 PINOUT

RS-232

RS-232 (Recommended Standard - 232) is a telecommunications standard for binary serial communications between devices. It supplies the roadmap for the way devices speak to each other using serial ports. The devices are commonly referred to as a DTE (data terminal equipment) and DCE (data communications equipment); for example, a computer and modem, respectively.

RS-232 sets acceptable voltage and signal levels, along with common pin designations, or configurations, for wiring serial connector ports. It also specifies protocols for the control information passed between devices, which include such events such as indicating the beginning or end of a data stream.

RS-232 C

RS-232 stands for Recommend Standard number 232 and C is the latest revision of the standard. The serial ports on most computers use a subset of the RS-232C standard. The full RS-232C standard specifies a 25-pin "D" connector of which 22 pins are used. Most of these pins are not needed for normal PC communications, and indeed, most new PCs are equipped with male D type connectors having only 9 pins.

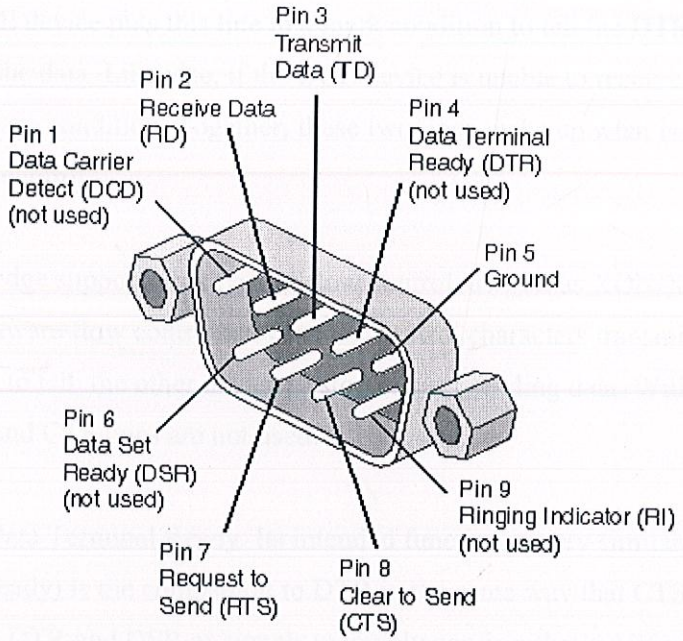


Figure 2.1 9 Pin Connector on a DTE device (PC connection)

The TD (transmit data) wire is the one through which data from a DTE device is transmitted to a DCE device. This name can be deceiving, because this wire is used by a DCE device to receive its data. The TD line is kept in a mark condition by the DTE device when it is idle. The RD (receive data) wire is the one on which data is received by a DTE device, and the DCE device keeps this line in a mark condition when idle.

RTS stands for Request to Send. This line and the CTS line are used when "hardware flow control" is enabled in both the DTE and DCE devices. The DTE device puts this line in a mark condition to tell the remote device that it is ready and able to receive data. If the DTE device is not able to receive data (typically because its receive buffer is almost full), it will put this line in the space condition as a signal to the DCE to stop sending data.

When the DTE device is ready to receive more data (i.e. after data has been removed from its receive buffer), it will place this line back in the mark condition. The complement of the RTS wire is CTS, which stands for Clear to Send. The DCE device puts this line in a mark condition to tell the DTE device that it is ready to receive the data. Likewise, if the DCE device is unable to receive data, it will place this line in the space condition. Together, these two lines make up what is called RTS/CTS or "hardware" flow control.

The Software Wedge supports this type of flow control, as well as XON/XOFF or "software" flow control. Software flow control uses special control characters transmitted from one device to another to tell the other device to stop or start sending data. With software flow control the RTS and CTS lines are not used.

DTR stands for Data Terminal Ready. Its intended function is very similar to the RTS line. DSR (Data Set Ready) is the companion to DTR in the same way that CTS is to RTS. Some serial devices use DTR and DSR as signals to simply confirm that a device is connected and is turned on. The Software Wedge sets DTR to the mark state when the serial port is opened and leaves it in that state until the port is closed.

The DTR and DSR lines were originally designed to provide an alternate method of hardware handshaking. It would be pointless to use both RTS/CTS and DTR/DSR for flow control signals at the same time. Because of this, DTR and DSR are rarely used for flow control.

CD stands for Carrier Detect. Carrier Detect is used by a modem to signal that it has a made a connection with another modem, or has detected a carrier tone.
The last remaining line is RI or Ring Indicator. A modem toggles the state of this line when an incoming call rings your phone.
The Carrier Detect (CD) and the Ring Indicator (RI) lines are only available in connections to a modem. Because most modems transmit status information to a PC when either a carrier signal is detected (i.e. when a connection is made to another modem) or when the line is ringing, these two lines are rarely used.

CHAPTER 4

GSM MODULE

4.1 Serial Port Communication

A serial port is a serial communication physical interface through which information transfers in or out one bit at a time. The term "serial port" usually identifies hardware more or less compliant to the RS-232 standard, intended to interface with a modem or with a similar communication device.

4.1.1 Types of serial port communication

There are two basic types of serial communication, synchronous and asynchronous. With synchronous communication, the two devices initially synchronize themselves to each other, and then continually send characters to stay in sync. Even when data is not really being sent, a constant flow of bits allows each device to know where the other is at any given time. That is, each character that is sent is either actual data or an idle character.

Synchronous communication allows faster data transfer rates than asynchronous methods, because additional bits to mark the beginning and end of each data byte are not required.

The serial ports on IBM-style PCs are asynchronous devices and therefore only support asynchronous serial communication.
Asynchronous means "no synchronization", and thus does not require sending and receiving idle characters. However, the beginning and end of each byte of data must be identified by start and stop bits. The start bit indicates when the data byte is about to begin and the stop bit signals when it ends.

The requirement to send these additional two bits cause asynchronous communication to be slightly slower than synchronous however it has the advantage that the processor does not have to deal with the additional idle characters.

An asynchronous line that is idle is identified with a value of 1, (also called a mark state). By using this value to indicate that no data is currently being sent, the devices are able to distinguish between an idle state and a disconnected line. When a character is about to be transmitted, a start bit is sent.

A start bit has a value of 0, (also called a space state). Thus, when the line switches from a value of 1 to a value of 0, the receiver is alerted that a data character is about to come down the line.

4.1.2 Advantages of serial port communication

1. The serial port cable can be longer than a parallel port cable, as serial port transmits '1' as voltage from -5 to -12V and '0' as voltage from +5 to +12 V, while parallel port transmits '1' as voltage of 5 volts and '0' as voltage of 0 volts. At the same time the receiver of the serial port receives '1' as voltage from -3 to -25 V and '0' as voltage from +3 to +25 V. Thus serial port can have maximal swing up to 50 volts, while parallel port has maximal swing of 5 volts. Thus the losses in the cable when transmitting data using serial port are less substantial then losses when transmitting data using parallel port.

2. The number of wires needed when transmitting data serially is less than when the transmission is parallel. Is the external device has to be installed at a great distance from the computer, the cable with three wires is much cheaper than the cable with 19 or 25 wires if the transmission is parallel. Still one should remember that there are interface creation expenses for every receiver/transmitter.

3. Further development of serial port is usage of infrared devices which immediately proved popular. Many electronic diaries and palmtop computers have inbuilt infrared devices for connection with external devices.

4. Another proof of serial port universality is microcontrollers. Many of them have inbuilt SCI (Serial Communications Interfaces), used for communication with other devices. In this case serial interface reduces the number of outputs on the chip. Usually only 2 outputs are used: Transmit Data (TXD) and Receive Data (RXD). Just compare that to minimum of 8 outputs.

4.2 GSM Modem

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it may be a mobile phone that provides GSM modem capabilities. Both GSM modems and dial-up modems support a common set of standard AT commands. You can use a GSM modem just like a dial-up modem.

A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card / PCMCIA Card slots of a laptop computer.

In addition to the standard AT commands, GSM modems support an extended set of AT commands. These extended AT commands are defined in the GSM standards.

These extended AT commands provide features like:

- Reading, writing and deleting SMS messages.
- Sending SMS messages.
- Monitoring the signal strength.
- Monitoring the charging status and charge level of the battery.
- Reading, writing and searching phone book entries

4.2.1 Comparing Mobile Phone and GSM Modem

In general, a GSM modem is recommended for use with a computer to send and receive messages. This is because some mobile phones have certain limitations comparing to GSM modems.

Some of the limitations are described below:

- Some mobile phone models cannot be used with a computer to receive concatenated SMS messages. A concatenated SMS message is a message that contains more than 140 bytes. (A normal SMS message can only contain at most 140 bytes.) Concatenated SMS works like this: the sender's mobile device breaks a message longer than 140 bytes into smaller parts. Each of these parts are then fitted in a single SMS message and sent to the recipient. When these SMS messages reach the destination, the recipient's mobile device will combine them back to one message. When the mobile phone receives the SMS messages that are parts of a concatenated SMS message, it combines them to one message automatically. The correct behavior should be: when the mobile phone receives the SMS messages that are parts of a concatenated SMS message, it forwards them to the computer without combining them.

- Many mobile phone models cannot be used with a computer to receive MMS messages. Because when they receive a MMS notification, they handle it automatically instead of forwarding it to the computer.

- A mobile phone may not support some AT commands, command parameters and parameter values. Usually GSM modems support a more complete set of AT commands than mobile phones.

- Most SMS messaging applications have to be available 24 hours a day. If such SMS messaging applications use mobile phones to send and receive SMS messages, the mobile phones have to be switched on all the time. However, some mobile phone models cannot operate with the battery removed even when an AC adaptor is connected, which means the battery will be charged 24 hours a day.

Besides the above issues, mobile phones and GSM modems are more or less the same for sending and receiving SMS messages from a computer. There is not much difference between mobile phones and GSM modems in terms of SMS transmission rate, since the determining factor for the SMS transmission rate is the wireless network.

4.3 Introduction to AT Commands

AT commands are instructions used to control a modem. AT is the abbreviation of ATtention. Every command line starts with "AT" or "at". That's why modem commands are called AT commands. Many of the commands that are used to control wired dial-up modems, such as ATD(Dial), ATA (Answer), ATH (Hook control) and ATO (Return to online data state), are also supported by GSM/GPRS modems and mobile phones. Besides this common AT command set, GSM/GPRS modems and mobile phones support an AT command set that is specific to the GSM technology, which includes SMS-related commands like AT+CMGS (Send SMS message), AT+CMSS (Send SMS message from storage), AT+CMGL (List SMS messages) and AT+CMGR (Read SMS messages).

Note that the starting "AT" is the prefix that informs the modem about the start of a command line. It is not part of the AT command name. For example, D is the actual AT command name in ATD and +CMGS is the actual AT command name in AT+CMGS. However, some books and web sites use them interchangeably as the name of an AT command.
Here are some of the tasks that can be done using AT commands with a GSM/GPRS modem or mobile phone:

- Get basic information about the mobile phone or GSM/GPRS modem. For example, name of manufacturer (AT+CGMI), model number (AT+CGMM), IMEI number (International Mobile Equipment Identity) (AT+CGSN) and software version (AT+CGMR).

- Get basic information about the subscriber. For example, MSISDN (AT+CNUM) and IMSI number (International Mobile Subscriber Identity) (AT+CIMI).

- Get the current status of the mobile phone or GSM/GPRS modem. For example, mobile phone activity status (AT+CPAS), mobile network registration status (AT+CREG), radio signal strength (AT+CSQ), battery charge level and battery charging status (AT+CBC).

- Establish a data connection or voice connection to a remote modem (ATD, ATA, etc).

- Send and receive fax (ATD, ATA, AT+F*).

- Send (AT+CMGS, AT+CMSS), read (AT+CMGR, AT+CMGL), write (AT+CMGW) or delete (AT+CMGD) SMS messages and obtain notifications of newly received SMS messages (AT+CNMI).

- Read (AT+CPBR), write (AT+CPBW) or search (AT+CPBF) phonebook entries.

- Perform security-related tasks, such as opening or closing facility locks (AT+CLCK), checking whether a facility is locked (AT+CLCK) and changing passwords (AT+CPWD). (Facility lock examples: SIM lock [a password mustbe given to the SIM card every time the mobile phone is switched on] and PH-SIM lock [a certain SIM card is associated with the mobile phone. To use other SIM cards with the mobile phone, a password must be entered.])

- Control the presentation of result codes / error messages of AT commands. For example, you can control whether to enable certain error messages (AT+CMEE) and whether error messages should be displayed in numeric format or verbose format (AT+CMEE=1 or AT+CMEE=2).

- Get or change the configurations of the mobile phone or GSM/GPRS modem. For example, change the GSM network (AT+COPS), bearer service type (AT+CBST), radio link protocol parameters (AT+CRLP), SMS center address (AT+CSCA) and storage of SMS messages (AT+CPMS).

- Save and restore configurations of the mobile phone or GSM/GPRS modem. For example, save (AT+CSAS) and restore (AT+CRES) settings related to SMS messaging such as the SMS center address.

4.3.1 Basic Commands and Extended Commands

There are two types of AT commands: basic commands and extended commands.

1. Basic commands are AT commands that do not start with "+". For example, D (Dial), A (Answer), H (Hook control) and O (Return to online data state) are basic commands.

2. Extended commands are AT commands that start with "+". All GSM AT commands are extended commands. For example, +CMGS (Send SMS message), +CMSS (Send SMS message from storage), +CMGL (List SMS messages) and +CMGR (Read SMS messages) are extended commands.

4.3.2 General Syntax of Extended AT Commands

The general syntax of extended AT commands is straightforward. The syntax rules are provided below. The syntax of basic AT commands is slightly different. All SMS messaging commands are extended AT commands.

Syntax rule 1: All command lines must start with "AT" and end with a carriage return character (<CR>). In a terminal program like HyperTerminal of Microsoft Windows, we can press the Enter key on the keyboard to output a carriage return character.
Example: To list all unread inbound SMS messages stored in the message storage area, type "AT", then the extended AT command "+CMGL", and finally a carriage return character, like this: AT+CMGL<CR>

Syntax rule 2: A command line can contain more than one AT command. Only the first AT command should be prefixed with "AT". AT commands in the same command-line string should be separated with semicolons.

Example: To list all unread inbound SMS messages stored in the message storage area and obtain the manufacturer name of the mobile device, type "AT", then the extended AT command "+CMGL", followed by a semicolon and the next extended AT command "+CGMI": AT+CMGL; +CGMI<CR>

An error will occur if both AT commands are prefixed with "AT", like this:

AT+CMGL; AT+CGMI<CR>

Syntax rule 3: A string is enclosed between double quotes.

Example: To read all SMS messages from message storage in SMS text mode, we need to assign the string "ALL" to the extended AT command +CMGL, like this:

AT+CMGL="ALL"<CR>

Syntax rule 4: Information responses and result codes always start and end with a carriage return character and a linefeed character.

Example: After sending the command line "AT+CGMI<CR>" to the mobile device, the mobile device should return a response similar to this:

<CR><LF>Nokia<CR><LF>

<CR><LF>OK<CR><LF>

The first line is the information response of the AT command +CGMI and the second line is the final result code. <CR> and <LF> represent a carriage return character and a line feed character respectively. The final result code "OK" marks the end of the response. It indicates no more data will be sent from the mobile device to the computer / PC.

When a terminal program such as HyperTerminal of Microsoft Windows sees a carriage return character, it moves the cursor to the beginning of the current line.

When it sees a line feed character, it moves the cursor to the same position on the next line. Hence, the command line "AT+CGMI<CR>" that we entered and the corresponding response will be displayed like this in a terminal program such as

CHAPTER 5

SOURCE CODE OF MICROCONTROLLER

```
#define RS P35
#define RW P36
#define E P37
#define DATA P1
#include<stdio.h>
#include<lcdsms.h>
#include<serial.h>
#include<string.h>
#include<atcommands.h>
unsigned char idata  msg[100];
unsigned char idata buf[20];
unsigned char can1=0,can2=0,can3=0,can4=0;
unsigned char index;
bit flag=0;

#define buzz P20

#define number2 "7696108090"


void serial_rec(void)interrupt 4 using 3
{
          msg[index]=SBUF;
          msg[index+1]='\0';
          index++;
          if(index>96)
               index=96;
          flag=1;
}


void clear_msg()
{
unsigned char temp=0;
 while(temp<96)
 {
  msg[temp]=32;
  temp++;
 }
}
void put_at(char *s)
{
    send(s);
   }
}
```

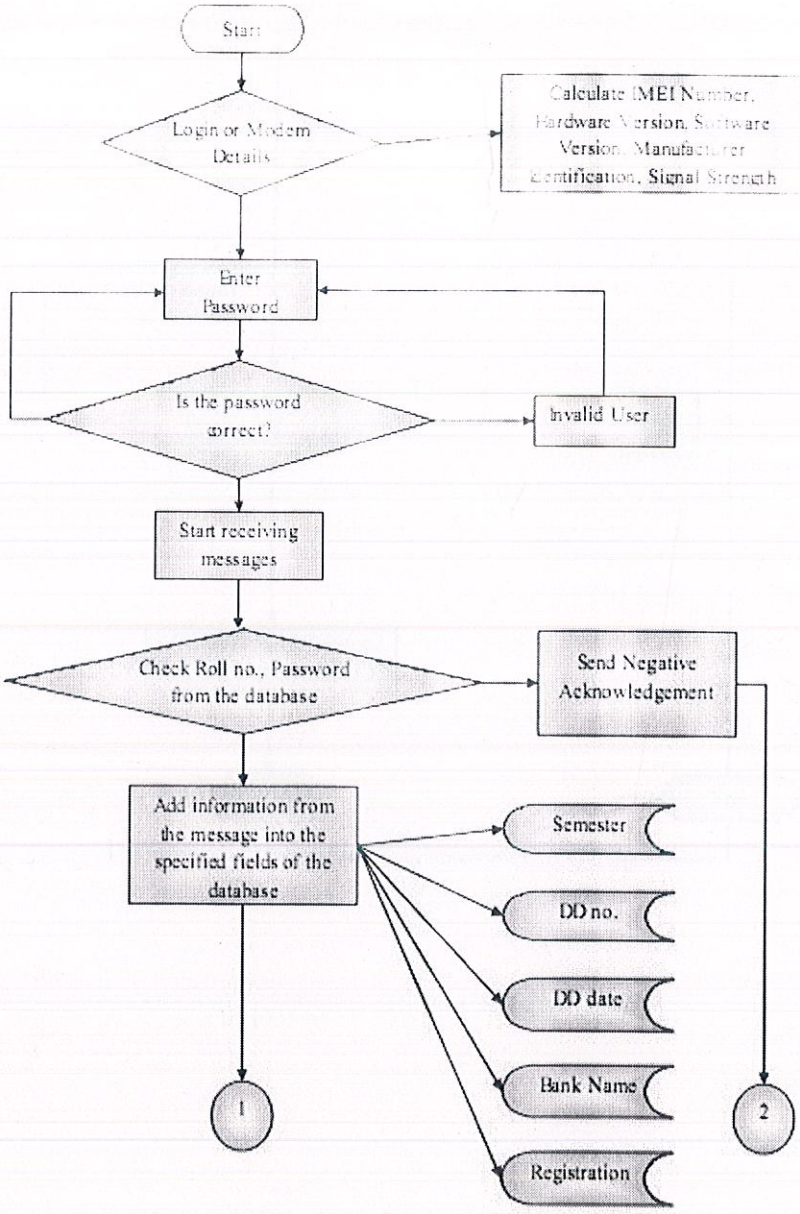
```
void del_msg()
{
      unsigned char loc=0;
     lcd_cmd1(0x01);
      lcd_cmd1(0x80);
      lcd_puts("Deleting...");
      for(loc=1;loc<=2;loc++)
      {
            flag=0;
            put_at(buf,"AT+CMFD=%bu",loc);
                        lcd_cmd1(0xc0);
                  displaypval(loc);

      }
      lcd_cmd1(0x80);
      lcd_puts("Deleted....");
      secdelay(2);
}
void check_gsm()
{
  unsigned char in=0;
  clear_msg();
      lcd_cmd1(0x01);
      lcd_cmd1(0x80);
      lcd_puts("Test 1");

      while(flag==0)
      {
            put_at("AT");
            ms_delay(200);

      }
      if(msg[in]=='O' && msg[in+1]=='K')
      {
            lcd_cmd1(0xc0);
            lcd_data(msg[in]);
            lcd_data(msg[in+1]);
            ms_delay(200);
      }
      lcd_puts("Test 2");
      clear_msg();
      index=0;
      flag=0;
      while(flag==0)
      {
            put_at("AT+CMDF=1");
            lcd_cmd1(0xc0);

      }
      if(msg[in]=='O' && msg[in+1]=='K')
      {
```

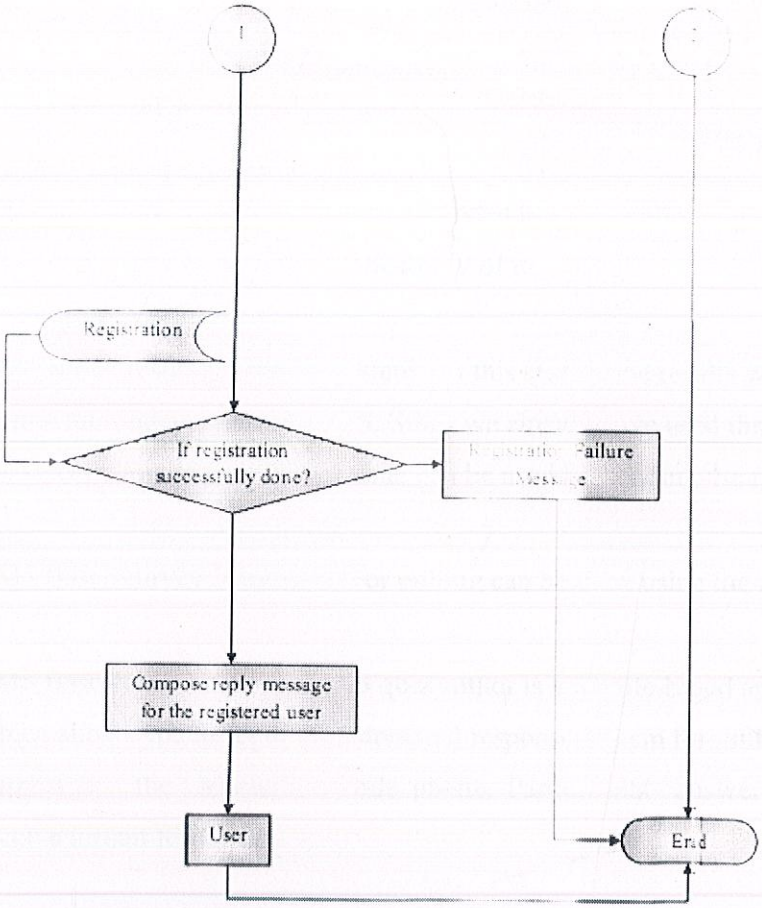
```
        lcd_cmd1(0xc0);
        lcd_data(msg[in]);
        lcd_data(msg[in+1]);
        ms_delay(200);
        send_message_at("Voting ON",number2);

        }

void main()
{
        unsigned char loc,temp,i;
        bit s=1;

        init_serial(9600);
        lcd_init();
        lcd_puts("  SMS Based  ");
        lcd_cmd1(0xc0);
        lcd_puts(" Voting Machine ");
        check_gsm();
        del_msg();

        while(1)
        {
                start:
                clrscr();
                lcd_cmd1(0x01);
                index=0;flag=0;
                clear_msg();
                while(!flag)
                {
                        lcd_cmd1(0x80);
                        lcd_puts(" C1   C2   C3   C4 ");
                        sprintf(buf,"   %bu    %bu    %bu    %bu
",can1,can2,can3,can4);
                        lcd_cmd1(0xc0);
                        lcd_puts(buf);
                }


                if(flag==1)
                {
                        clrscr();
                        lcd_puts("Received...");
                        buzz=0;
                        lcd_cmd1(0xc0);
                        lcd_puts("Loc ");
                        buzz=1;

                        loc = 1;

                        displaypval(loc);
                        lcd_cmd1(0xc9);
```

```
                displaypval(temp);

                secdelay(3);
          }
          flag=0;
          index=0;
          if(loc>=10)
          {
                clrscr();
                lcd_puts(" Invalid...");
                lcd_cmd1(0xc0);
                lcd_puts(" Location");
                del_msg();
                goto start;
          }
          clear_msg();
          put_at(AT+CMTR=%bu",loc);
          clrscr();
          secdelay(2);

          temp=33;
          lcd_puts("Number");

          temp=33;
          lcd_cmd1(0xc0);

          for(i=0;i<=12;i++)
          {
                lcd_data(msg[temp+i]);
          }
          secdelay(5);
          lcd_cmd1(0x01);
          lcd_puts("DATA:-");

          for(i=42;i<=47;i++)
          {
                lcd_data(msg[temp+i]);
          }
          lcd_cmd1(0xc0);
          if(msg[temp+42]=='2' && msg[temp+43]=='5' &&
msg[temp+44]=='5' && msg[temp+45]=='2')
          {
                if(msg[temp+46]=='0' && msg[temp+47]=='1')
                {
                      send_message_at("Candidate 1
Voted",number2);
                      lcd_cmd1(0xc0);
                      lcd_puts("Cand 1 voted    ");
                      can1++;
                }
```

```
                        else if(msg[temp+46]=='0' &&
msg[temp+47]=='2')
                        {
                              send_message_at("Candidate 2
Voted",number2);
                              lcd_cmd1(0xc0);
                              lcd_puts("Cand 2 voted     ");
                              can2++;
                        }
                        else if(msg[temp+46]=='0' &&
msg[temp+47]=='3')
                        {
                              send_message_at("Candidate 3
Voted",number2);
                              lcd_cmd1(0xc0);
                              lcd_puts("Cand 3 voted     ");
                              can3++;
                        }

                        else if(msg[temp+46]=='0' &&
msg[temp+47]=='4')
                        {
                              send_message_at("Candidate 4
Voted",number2);
                              lcd_cmd1(0xc0);
                              lcd_puts("Cand 4 voted     ");
                              can4++;

                        }
                        else if(msg[temp+46]=='A' &&
msg[temp+47]=='3')
                        {
                              sprintf(buf,"C1 %bu,C2 %bu,C3 %bu,C4
%bu",can1,can2,can3,can4);
                              send_message_at(buf,number2);
                              lcd_cmd1(0xc0);
                              lcd_puts("  Result Requested   ");

                        }
            }

            else
            {
            lcd_cmd1(0xc0);
            lcd_puts("Invalid Code      ");
            }
            flag=0;
            index=0;
            secdelay(3);
            del_msg();
      }
  }
```

3.2 Flowchart




Registration
If registration successfully done?
Compose reply message for the registered user
User
End

CHAPTER

SCOPE OF FUTURE WORK

The project is working fine as we have tested it well. However following additions at the university level to the project can improve the applicability of it:

- SMS Based result generation system: In this system the results would be sent to the students through SMS. Since we already have used the database of the students in our project the same can be used for sending the results also.

- SMS Based survey: Any survey or polling can be done using the same model.

- SMS Based quiz authoring: SMS quiz author is a mobile-based application which allows you to set up automated response system for multiple-choice quizzes on the learner's mobile phone. Participants answer questions by text and receive instant feedback.

- SMS Based dictionary system: Since in the university there are many aspiring candidates for competitive exams, this system would be very helpful for them. The user just needs to send the word and the automated system would send the meaning to the user from the database.

These applications were all at the university level. Now at national level this model can be used for SMS based election voting, which would replace the traditional voting system, and in turn would be more transparent, reliable, and secure.

Hence there are many research areas where the same model can be used to ease the process.

CONCLUSION

The main objective of our project was to design a efficacious model for the Voting. The approach discussed and implemented in the project is novel and has successfully achieved the target to enable the student to remotely register using the SMS based system thus satisfying the student's needs and requirements.
During tests, the full functionality of the system was checked and after going through the various modules we found that our system comprises of the following four features, namely security, cost, time, and ease of access.

The following benefits are offered by our system

- Security - The users are expected to acquire login and password to access
- Cost efficient - In the present day SMS is cheapest method of communication. Most network providers are continuously providing schemes for free SMS or at a very reasonable rate.
- Time efficient - It is highly time efficient as the student just has to send the SMS request and the rest of the process is fully automated.
- Accessibility - All students have access to services without being physically present at the university just with the help of a mobile phone.
- Reliability - The system performs dependably, accurately, and consistently.
- Accuracy - The implemented system is more accurate, minimal error possible.
- Usability - The system is easier and more convenient to use.

REFERENCES

Books:

1. Steven Holzner, Visual Basic 6 Black Book, Paraglyph Press, August 1998
2. Building Wireless Sensor Networks by Robert Faludi, O'Reilly Media, Inc, April 2010.

Research Papers:

1. SMS Based Wireless Home Appliance Control System(HACS) for Automating Appliances and Security by Malik Sikandar Hayat Khiyal, Aihab Khan, and Erum Shehzadi Software Engineering Dept., Fatima Jinnah Women University, Saudi Arab.

2. Six-Level Model of SMS-based eGovernment by Tony Dwi Susanto, Dr. Robert Goodwin, A/Prof. Paul Calder School of Informatics and Engineering-Flinders University, South Australia

3. The Sms Based Forecasting System Of Public Transport Arrival Time by Fong Yit Meng Yee Chee Hong Yong Huey Yi

4. An SMS Based Querying System for Mobile Learning by Dunwei Xiong Ally Lin.