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GSM based Wireless Electronic Notice Board LED Display

Prof. A. S. Kudalkar[1], Atharva Dabade[2], Darshan Dhangar[3], Konde Omkar[4]

[1,2,3,4]*Department of Electrical Engineering, Bhivarabai Sawant college of Engineering and Research, Narhe, Pune-411041, Maharashtra.*

ABSTRACT – Scrolling display board is a common sight today. Advertisement is going digital. The use of led scrolling display board at big shops, shopping centers, railway station, bus stands and educational institutes is becoming an effective mode of communication in providing information to the people. But these off-the-shelf units are somewhat inflexible in terms of updating the message instantly. If the user wants to change the message it needs to be done using a computer and hence the person needs to be present at the location of the display board. It means the message cannot be changed from wherever or whenever. Also, the display board cannot be placed anywhere because of complex and delicate wiring.

'GSM based LED Scrolling Display Board' is a model for displaying notices/messages at places that require real-time noticing, by sending messages in the form of SMS through mobile. It is a system wherein the display board need not be reprogrammed to display a new message because it is wireless. The project aims to develop a moving sign board which empowers the user to change the scrolling message using SMS service instantaneously unlike a desk bound device such as PC or laptop. The user can update it even from a remote distant. The SMS is deleted from the SIM each time it is read, thus making room for the next SMS.

1. INTRODUCTION

The project is an implementation to the idea of the wireless communication between a mobile phone and a display board. This model combines the advantages of the microcontroller and wireless technology, to build an effective and accurate communication system. The prototype model developed uses the following major components:

- GSM modem-SIM900A
- Microcontroller- AT89C52
- 8X8 led dot matrix
- Shift Register- IC 74HC595
- ESP8266
- Current limiting Resistors- 1k ohm.

The administrator (user) uses a simple GSM based handset for sending messages to display board. The GSM modem used at the receiver end is used to receive the messages. The sent message is stored in the SIM of the modem. By issuing proper AT commands, it is read from the modem and stored in the microcontroller. In order to reduce the current required for the module and to simplify the hardware and wiring necessary to drive the LEDs this design uses Multiplexing. In this technique, at the time only required LEDs are glowing at any one time and hence power required for display module is reduced

The led display board accommodates 8x8 led displays. The preprogrammed controller is supplied with the standard character set containing alphabets and numbers. For each character a display pattern in the form of HEX values is stored inside the microcontroller which is termed as look up table. The microcontroller looks for the pattern and sends out the data bits serially and clock signal. This data is shifted by the shift registers. The data is sent on columns and rows are scanned fast which allows the pattern to be displayed because of persistence of vision. The row driver IC is used to source current for LED rows (anodes).

2. PROBLEM STATEMENT

In the realm of LED notification boards, the choice between GSM-based systems and wired systems poses a significant dilemma. The necessity to select the most efficient and reliable communication method for these boards prompts the need for a clear problem definition. The primary concern lies in the limitations and drawbacks of wired systems, such as their susceptibility to physical damage, high installation costs, and inflexibility in terms of location. These constraints inhibit their adaptability and effectiveness, particularly in environments where mobility and remote access are crucial. Conversely, GSM-based systems offer a promising alternative with their wireless connectivity, enabling remote management, cost-effective deployment, and enhanced flexibility in installation. However, concerns may arise regarding GSM's reliability in areas with weak signal coverage or potential security vulnerabilities. Therefore, the problem at hand entails evaluating the advantages and drawbacks of both GSM-based and wired systems to determine why the former should be preferred for LED notification boards, taking into account factors such as reliability, cost-effectiveness, adaptability, and security.

3. OBJECTIVE

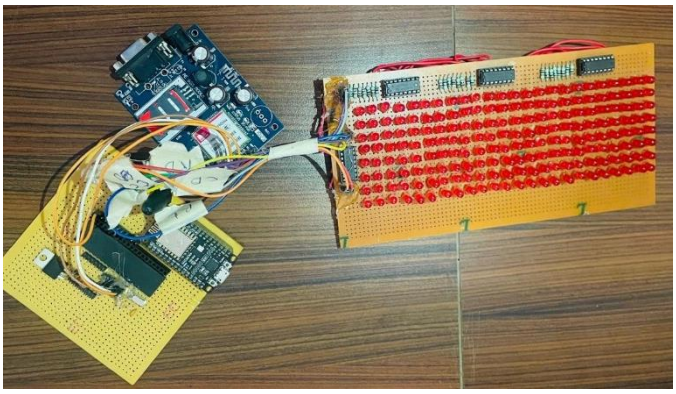
In this system we can display a message or notice to some display device like LED, and this message can be easily set or changed from anywhere in the world, just by using the SMS facility of your mobile handset.

Wireless communication can interconnect with people easily and it requires less amount of time.

4. SCOPE

It aims to display text messages remotely through GSM technology, facilitating quick updates, emergency notifications, and seamless communication, making it a versatile communication tool for various applications

5. COMPONENTS OF MODEL



(Complete Setup of model)

1) GSM SIM 900A –

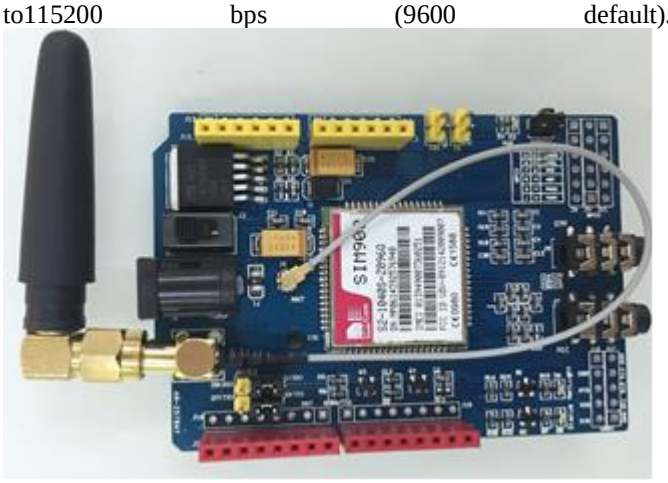
This is the first block in the receiving section. It consists of a slot for holding SIM card. The message sent by the user is stored in this SIM card.

Major features of this modem are:

• Designed for global market, SIM900A is a Tri-band GSM/GPRS engine that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS1900 MHz SIM900A provides GPRS multi-slot class 10 capabilities and support.

• Can be used to send SMS, make and receive calls, and do other GSM operations by controlling it through simple AT commands from microcontrollers and computers.

• The SIM900A allows an adjustable serial baud rate from 1200 to115200 bps (9600 default).



2) Microcontroller AT89C52 –

AT89C52 is a powerful 40 pin microcontroller which provides a range of features such as:

• 89C52 Central Processing Unit

• 64 kB of on-chip Flash program memory with ISP (In-System Programming)

• 5 V Operating voltage from 0 to 40 MHz

• 64 kB Flash memory

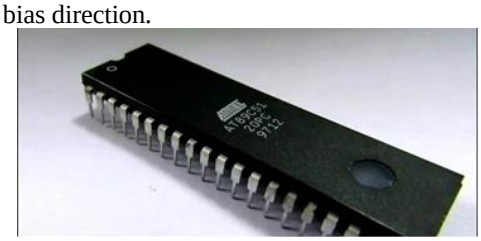
• 1024 bytes of data RAM

• Four 8-bit I/O ports with three high-current Port 1 pins (16 mA each)

• Three 16-bit timers/counters

• Eight interrupt sources with four priority levels.

The microcontroller transmits AT commands to receive the message which is sent by the user. It receives the message and only keeps the message part of the response sent by modem. It provides with the data signal and clock signal for scrolling the message.conduct, while during the negative half cycle, the remaining two diodes conduct. These diodes conduct only in the forward bias direction.



3) 8x8 LED Dot Matrix –

In a LED display, multiple LEDs are wired together in rows and columns. This is done to minimize the number of pins required to drive them. For example, a 8x8 matrix of LEDs would need 64 I/O pins, one for each LED. By wiring all the anodes together in rows (R1 through R8), and cathodes in columns (C1 through C8), the required number of I/O pins is reduced to 16. Each LED is addressed by its row and column number. If R4 is pulled high and C3 is pulled low, the LED in fourth row and third column will be turned on. Characters can be displayed by fast scanning of either rows or columns. This model uses Column Anode-Row cathode configuration with data signal on columns and rows are scanned.

4) Shift Register- IC 74HC595 –

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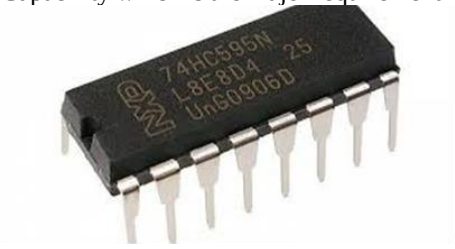
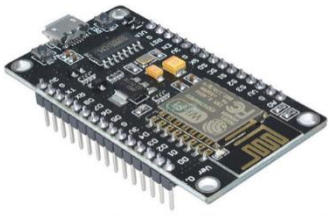
The 74HC595 IC is 8-channel source driver IC, used for high-side switching applications that benefit from separate logic and load grounds. These 8-channel source drivers are useful for interfacing between low-level logic and high-current loads. The seven display matrix rows are selected by the outputs of the source driver 74HC595 IC. It is TTL, DTL, PMOS, or CMOS Compatible Inputs. It has 500 mA Output Source Current Capability which is the major requirement for the display board.



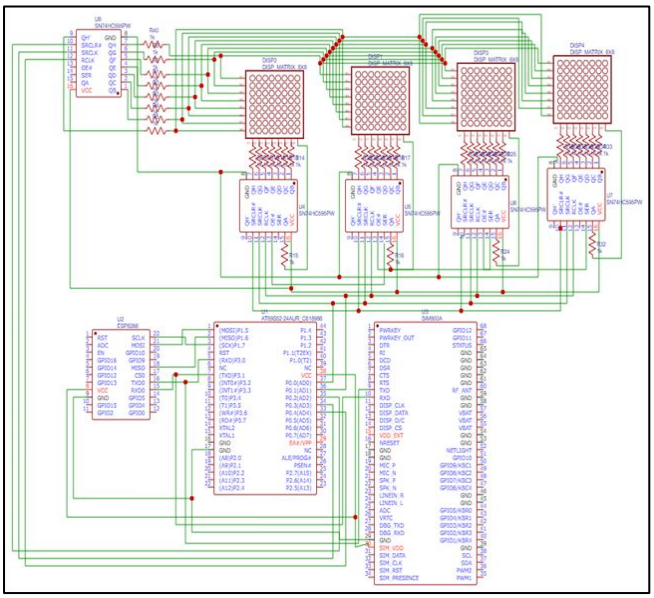
5) ESP8266 –

Memory:
32 KB instruction RAM
32 KB instruction cache RAM
80 KB user-data RAM
16 KB ETS system-data RAM
External QSPI flash: up to 16 MB is supported (512 KB to 4 MiB typically included)

This high memory capacity allows high memory demanding programs to be stored for further processing in AT89c51 IC. Also, it makes the process of communication with computer while programing and testing with microcontroller so much easier..



6. WORKING PRINCIPLE



The system was designed as the circuit diagram. +5v is required to power the microcontroller and the LED display. It is sufficient for the GSM module. An adapter supplies the needed power for the design. Microcontroller acts as the central processing unit for this project. Ideal for low power (nano Watt) and connectivity applications that benefit from the availability of three serial ports. Large amounts of RAM memory for buffering and Enhanced FLASH program memory make it ideal for embedded control and monitoring applications that require periodic connection with a (legacy free) Personal Computer via USB for upload/download and/or firmware updates. While operating up to 48MHz, the Microcontroller is also mostly software and hardware compatible with the Microcontroller Low-Speed USB OTP devices Its special features include memory endurance, self-programmability, extended instruction set, enhanced addressable USART, 10-bit A/D converter and dedicated ICD/ICSP port. Microcontroller requires some extra supporting hardware like +5volts power supply, Power on RESET (POR), as well as manual RESET, Clock generator and pull up resisters when the power supply of the CPU board is switched ON, the microcontroller must be RESET to start the program execution from 0000H memory location. In microcontroller, port 0 does not have internal pull up resistor therefore, external pull up resistor has to be used at port 0. At other ports external pull up resistor is optional; however external pull up resistors is already connected for the other ports Microcontroller connected with transistor level converter interfaces the GSM module with microcontroller.

7. MERITS

It is a wireless system.

Text can be delivered from remote place.

Data can be stored in the memory so it will not be lost in power failure condition.

A lot of interaction and information sharing occurs.

Printing and photocopying cost not require.

Save time, energy and resources.

GSM can be used for long distance data transmission.

8. LITERATURE REVIEW

Authors and Research Papers	Brief Information
Prof. Ravindra Joshi, Abhishek Gupta, Rani Borkar, Samita Gawas, Sarang Joshi. GSM based Wireless Notice Board in International Journal of Technical Research and Application.Issue 40 (KCCEMSR), March 2016.	This paper outlines the design of an E-noticeboard utilizing GSM technology with key components including a GSM modem, microcontroller, LCD monitor, and mobile device. It enables remote notice display, reducing paper usage and environmental impact.
D Dalwadi, N Trivedi and A Kasundra (2011), Article in Nation conference on recent trends in engineering and technology, INDIA	This system employs an ATMEGA32 microcontroller and a SIM300 GSM modem, allowing users to send SMS messages for display on a notice board through mobile phones.
Prof. P.yakaiah, Bijjam Swathi, M. Jhansi, B. Nikhala, K.Shiva Prasad. Remotely Cotrolled Android Based Electronic Notice Board in IJSDR, Vol.2, Issue 4, April 2017.	This project introduces a wireless Electronic notice board for organizations. Messages sent via Android app are displayed on a notice board through Wi-Fi and a microcontroller with an LCD screen.

9. CONCLUSION

The project explains how we can develop GSM based led scrolling board, by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. The scrolling board successfully displays the message word by word. The speed of scrolling is controlled using software. The major constraint of flicker and intensity of LEDs is eliminated by the use of high frequency crystal. Due to the use of multiplexing technique, power dissipated by the LEDs is low. Greater efficiency is achieved by using the concept of wireless communication. The model can be efficiently used in restaurants to display the menu, at railway station in case of cancellation of trains, in educational institutes for faster communication of notices or messages, banks and bus stands. The system can also be employed in hotels, rooms in cases of emergency. The major advantage of this model is that the person can change the message at any point with no constraint of distance. There can be latency involved in delivering the message to the GSM modem and hence it is advisable to use a high standard modem with good range capability (use of better antenna).

10. REFERENCE

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