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SMART NOTICE BOARD USING GSM INTERFACING WITH 8051 MICROCONTROLLERS

[1]Abhinav Raman, [2]Shantanu Anand

[1]student, [2]student
[1]School of Electronics and Communication Engineering
[1]Vellore Institute of Technology, Vellore, India

***Abstract*:** Notice Board is the most uniform and essential instrument in any university, schools or public places like transport stations, rail stations and children park. Yet fixing and changing different notification of guidance on a everyday is a troublesome process. The primary target of this paper is to build up a remote notification board that shows messages send from the client's portable device (e.g. Smartphone, Tablet, Laptop). At the point when a client communicates something specific, it is received by a SIM embedded in GSM modem at the receiver unit. The GSM modem is interfaced with level shifter IC to Microcontroller. The message got by the GSM is shipped off the microcontroller that further shows it on an electronic notice board. The Notice board is an LCD unit interfaced to a microcontroller, controlled by a directed power supply of 230 V AC.

***Keywords*:** Microcontroller, SIM, GSM, LCD.

I. Introduction

Specialized gadgets, for example, smart handsets and related remote advancements have gotten universal. Different areas in the field of Communication and embedded gadgets are by and large progressively investigated. The utilization of phones has quickly expanded these days. Improvements in correspondence advancements have leads to the development of dense networks. As a method for correspondence, notice boards are broadly in vogue with its applications going from schools, universities, medical clinics to significant associations. Notice boards successfully tackle the worldwide issue of deforestation by passing on messages everywhere without the utilization of paper. Such inventive estimates will go far in adjusting the harm to the climate. GSM innovation points in reducing the unpredictability for communicating something specific by joining SMS (Short Message Service) innovation. This innovation can be utilized in public places for example, clinics, schools, multiplexes and structures to improve the security framework and furthermore to spread mindfulness in a crisis. The target of this paper is to investigate and analyse the different recommendations and advancements of a SMS controlled wireless notice board that may in the end replace the conventional paper/black board the by and by utilized paper based what's more, programmable notification sheets.

II. *Literature Review*

For expanding the absence of frequencies in the radiotelephone administrations with the advancement of cell networks in the 1970's which thus lead to presentation of Advanced Mobile Phone Framework (AMPS) where the transmission was simple based. This was known to be the 1ST Generation or 1G era in cell networks. The second era or 2G in cell organizations depended on computerized transmission and was called as

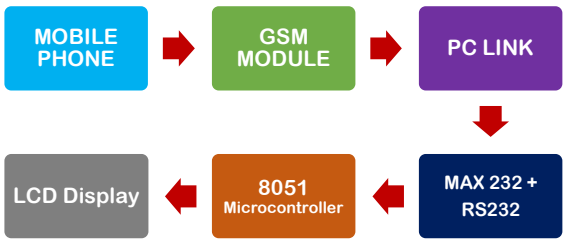


Figure 1 - Block Diagram for Smart Notice Board

Global System for Versatile interchanges (GSM) or European Radio Informing System (ERMES). Different Cordless phone norms were likewise presented all through this time. The third era/generation 3G has ascended with the unification of various advancements and some of them that are prominently known are FPLMTS (Future Public Land Portable Telecommunications System), UMTS (All inclusive Mobile Telecommunication System), and IMT-2000(International Mobile Telecommunication).

III. *Components*

3.1 8051 Microcontrollers

In this project we have AT89C52 an 8051-architecture based microcontroller. Consists of 40 Pins Microcontroller IC available in DUAL INLINE PACKAGE.

32 pins are bi-directional pins divided as P0, P1, P2 & P3 considered as 8bit registers.

Dual Functionality pins A0-A7 and A8-15 used for connecting external memory. Similarly P3.0 & P3.1 is used for serial comm., P3.2 & P3.3 are used as interrupts (external), P3.4 and P3.5 for Timers and Counters & P3.6 & P3.7 for write and read operation. We will be using P3.0 & P3.1 i.e. RXD & TXD.

Registers which will be used in this project are TMOD & TCON for Timer and in Serial we will use SCON & SBUF.

3.2 GSM Module

It consists of: GSM Modem, Power Supply Unit, Communication Interface (e.g. RS232)

A GSM modem is a particular kind of modem which accepts a SIM card. It is mostly used to establish communication between computer and GSM network. It works over a membership-based subscription fee which is paid to a mobile service provider or administrator, much the same as for a smartphone. The GSM modem has its own unique IMEI number. From the mobile operator viewpoint, a GSM modem looks just like a cell phone. A GSM modem uncovers an interface that permits applications, for example, NowSMS for sending and receiving messages over the modem interface. At the time when we install our GSM modem, or while interfacing our GSM cell phone to the PC, make certain about introducing the official Windows modem driver from the producer. The Now SMS and MMS entryway can simultaneously uphold different various modems, given that our PC equipment has the accessible port for communication. It is connected to the 8051 microcontrollers via MAX232.

AT Commands of GSM Modem

These commands are needed in order to interact with the microcontroller. Microcontroller Sends AT command & GSM modem is used to send result. Common AT Commands:

AT:

Used to check the GSM module (i.e. used to check whether the module is working or not). If "AT" is sending the reply should be "OK" for the precheck.

AT+CMGF:

Since the GSM module by default will show the message in PDU format (where message is shown in numbers). To view the message in general text format we send "AT+CMGF=1"

AT+CMGR:

To read new message we send "AT+CMGR=x" where x being the location of new message.

3.3 MAX 232

MAX232 is used in TTL viable DL (Digital Logic) circuit, basically MAX 232 is an IC that coverts signals that come from RS-232 serial port to signals that are appropriate. MAX 232 is a double driver/recipient and normally converts the signals TX, RTS, RX and CTS as it is needed to be.

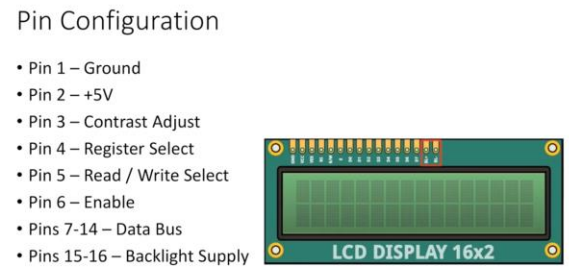


Figure 2 - PIN configuration of 16X2 LCD Display

3.4 16x2 LCD Display

An LCD screen is an electronic display screen and the one used in this project is 16X2 Alphanumeric LCD display which can display 224 different symbols and characters. It can display 16 characters per line and there are 2 such lines present.5x8 pixel Matrix and not only display special but can also display custom characters. Consists of 2 registers which are Command and Data. The pin configuration are as follows:

IV. *Methodology*

We will be only going for a software simulation so we can consider that the whole proteus simulation setup is on an 8051 Development Board. An 8051 Development Board is a PCB with Microcontroller and other important components such as ZIF Socket, Pins for I/O RS232, 7 segment LED display, 16x2LCD display, Power Supply Unit and other development components. The main advantage of development board is that it allows us to save time which is generally spend on connecting components on the prototype board. Moving on to the connection part, even though the connections are on the development board it is still important to describe the connection in this paper as we are only going for the software simulation. The 8051 has an on-chip oscillator but still it requires an external clock to run so we have used a 11.0592 QUARTZ crystal here. The Reset circuit consists of 10k ohm resistor,10uF capacitor and a tactile switch. For connection we first connected the Reset Circuit to the RST pin of the microcontroller upon a High Pulse the microcontroller resets. The External Access (EA) pin is connected to the VCC through a 10K ohm resistor. The 3 Control Pins (RS, RW & E) of the 16x2 LCD are connected to P3.6, GND & P3.7 respectively. The 8 Data Pins of LCD are connected to Port1 pins of Microcontroller after this connection we connect the GSM Module. The TX of GSM is connected to RXD (P3.0) of the Microcontroller and RX of GSM is connected to TXD (P3.1) of the Microcontroller. The Microcontroller sends AT to trigger the GSM module, for which the module replies with AT. Once the message has been received by the GSM module it will reply with AT+CMTI x to the Microcontroller, where, x is the location of the message received. The microcontroller stores the value x. the microcontroller sends the command AT+CMGF=1 to tell the GSM module to send the message in SMS text form so that it is readable and then sends AT+CMGR=x to retrieve the message at the location x. Finally it displays the message on the 16x2 LCD display unit.

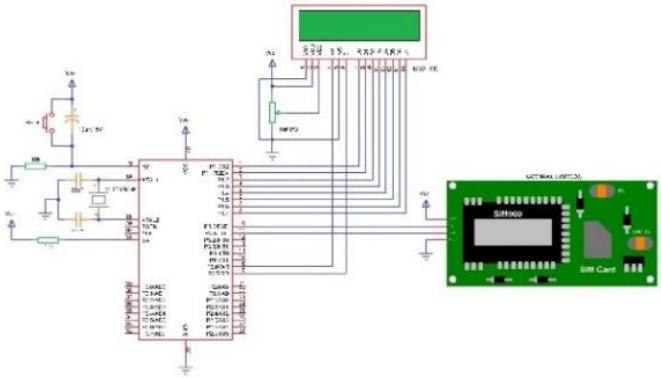


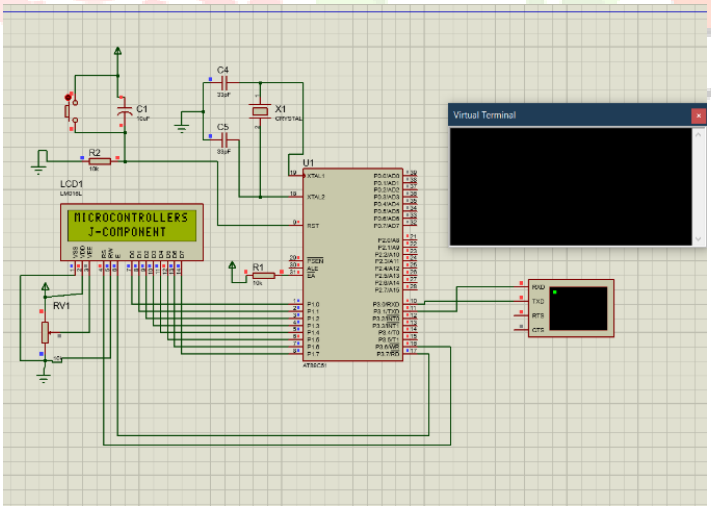
Figure 3 - Circuit Diagram for the explained methodology

AT Commands	Path	Function
AT+CMTIx	GSM to Microcontroller	To notify that a message has been received at location x
AT+CMGF=1	Microcontroller to GSM	Convert the message to SMS text format to make it readable
AT+CMGR=x	Microcontroller to GSM	To retrieve message from location x in GSM

Table 1 - AT Commands, their path and function

V. *Result*

The KEIL and PROTEUS simulation results are as follows:



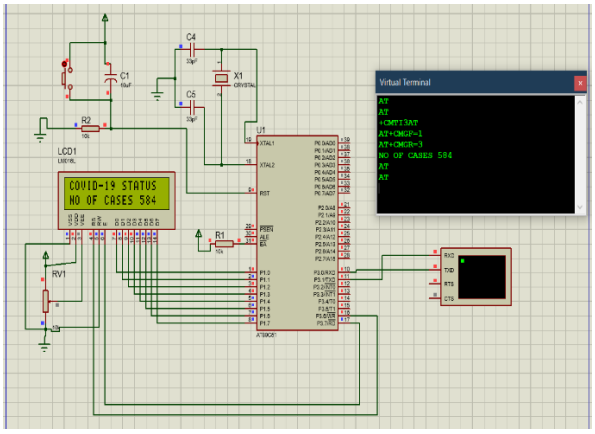


Figure 4 AND 5 - Proteus Simulation

VI. Conclusion

We have used the virtual terminal as GSM module for our simulation, since the Pspice model for the GSM module has only on set of transmission and reception terminals.

We have successfully simulated the designed circuit in the PROTUES software and the results have been as expected. The message displayed can be sent over an SMS and the notice board will immediately display the message sent. We can see that the LCD displays only the message and not the AT commands.

This project can be put in use in public places such as railway stations, airports, offices, religious places and academic institutions.

Gauging the current COVID-19 pandemic situation, we can install this system outside COVID hotspots to indicate the place being a hotspot and to indicate the number of virus affected people in the region. Updating the number of patients will not take time as it usually does with the current methods in place. This can also be used by public places to display guidelines and protocols to be followed in a cost and performance effective manner.

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