DTMF based Smart Notice Board System

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Abstract- The mobile phone technology like Dual Tone Multi Frequency (DTMF) and Global System for Mobile communication (GSM) have pushed us to control the things around us with mobile phones and the world is going mobile. Whatever appliances we are dealing with, in our daily life, we want to control them without physically moving to the control unit. As we see in our schools and colleges, we are using manual notice boards that require enough time and man power to change the notices every time we wish to change. As an advancement, the concept of programmable display boards was introduced. But these boards need to be reprogrammed each time. This makes them inefficient for immediate information transfer. In this paper, we have designed a smart notice board by which we can update the notice to be displayed from any part of the world in no time and it is advantageous during emergencies when we want to display alert messages or changed schedule speedily. Our system consists of three main modules viz DTMF module, Liquid Crystal Display (LCD) module, Microcontroller module and a mobile phone attached to display system. The DTMF based smart notice board system can be used at different parts of the city and the messages like Advertisements, News can be instantly displayed and updated. The user presses different numbers which correspond to different dial tones, which are then coded and sent from user mobile phone to display on the system wirelessly and accordingly the stored message for a code is displayed on LCD.

Index Terms- Dual Tone Multi Frequency (DTMF), Liquid Crystal Display (LCD), Smart Notice Board System (SNBS)

I. INTRODUCTION

The inclination of making the manually controlled things automatic has become a common practice these days. The process of making the things automatic is being exploited in almost all the major fields of life. Making things automatic reduces burden on the humans. The time utilized and the effort used in manually controlled processes is much higher than the automated systems. Considering the commonly used notice board system in our schools, colleges and universities and the advancement in technology, there occurs a gap between the two. In these institutes, we still use manual way of putting the important notices, class and examination schedules, results, etc in the notice boards. This manual system needs more effort and time to get the written announcements from the faculty and then put it on the notice board. In this paper, we have developed a Smart Notice Board System (SNBS) which is automatic in nature and provides us the means by which we can update the notices, changed schedules, display results quickly on the display system without the intervention of other person. The advancements in technology has been put together to make an effort to automate the process of manually publishing notices. One of the modules in our system is Dual-tone multi-frequency (DTMF) that is used for telecommunication signaling over analog telephone lines in the voice-frequency band between telephone handsets and other communications devices and the switching center. The version of DTMF that is used in push-button telephones for tone dialing is known as Touch-Tone [1]. This DTMF module is put together functionally with microcontroller and LCD modules to complete the task of automating and providing mobile control to notice boards.

II. SMART NOTICE BOARD SYSTEM

We designed a method for automating the notice display process in an efficient way in order to reduce the time and effort needed to get the notice from any faculty member and then to put in notice board. Figure 1 shows the block diagram of our design. In our approach, we divided the overall Smart Notice Board System into four sub-modules viz DTMF, LCD, power module and Microcontroller. Also, a mobile phone is attached to the LCD system which acts as a modem for receiving the incoming calls. All these sub-modules work collaboratively, intelligently and in coordination to automate the entire process of displaying notices speedily, as and when required. Kiel software is used to program the microcontroller and then interface it accordingly with LCD and DTMF [3]. SNBS provides an easy way to display notices in institutes, shopping centers, airports etc. we need not to go there & connect it to the laptop but we can change the messages using our mobile phone. The important feature of this project is that we are using a GSM network by which we can control LCD display from any part of the globe. It is one of the new technologies in the embedded field to make the communication between microcontroller and mobile. This project is a remote notice board with MODEM connected to it in the form of a mobile phone. We have designed a notice board that would avoid the usage of man power & reduces wastage of time. Also, it would be wireless and fast.

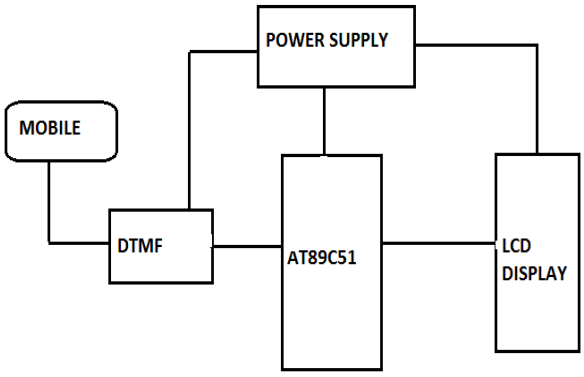

Fig 1: Block diagram of SNBS

A. Power Supply Module

This is the most prominent module which is used to drive all other hardware modules. The AC source is available in 220V and 50Hz. As such a step down transformer is used to lower the voltage level from 220V to a limit that can be easily converted to DC. The reduced AC voltage is then converted to DC voltage using a bridge rectifier. But to operate the various components like ICs, transistors, etc, a regulated DC voltage is required whose value should be no more than 5 volt. Thus, a voltage regulator IC 7805 is used for this purpose. The snapshot of the power module after it is made is shown in the figure 2 below.

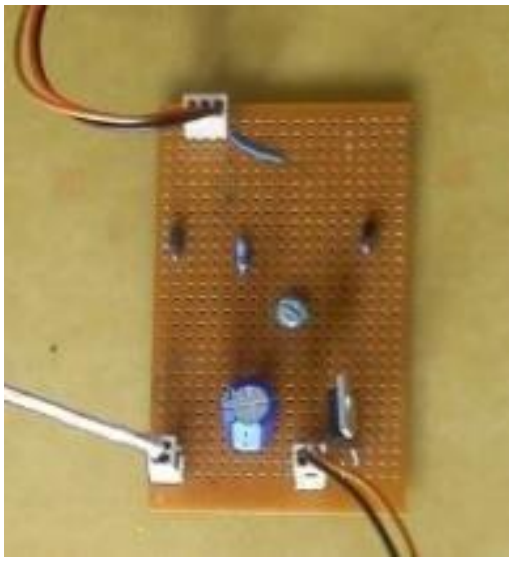

Fig 2: Layout of Power Supply Module

B. Microcontroller Module

It is the heart of this project as it controls the functioning of LCD depending on the input obtained from the user via DTMF. A microcontroller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals [2]. In our proposed system, we have used AT89C51 as it suited the overall requirements. The AT89C51 provides 4K bytes of flash, 128 bytes of RAM, 32 I/O lines, two 16 bit timer/counter, five vector two level interrupt architecture, a full duplex serial port. It is connected to the DTMF via four-line bus and controls the messages to be displayed on LCD. Figure 3 below shows the microcontroller module.

Fig 3: Layout of Microcontroller Module

C. DTMF Module

Dual tone multi frequency signaling controls the Smart Notice Board System by a mobile phone. A cell phone is attached to this module that is used to receive the calls from mobile phones of faculty. The DTMF input is fed to MT8870D which is 20 DIP IC. The DTMF circuitry converts the particular DTMF tone into a 4 line output which is fed to microcontroller. Depending upon the key pressed, a particular 4 line output (i.e. Q4, Q3, Q2, Q1) is generated by the decoder which is shown below in a table I.

Table I: Output from Various Key Tones

KEY TONE				
	Q4	Q3	Q2	Q1
1	1	1	1	0
2	1	1	0	1
3	1	1	0	0
4	1	0	1	1
5	1	0	1	0
6	1	0	0	1
7	0	1	0	0
8	0	1	1	1
9	0	1	1	0
0	0	1	0	1
*	0	1	0	0
#	0	0	1	1

The snapshot of the DTMF module is presented in figure 4 below.

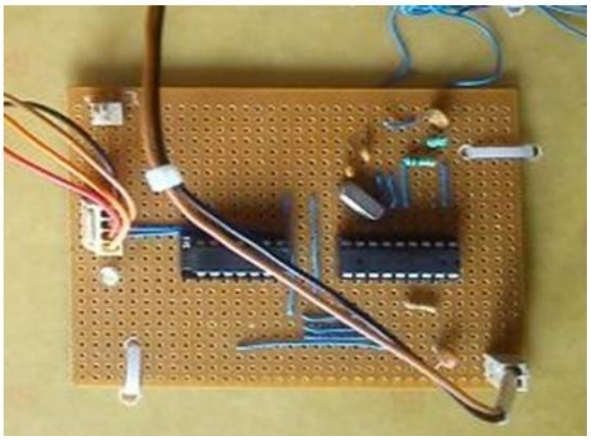

Fig 4: Layout of DTMF Module

D. LCD Module

A liquid-crystal display (LCD) is a flat panel electronic visual display that uses the light modulating properties of liquid crystals. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. We have used 16x2 LCD which means it can display 16 characters per line and there are two such lines. The function of this module is to display the stored messages depending on the decoded logic of dtmf tone by the microcontroller. Figure 5 below shows LCD module.

Fig 5: Layout of LCD Module

III. OPERATION

Since the SNBS consists of four sub-modules and the main module on which the others work is the DTMF module. It is connected to the mobile phone which is used to receive the calls from the cell phones of faculty who wish to change/update the notice. During the ongoing call, a DTMF tone is generated which is decoded into its equivalent binary by the decoder. This binary equivalent of the tone is then sent to the microcontroller which is preprogrammed to take a decision for any given input. Any mobile which makes a call to the mobile phone attached to the board will act as remote device. This feature of SNBS makes it controllable from any part of the world, which means we just have to call to the phone attached to SNBS and accordingly the notice and any new updates can be displayed automatically and speedily. The DTMF input (i.e. tone) is fed to the MT8870D via a speaker of headset attached to mobile phone. The DTMF circuitry converts the particular DTMF tone into a 4 line output which is fed to microcontroller. Depending upon the key pressed, a particular 4 line output (i.e. Q4, Q3, Q2 and Q1) is generated by the decoder. This 4 line binary output is sent to microcontroller. The microcontroller has different messages to be outputted depending on the combinations of input signals received from DTMF. For each combination of DTMF output pins, a separate message is activated in microcontroller which is then sent to LCD to be displayed.

IV. RESULT

The diagram of the overall hardware implementation after the integration of the various modules is shown in figure 6 below:

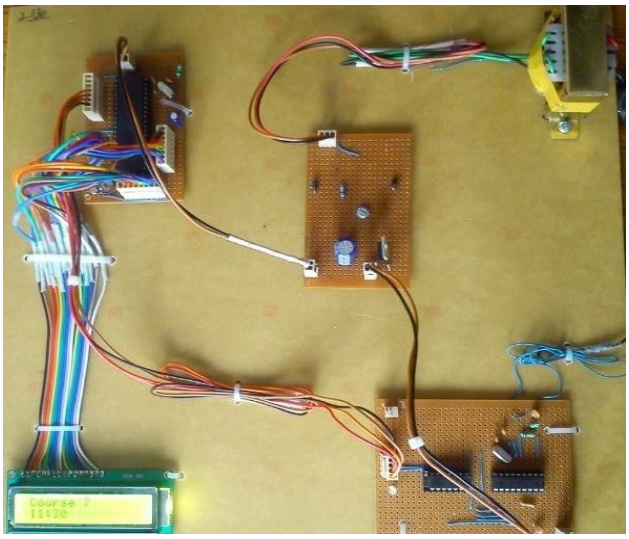

Fig 6: Layout of overall hardware architecture

Result I: On pressing "5" from the mobile phone, the message displayed on LCD is shown in figure 7 below.

Fig 7: LCD output for Result I

Result II: On pressing "6" from the mobile phone, the result obtained at LCD is shown in figure 8 below.

Fig 8: LCD output for Result II

V. CONCLUSION

The Smart Notice Board System is a step forward to make the manual process of displaying the important notices, class time tables, results, etc automated in nature. The developed system integrated by using four sub-modules the DTMF, LCD, power module and Microcontroller in which it would pioneer work for displaying the notices in an advanced and technological way. This proposal for the automation of producing notices is efficient and time saving process than the currently employing method in which a person has to get the hardcopy of the notice and the put in the notice board, which is complex and time consuming process. This automation of producing and displaying the notices also reduces the human effort and consequently the cost of the whole process. This system can be implemented at any place with ease and within reasonable amount of time. The implementation costs for the automation is also affordable. The SNB system also makes it easy to display messages during critical times when we want to update the notices by being far away and in quick time.

REFERENCES

[1] http://www.genave.com/dtmf.htm
[2] The 8051 microcontroller by Kenneth J. Ayala.
[3] www.keil.com/forum/docs
[4] http://www.datasheetcatalog.com

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