Abstract-- The ways of addressing public at large viz; bus terminals, railway stations, colleges, universities etc. has significantly changed over the last few decades. The advent of embedded systems in communication field has revolutionized the way of transferring data from host to receiver. Audio visual system like public announcements, CCTV, sign boards etc are being used for the same. Normally, all these systems are hardware wired which limits its usage, are time consuming and offer less flexibility. In these systems a digital computer needs to be attached to the equipment using serial communication. The serial communication can be used for a single display at a time. To overcome this limitation it is proposed to update the message from anywhere by adding an inexpensive GSM (Global System for Mobile communication) based wireless communication interface. Microcontroller (89s52) is used to control the GSM modem. The incorporation of GSM modem, microcontroller and other devices like EEPROM makes the notice board a smart board.

Keywords: 89S52, GSM, EEPROM, LED matrix, SIM.

I. INTRODUCTION

LED display boards are being used educational institutions and other organizations for displaying notices. Earlier the displays were updated by connecting them to PC’s or simply keyboard using wired communication which was quite inefficient. Addition of GSM wireless communication makes it smart. In this method message can be updated from user’s mobile phone. The smart board is made using two 89S52 microcontrollers from Atmel®. One of the microcontrollers is used to control the wireless communication and decoding of the message. Other one controls the 16 x 64 LED matrix to display numbers, alpha numeric’s and characters. An EEPROM is used to save the message in case the main power supply fails.

A. Problem Analysis

In public places, colleges, universities and many other places like industries LED boards are connected to PC or LAPTOP through a serial cable, which makes the system complex. In order to update a message every time the display needs to be connected physically with a computer. This makes the system time consuming and hence has a lot of limitations. This drawback can
be overcome by adding a GSM interface which is wireless based system.

B. Design Overview

Introduction of GSM modem in LED display boards increases the flexibility of the system. This modem consists of a Subscriber Identity Module (SIM) which has a unique number. Message from mobile phone is sent to this number. Microcontroller 89S52 (1) reads and authenticates the message and sends to EEPROM. SMS service enables updating of message from any location. Therefore it eliminates the physical connectivity and makes system reliable and fast.

C. Proposed Work

Smart notice board is an embedded system application. It consists of two microcontrollers which are used to control the GSM modem and LED matrix. One of the controllers is used to control the GSM module by using AT commands. When a new message arrives it reads the message and decodes the number from which it is sent. If message is sent from a registered user, only then it saves the message to EEPROM otherwise it will continue its operation from where it was interrupted. The message is deleted from the SIM memory automatically to make place for next message. After saving the message this microcontroller decodes the message and sends it to second microcontroller which controls the LED’s to display characters. Both the controllers are synchronized with handshaking signals and data is transferred serially.

D. Components of LED Display Board

1. GSM Module: Global System for mobile Communication, originally Group Special Mobile is a standard developed by European Telecommunications Standard Institute to describe the protocols for 2nd generation digital cellular networks used in mobile phones. It was developed to replace the first generation analog cellular networks. It offers eight full rate or sixteen half rate channels per radio frequency. The channel rate for eight channels is 270. 833 Kbits/s. GSM Module consists of GSM/GPRS modems, power supply circuit and other IC’s like Max 232 for serial communication. It needs a SIM card to make connectivity with the network. It can be used to receive or send text messages and to make or receive the call. It is controlled using AT commands. This module has different interfaces for RS232 and TTL interface.

![fig1](image)

Fig. 1. Block Diagram of Smart Notice Board

2) Subscriber Identity Module: Subscriber Identity Module (SIM) is a removable smart card which contains the user’s subscription information and phone book. It is an integrated circuit chip which is used to store international mobile subscriber identity number and its related key. It is made of PVC with embedded contacts and semiconductors. A SIM card contains a unique serial number, international mobile subscriber identity number, security authentication and temporary information about local network.

3) AT89S52 Microcontroller: The AT89S52 is a high performance, low power, 8-bit microcontroller based on CMOS technology having 8kB in-system programmable flash memory. It is made by Atmel and compatible with standard 80c51 instruction set and pin out. It has following features:

- 8k bytes In-system programmable flash memory
- Fully static operation at 0-33 MHz

- 256 x 8 bit internal RAM
- 32 general purpose I/O pins
- Three 16 bit Timers/Counters
- Watch dog Timer
- Brown out detection
- Full duplex UART channel

4) EEPROM: EEPROM stands for the Electrically Erasable Programmable Read Only Memory. It is a non-volatile memory which is used in computers and other electronic devices to store small amount of data. Individual bytes can be erased or reprogrammed using special programming signals. On the basis of interface there are two types of EEPROM’s: Serial EEPROM and parallel EEPROM. AT28c16 EEPROM which is a low-power high performance 16kB memory and organized as 2048 words by 8 bits is used in the smart board. This device is manufactured with Atmel’s CMOS Technology.

5) Power Supply: Power supply is a circuit which supplies electrical energy to microcontrollers and other components. They all require a supply of +5 volt DC. The power supply uses a 9-0-9 transformer to step down the incoming 220 volt AC. This AC voltage is then converted into DC by using a center tap full wave bridge rectifier. The ripples and noises at the output are removed using an electrolytic capacitor of 2200µF and 0.01µF. 7805 IC is used to regulate the DC voltage at +5 volts.

6) LED Matrix: LED 16x64 matrixes is used to display the message. It contains the following components.

- LED:
  Light Emitting Diode is a P-N junction device which emits light on activation (Forward Biased). When a suitable voltage is applied across the terminals of LED, electrons and holes combine which results in emission of photons. The color of LED depends on the band gap of semiconductor used for the manufacturing of LED. It has two terminals: Anode and cathode. Anode is connected to +5V supply through a transistor and cathode is connected to ground through another transistor. The display is made using 1024 red color LED’s which were soldered in 16 x 64 matrix format.

Fig. 3. Light Emitting Diode

- Transistors:
  Transistor is a semiconductor device which can be used as an amplifier or as a switch. Transistors used here provide ground to the columns. In LED matrix there were 16 LED’s in each column. Single LED draws 20-25 mA current normally. It means that if all the LED’s are glowing at a same time to display any character so total current which will flow through the transistor will lie in range of 320-400 mA. So, CL100 (NPN) transistor has been chosen whose collector current is 1A. BC547 transistor is used to supply 5 volt to LED because fan out capability of microcontroller is very small.
Decoders: 74HC154
Decoder is an IC which decodes 4 binary coded inputs into one of the 16 mutually exclusive outputs. Four decoders are used to select the columns. Decoder provides a triggering pulse to base of the CL100 transistor of that column which we want to select. Transistor grounds the column and LED’s in that column glows according to the 16 bit data input. There were 4 pins to select these four decoders and 4 input pins to all the decoders. Therefore 8 pins of microcontroller were used to select the columns and these pins are referred as control bus in the block diagram.

III. PROGRAMMING ALGORITHMS
Programming was the main part of this project. Programming language selected should be efficient, high level having low level access to hardware. Therefore C programming language was selected which is quite popular, easy to understand, efficient and high level language having low level access to hardware. Microvision IDE (Integrated Development Environment) from Keil was used.
IV. CONCLUSION:

GSM based LED display boards are more efficient than computer connected boards. Message can be updated from any location by sending the text message. When this system receives a new message it checks whether it is from valid number or not. If it is from a valid number then stores it in EEPROM and deletes it from the SIM card. From EEPROM it decodes the message and sends it to the 2nd controller for display. It can display only one message at a time. This limitation can be overcome by using ARM microcontrollers.

V. FUTURE WORK:

This prototype can be connected with internet using Ethernet module or Wi-Fi module. By connecting it to the internet we can update the message through internet. When a new message is updated at the website of the organization then it is automatically gets updated on display through the internet.

REFERENCES:


