GSM BASED ELECTRONIC NOTICE BOARD

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Abstract

Notice board is primary thing in any institution or organization or public utility places like Banks, bus stops, hospitals, or parks etc. This paper presents an idea of wireless Digital Notice Board Using GSM Technology which can help in reducing paper work and time. The main objective of this project is to develop a wireless notice board that displays messages sent from the user's mobile. Its operation is based on microcontroller Arduino programmed in assembly language. A SIM900 GSM modem with a SIM card is interfaced to the ports of the microcontroller with the help of AT commands. When the user sends a SMS via a registered number from his mobile phone, it is received by SIM900 GSM modem at the receiver's end. The messaged is thus, fetched into the microcontroller and it is displayed on LCD. This project is our experiment on real time noticing. Further development to this project has been done by providing message storage facility by non-volatile memory i.e. EEPROM attached to the microcontroller for retrieval of old messages if required. It can also be expanded to a bigger LCD screen.

Keywords : *GSM module, Arduino, LCD, SIM, EEPROM, Regulated Power Supply*

1. INTRODUCTION

In Bhutan almost all the institutions, organizations and public utility places uses old method of placing notice. A notice is written by hand or typed and pasted it on the wooden board which is not reliable as well as time consuming and material wastage. But, this days most of the countries are advertising through digital. The big shops and the shopping centers use digital displays. Also, in trains and buses the information like platform number and ticket information is displayed in digital boards. Most People are adapted to the idea of the world at its finger-tips now. The use of mobile phones have increased drastically over years. Control and communication has become important in all the parts of the world.

Moreover, people are keen in sharing information through SMS messaging. This gave us the ideas to use mobile phones to receive message and then display it on an electronic board. The GSM technology is used which GSM stands for Global System for Mobile Communication. It has the system for SMS Short Message Service. This project is a remote notice board with a GSM modem at the receivers end. So, if the user wants to display any message, he can send the information by SMS and thus, updates the

LCD display accordingly. Whenever new message is received it gives indication by buzzer and LED.

2. SYSTEM DESIGN AND ITS OPERATION

In this proposed system the message send from user to GSM module which is located on the notice board. So, this GSM module receives the message and displayed on notice board, and simultaneously sends to many different mobile number that are stored in memory of microcontroller. When new message is arrived at notice board, the buzzer will beep and Red LED will glow remaining ON until new message is read. Max232 shift the level of signal which converts the signal between the microcontroller and GSM module. After the conversion of signal the message will be displayed on notice board and it will get stored in EEPROM for future reference.

The main components of the system are :
1. GSM Modem
2. Microcontroller
3. 20x4 LCD Character Display Module
4. Magnetic Buzzer
5. 15-0-15V center trapped Transformer
6. Regulator
7. SIM card

2.1 GSM Modem

GSM (Global System for Mobile) / GPRS (General Packet Radio Service) TTL -Modem is SIM900 Quad-band GSM / GPRS device, works on frequencies 850 MHZ, 900 MHZ, 1800 MHZ and 1900 MHZ. Its size is very compact and easy to use as plug in GSM Modem. The Modem is designed with 3V3 and 5V DC TTL interfacing circuitry which allows User to directly interface with 5V Microcontrollers (PIC, AVR, Arduino, 8051, etc.) as well as 3V3 Microcontrollers (ARM, ARM Cortex XX, etc.). The baud rate can be configurable from 9600- 115200 bps through AT (Attention) commands. This GSM/GPRS TTL Modem has internal TCP/IP stack to enable User to connect with internet through GPRS feature. It is suitable for SMS as well as DATA transfer application in mobile phone to mobile phone interface. The modem can be interfaced with a Microcontroller using USART (Universal Synchronous Asyn-chronous Receiver and Transmitter) feature (serial communication) (Campus Component, 2011).

2.2 Microcontroler

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital in-put/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, ICSP header and a reset button. It contains all components which supports the microcontroller; to start its function, connect to a computer with a USB cable or battery or pass the power to AC-DC adapter.

It features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

The Uno is the latest in a series of USB Arduino board and the reference model for the Arduino platform.

2.3 20x4 LCD Character Display Unit

A 20x4 LCD display is basic module and

it is commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons for LCDs being used are economical, easily programmable, have no limitation of displaying special & even custom characters (unlike in seven segments) and animations.

A 20x4 LCD can display 20 characters per line and there are 4 such lines. It is shown in Figure 10. In this LCD each character is displayed in 5x7 pixel matrix. It has two registers namely Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display and etc. The data register stores the data to be displayed on the LCD.

2.4 Magnetic Buzzer

The buzzer is one integrated electronic trans-ducers, DC voltage supplier widely used in computers, printers, copiers, alarm, electronic toys, automotive electronic equipment, telephones, timers and other electronic products for sound devices.
They can be divided into the: active buzzer (containing driver line) and passive buzzer (ex-ternal drive).

2.5 15-0-15 Center Trapped Transformer

A Centre Tapped transformer works similar to usual transformer. The difference is its secondary winding is divided into two parts. So, two individual voltages can be acquired across the two line ends.

However, internal process is same which when an alternating current is supply to the primary winding of the transformer it creates a magnetic flux in the core. And when the secondary winding is brought near, an alternating magnetic flux is also induced in the secondary winding. As flux flows through the ferromagnetic iron core, its direction changes with every single cycle of the alternating current. In this way, an alternating current also flows through the two halves of secondary winding of the transformer and flows to the external circuit (Storr, 1999).

2.6 Regulator

A device which maintains the output voltage of an ordinary power supply constant irrespective of load variations or changes in input a.c. voltage is known as a voltage regulator.

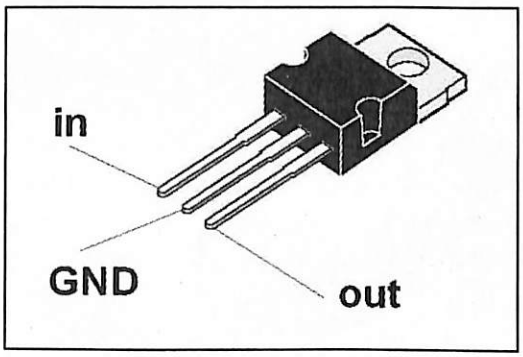

Fig. 1 Pin Diagram of IC 7805 Voltage Regulator.

IC 7805 is commonly used IC voltage regulator and has three terminals. Fig 3.8 shows how the 7805 IC is connected to provide a fixed D.C. output of +5V. The unregulated input voltage is connected to IC's IN terminal and the IC's OUT terminal provides + 5V (Engineer's Garage, n.d.).

3. DESIGN, SIMULATION AND VALIDATION OF THE SYSTEM

3.1 Block Diagram of proposed system

The block diagram of GSM Wireless E-Notice Board is shown in Fig. 2.

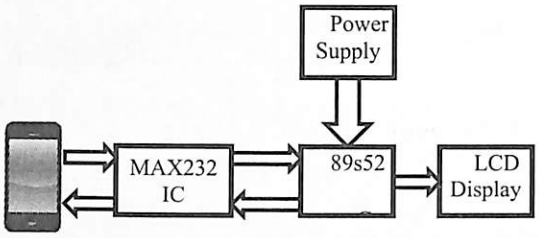

Fig. 2 Block diagram of GSM Wireless E-Notice Board.

3.2 Opration of Proposed System

The proposed circuit consist of a GSM SIM900 module, Arduino UNO R3, 16*2 Liquid crystal display and a buzzer. In this system Arduino UNO is used for controlling the whole process. The GSM SIM900 module is used as a receiver and a cell phone as a transmitter.

The communication between the GSM SIM900 module and the cell phone requires GSM network. For this reason, a valid GSM subscriber identity module (SIM) is needed in both the transmitter and the receiver. The availability of network on the GSM is indicated by blinking of LED or else has to call the number placed in the GSM. If the GSM is in the network coverage of the subscriber, the RED LED will glow indicating the GSM is busy.

Firstly, the program checks for the GSM module. If the GSM module is not connected to the Arduino board then LCD will display "Finding module" and the buzzer will sound until the GSM module is connected. The buzzer stops when the GSM module is connected. Then program checks for the availability of network and displays "system ready" after GSM module is ready.

When the GSM module receives SMS from the cell phone, the red LED on the GSM module will blink once and buzzer will make a sound for 3 seconds indicating new SMS being received. We can send some message or notice like "#Type Message*", through the SMS. Here, we have used a prefix in the message string i.e. '#'. This prefix is used to identify the starting of the message or notice. And '*' is used as suffix to indicate the end of the message or notice.

4. PROTOTYPE DEVELOPMENT AND TESTING

Before fabricating the actual system on PCB board, components were tested on the breadboard. Test of main components are shown below.

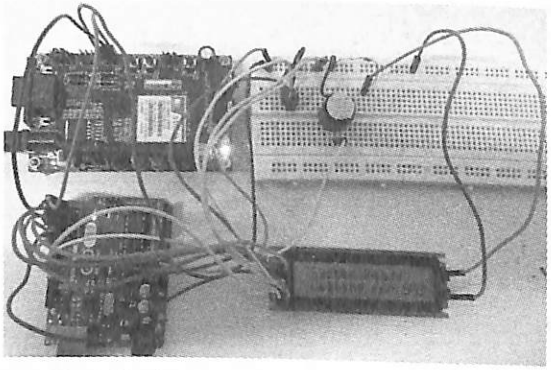

Fig. 3 Circuit Testing of LCD with Arduino UNO on Breadboard.

5. DISCUSSION AND ANALYSIS

5.1 Advantages

Advantages of the system are as follows.

- Real time display
- Easy to use
- Wider range
- Wireless

5.2 Disadvantages

Disadvantages of the system are as follows.

- Limited character display
- Charge on SMS by the service provider
- Security issues

6. Application

The following all pications are considered.

Educational Institutions and Organizations
Currently, we inform the public of any events through typed or hand written papers on notice boards. Thus, this mode of information transmission can be discarded by using wireless notice boards display information.

Crime Prevention:
Display boards put up aside roads will display public security, accident prevention and infomation on criminals.

Managing Traffic
The frequent traffic jam in metropolitan cities can be solved by wireless notice boards. And traffic jam at cross roads can be also informed.

Advertisement
In shopping malls, marketing officers do an verbal nouncements of various products offers. Instead we can continuously display the information regarding the products and related offers on electronic display boards.

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