Home Automation System using DTMF

Monika L. Bawankule[1] Achal V. Bhalerao[2] Ashwini F. Kokate[3]
[1,2]Student [3]Assistant Professor
[1,2,3]Department of Electrical Engineering
[1,2,3]MPCE Bhilewada, Bhandara, India

Abstract— Now a day's mobile has become an area of our standard of living. Due to low value of mobile phones, that's why we are widely used for home automation. In this paper a remotely operated mobile controlled home appliances system is projected. It is a DTMF (Dual-Tone Multiple-Frequency) based system consist of two mobile phones, DTMF decoder and one microcontroller. One mobile is employed as remote which can find a way distance from home and another mobile is found at the house that act as a receiver. The DTMF signals send via the remote mobile as DTMF tone. This DTMF tone is received by the mobile phone installed at home. The received DTMF tone is then decoded by DTMF decoder IC. The output logic signals of the decoder used as an input to the microcontroller. The microcontroller is antecedently programmed to manage home appliances in line with output of the DTMF decoder.

Key words: Appliances, DTMF Decoder, Home-Automation, Microcontroller, Mobile Phone

I. INTRODUCTION

Automation could be a technique, method, or system of in operation or dominant a method by electronic devices with reducing human involvement to a minimum. The fundamental of building Associate in an automation system for Associate in Nursing workplace or house is increasing day-by-day with various advantages. Industrialist and researcher's area unit operating to create economical and affordability automatic systems to watch and management completely different machines like lights, fans, AC based on the requirement. Automation makes not only an efficient but also an economical use of the electricity and water and reduces much of the wastage [1]. People use different types of communication in control applications to control home appliances, industrial appliances, and other type of automation. There are two types of communication i.e. generally use - one is wired and alternative one is wireless. In wireless communication we tend to transmits signal wirelessly, like using radio frequency (RF) and in wired communication in which we uses wires like copper wire. In this paper "DTMF based mostly Home Automation System" we tend to area unit aiming to management our home appliances wirelessly. To control any electrical appliances mistreatment movable while not employing a microcontroller. This circuit makes use of DTMF (Dual Tone Multi Frequency) technique. Dual-tone multiple-frequency signal (DTMF) is Associate in an in-band telecommunication signal system mistreatment the voice waveband over phone lines between phone instrumentation and alternative communications devices and change centers. DTMF system also known as touch-tone system. The touch-tone system employing a phone input device bit by bit replaced the utilization of rotary dial and has become the business customary for phone line and mobile service. Other multi-frequency systems area unit used for internal signal at intervals the phonephone network. As register signaling is used in DTMF phones here tones rather than make/break pulse are used for dialing and each dialed digit is uniquely represented by a pair of sine waves tones. These tones (one from low group and another from high group) are sent to the exchange when a digit is dialed by pushing the key, these tone lies within the speech band of three hundred to 3400 cycle per second and area unit chosen thus on minimize the likelihood of any valid frequency try existing in traditional speech at the same time. A valid DTMF signal is that the total of 2 tones, one from a lower cluster (697-940 Hz) and therefore the alternative from the next cluster (1209-1663 Hz). The DTMF signal contains just one element from every of the high and low cluster. This significantly simplifies decoding because the composite DTMF signal may be separated with band pass filters into single frequency component each of which may be handled individually. The underlying principle chiefly depends upon the flexibility of DTMF ICs to come up with DTMF reminiscent of range variety} or code within the number pad and to observe identical number or code from its corresponding DTMF decoder [2]. DTMF is acronym for Dual Tone Multi Frequency. When you create necessitate client care, they will ask you to press 1, 2 or any other number. When you press variety from your mobile, one particular action is happening. All this is because of DTMF. When a button is ironed in your mobile input device, it will generate a tone of two frequencies. These tones are called row and column frequencies. Generally, row frequencies area unit low frequencies and column frequencies area unit high frequencies. These frequencies for DTMF area unit chosen in such how that they don't have harmonic relation with the others, so that they will not produce same tones. The column frequencies area unit slightly louder than the row frequencies to make amends for the high-frequency reel off of voice system. The application of this project is to change on and off home appliances by a cellular phone. It helps in effective management of home appliances and will increase power potency. It increases appliances lifetime and also power efficiency. DTMF tones area unit chiefly use in terrestrial stations for turning on and movement off remote transmitter. It is mainly use in telephone stations for detection of called and dialed numbers. It additionally helps USA to cut back wattage wastage.

II. METHODOLOGY

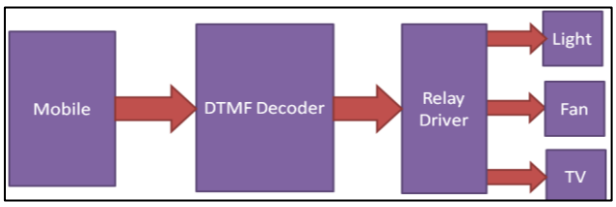
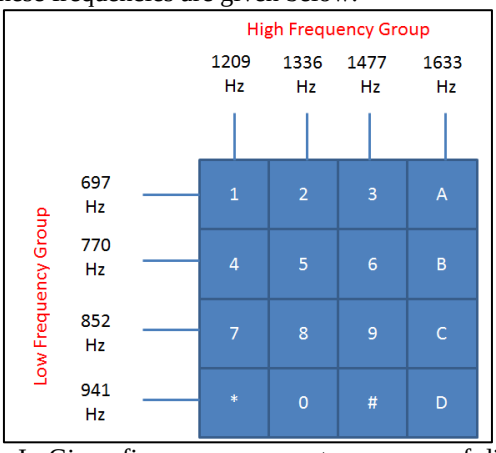


Fig. 1: Block Diagram of Home Automation System Using DTMF decoder.

III. WORKING

DTMF controlled home appliances project works over mobile DTMF technology that exists in Dial tone. DTMF stands for Dual Tone Multiple Frequency. There are some frequencies that we used to create DTMF tone. In simple words by adding or mixing two or more frequencies generates DTMF tone. These frequencies are given below:



In Given figure we can see two groups of different frequencies. When one upper and one lower frequencies mixed then a tone is created that tone we calls Dual Tone Multiple Frequency. In this project we control ac appliances by pressing dial pad keys like 1, 2, 3, 4, 5 and more.

Here we have connected a cell phone using aux wire to the DTMF decoder circuit. Before explaining the further working of project we need to know about the output of DTMF decoder for every key pressed.

S.No.	key	Digital Output			
		Q4	Q3	Q2	Q1
1	1	0	0	0	1
2	2	0	0	1	0
3	3	0	0	1	1
4	4	0	1	0	0
5	5	0	1	0	1
6	6	0	1	1	0
7	7	1	1	1	1
8	8	1	0	0	0
9	9	1	0	0	1
10	0	1	0	1	0

Now understand working according to given table.

IV. HARDWARE DESCRIPTION

A. *DTMF Decoder*

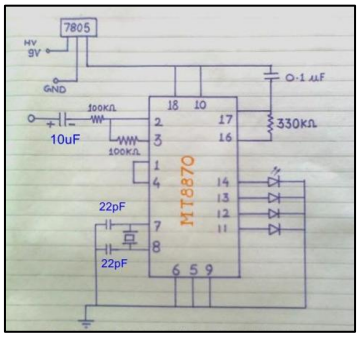


Fig. 4.1: DTMF decoder

Dual Tone Multi Frequency (DTMF) that is paired with a wireless module to provide seamless wireless control over many devices in a house. Dual-tone-multi-frequency (DTMF, also known as touch-tone) are the audible sounds you hear when you press keys on your phone. The tone generator (top) uses the 5589 chip and a DIP switch. You can actually hear the tones through the speaker. The bottom circuit uses the 8870 to decode a tone and display its associated number on the 7-segment LED. Touch-tone is familiar to many (telephone), it is a mature technology, and readily available with off-the-shelf, single-chip, low-cost components. For these reasons DTMF is often used in remote control applications that typically use telephones (e.g. accessing your messages from an answering machine, retrieving your account balance info from your bank's database).

B. *Microcontroller*

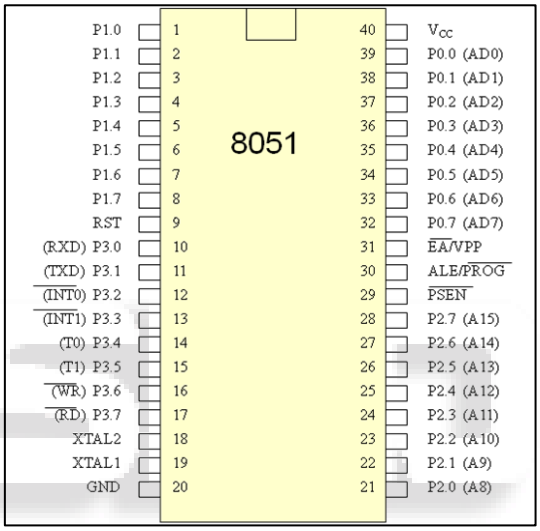


Fig. 4.2: 8051 Microcontroller

8051 is an 8-bit family of microcontroller developed by Intel in the year 1981. This is one of the most popular family of microcontroller being used all across the world. This microcontroller was also referred as "system on a chip" because it has 128 bytes of RAM, 4Kbytes of ROM, 2 Timers, 1 Serial port, and four ports on a single chip. The CPU can work for only 8bits of data at a time because 8051 is an 8-bit processor. In case the data is larger than 8 bits then it has to be broken into parts so that the CPU can process conveniently. Most manufacturers have put 4Kbytes of ROM even though the quantity of ROM can be exceeded up to 64 K bytes.

C. *GSM MODEM*

Fig. 4.3: GSM Modem

GSM module is used to establish communication between a computer and a GSM system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces (like RS-232, USB, etc.) for computer. The MODEM is the soul of such modules.

V. ADVANTAGE

1) It is robust and easy to used system.
2) There is no need for extra training of that person who is using it.
3) All the control would be in your hands by using this home automation system.
4) One can control home appliances from anywhere.
5) It reduces wastage of electricity if someone forgets to switch off any appliance connected to the system if we were away.

VI. FUTURE SCOPE

1) Memory can be used to store the appliance status during power failure.
2) Appliance scheduler/timer can be implemented using RTC (Real Time Clock).
3) Can be converted to an IoT device using Wi-Fi connectivity.

VII. RESULTS

In our testing we found that our system is operating successfully. When the call is initiated and the keys are pressed upon the cell-phone, the DTMF decoder decodes the signal into binary form. This is further processed by the microcontroller to generate the specific signal to drive the relay module for driving the output devices connected to it.

VIII. CONCLUSION

It will encourage us to consider bringing Home Automation into our own lives. The plugs in devices make an easy entry point to working with the technology. The received tone is processed with the help of DTMF decoder. The DTMF decoder then transmits the signal to the microcontroller to operate the relay. It provides the advantage of robust control, working range as large as the coverage area of the service provider. In this way, we have developed this which is capable of receiving & decoding the commands and control signals from the distant areas and can work according to our instructions. This home appliances control or home automation project also uses the same DTMF decoder circuit section with little modifications to control home and office electrical appliances. Just connect your cell phone headset (headphone) jack to the mobile phone and then mobile will control electrical appliances and electrical equipment through the DTMF key pad of your cell phone

REFERENCES

[1] Shih-Pang Tseng, Bo-Rong Li, Jun-Long Pan, and Chia Ju Lin,"An Application of Internet of Things with Motion Sensing on Smart House", 978-1-4799-6284-6/14ⓒ 2014 IEEE.
[2] Dodd, Annabel Z, "The essential guide to telecommunications", Prentice Hall PTR, 2002, pp. 183.
[3] Andrea Zanella, Nicola Bui, Angelo Castellani, Lorenzo Vangelista, and Michele Zorzi, "Internet of Things for Smart Cities", IEEE INTERNET OF THINGS JOURNAL, VOL. 1, NO. 1, FEBRUARY 2014.
[4] Vaishnavi S. Gunge, Pratibha S. Yalagi, "Smart Home Automation: A Literature Review", IJCA, RTDM 2016.
[5] Brand, S, How Buildings Learn, New York, Viking, 1994.
[6] R.E. Grinter, N. Ducheneaut, W.K. Edwards, M. Newman, "The work to make a home network work," in Proc. of Ninth European Conference on Computer-Supported Cooperative Work (ECSCW 05), pp. 469-488, 2005.
[7] M. Chetty, J.-Y. Sung, R. E. Grinter, "How Smart Homes Learn: The Evolution of the Networked Home and Household," Lecture Notes in Computer Science, vol. 4717, pp. 127-144, 2007.
[8] Greichen, J.J., "Value based home automation or today's market," IEEE Transactions on Consumer Electronics, vol. 38, no. 3, pp.34-38, Aug. 1992.

