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Experimental Study and Implementation of Industrial or Home Automation

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ABSTRACT

A telephone circuit which enables switching ON and OFF of appliances through telephone lines. It can be used to switch on or off the appliances from any distance, overcoming the limited range of infrared and radio remote controls. The DTMF signals in telephone instruments are used as control signals. The digit # in DTMF mode is used to toggle between the appliance mode and normal telephone operation mode. Thus the telephone can be used to switch on or switch off the appliances also while being used for normal conversation. In order to build a telephone operated remote switch, first DTMF signal is converted into BCD form with the help of IC MT8870. The DTMF signal in telephone instruments used as the control the digit # in DTMF mode is used to toggle between the appliances mode and normal telephone mode with the help of IC 74LS154 decoder and according data is stored in D-latch. In similar fashion, the relay is operated which causes the appliances turn ON or OFF. Before going to telephone operated remote switch let's consider function and operation of each block.

INTRODUCTION

To control the electronic devices at industry and home using telephone operated remote switch."Electronics dominate the world today and many of the people in it. Within the past twenty years or so, so many improvements and advancements in technology have created a world which relies on electronic services and communication. The main objective here is to remotely control devices/appliances at home or industries so we don't need to be at that place. It can solve many problems of industry and it's very useful. It is very useful at home and industries such as agriculture, hospital automation, power plant, ship loading etc.Generally, mechanical switches are used, but they can't remotely control. So telephone operated switch control devices far away from distance. Currently some appliance manufacturer provides facility to control that appliance through telephone. Using this remote control switch we can operate more than one appliance.

In this paper, telephone operated remote switch using DTMF (Dual Tone Multi-frequency Signalling) and micro-controller [1] is used. We will understand operation of components such as DTMF, Micro-controller, relay etc. Then we will learn how to interface this component with micro-controller. We will make and compile algorithms for micro-controller and in last we will implement hardware after debugging and troubleshooting. It should also sense if the connected «consumer» is turned-on or off and report to the administrator at the other end of the phone line

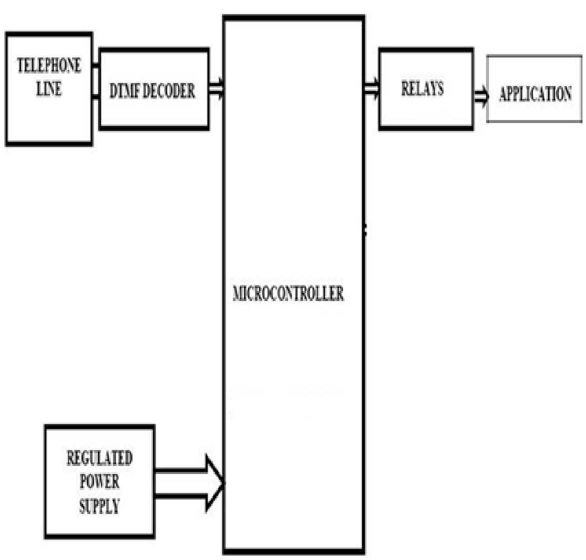
Our main objective here is to remotely control devices/appliances at home or industries so we don't need to be at that place [2,3]. It can solve many problems of industry and it's very useful. It is very useful at home and industries such as agriculture, hospital automation, power plant, ship loading etc. In this project we will implement the telephone operated remote switch using DTMF (dual tone multi-frequency signalling) and micro-controller. Tone and pulse dialing are two ways of communicating with the central telephone relay to indicate the telephone number that you wish to call. Pulse dialing indicates each digit in the phone number by a series of clicks that corresponds only to that digit. It would then need a short pause in order to clearly identify one digit from the next. [4,5]

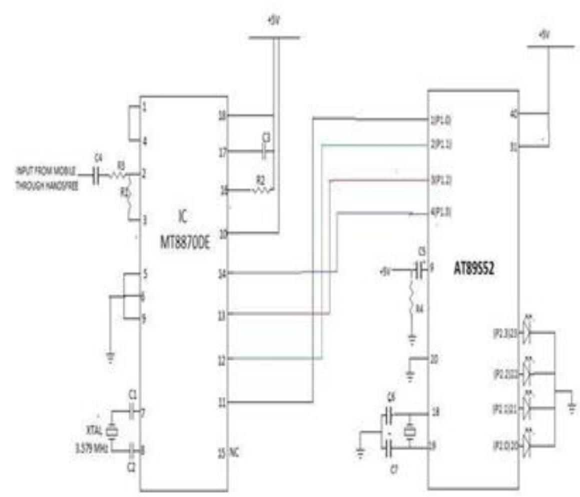
Tone dialling, also called as Dual Tone Multi Frequency, uses different tones to indicate a different number. Instead of sending multiple signals for each digit, it would only need to send one for each.For most cases, the most discriminating part between phone sets that use pulse or tone dialing is the mechanism used to dial the number. Tone dialing handsets use a numeric keypad where you simply push each digit [6]. Although there are some versions of pulse dialing phones with numeric keypads, the most prevalent models were those equipped with rotary dials. This difference between the two has huge implications with the ease of use. Dialing a number with a rotary dial takes a lot longer since you would need to wait for the dial to return in its resting position before you can dial the next digit. This is not an issue with tone dialing phones; you can dial as quickly as you can or want without causing any problem. [7,8,9]

Due to the advantages of tone dialing, it has now become the standard for telephone companies all over the world. You would be hard pressed to find an area that still uses pulse dialing. Despite this, most telephone systems that uses tone dialing are also able to recognize and work with pulse dialing. Some handsets are also manufactured to support both pulse and tone dialing. In these handsets, you can often find a toggle underneath the base with the letters P and T. This has all been done to ensure the backwards compatibility of the system and the handsets that work with them.

SYSTEM IMPLEMENTATION

For implementation of this project DTMF decoder, micro-controller, voltage regulator are used and the details of all components are described here.





Block Diagram   Circuit Diagram

Fig 1. Block Diagram and Circuit Diagram

Dual tone multi-frequency (DTMF) signalling is used for telecommunication signaling over analog telephone lines in the voice-frequency band between telephone handsets and other communications devices and the switching centre. The version of DTMF that is used in push-button telephones for tone dialling is known as Touch-Tone. Dual tone multi-frequency (DTMF) is a scheme for encoding 16 characters using the sums of sinusoidal signals of two distinct, harmonically unrelated frequencies.[10]

DTMF input signal is first buffered by an input op-amp which allows adjustment of gain and choice of input configuration. The input stage is followed by a low pass continuous RC active filter which performs an antialiasing function. [11,12] Each component tone is then smoothed by an output filter and squared up by a hard limiting comparator. The two resulting rectangular waves are applied to digital circuitry where a counting algorithm measures and averages their periods.[13]

Circuit mainly Use MT8870 DTMF decoder IC to decode incoming DTMF signal as shown in circuit diagram.Here we are using Hardware decoder instead of using micro-controller for decoding purpose because the code/operation will take much longer time for decoding the DTMF signal that there will be no space for code of switching operation or other controller operation.We have connected the MT8870 IC to port P0 of microcontroller [14]. Pin STD is Delayed steer which becomes high when IC detects valid pair of tone and the output /decoded data is latched at Q0 to Q3 which are also connected to Microcontroller.Relay is used to Pick up or terminate the call by applying output at the pin of microcontroller.[1,15]

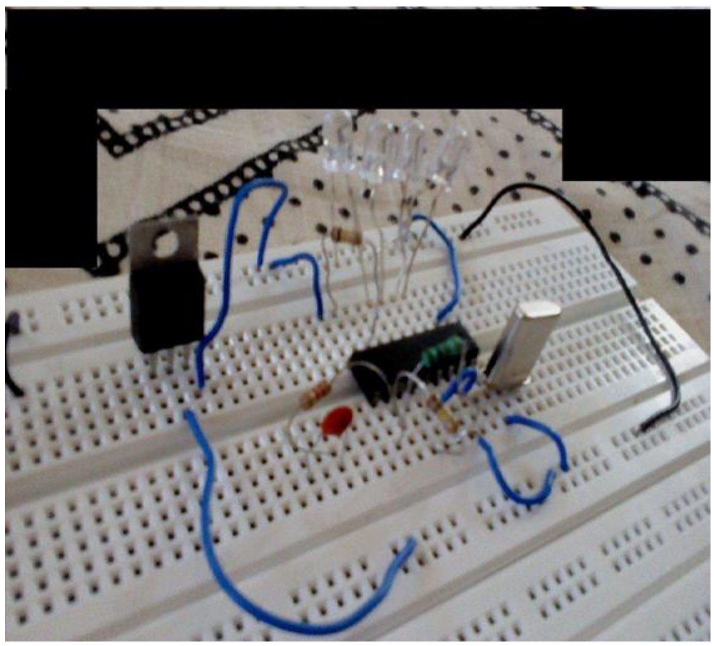


Fig. 2: Circuit for Interfacing AT89S52 with MT8870DE

RESULT & DISCUSSION

This demonstration showcases the use of the Goertzel function as a part of a DFT-based DTMF detection algorithm.Dual-tone Multi-Frequency (DTMF) signaling is the basis for voice communications control and is widely used worldwide in modern telephony to dial numbers and configure switchboards. It is also used in systems such as in voice mail, electronic mail and telephone banking.

The DTMF system uses eight different frequency signals transmitted in pairs to represent sixteen different numbers, symbols and letters. This table shows how the frequencies are organized:The frequencies used were chosen to prevent any harmonics from being incorrectly detected by the receiver as some other DTMF frequency.The transmitter of a DTMF signal simultaneously sends one frequency from the high-group and one freqency from the low-group. This pair of signals represents the digit or symbol shown at the intersection of row and column in the table. For example, sending 1209Hz and 770Hz indicates that the "4" digit is being sent.

At the transmitter, the maximum signal strength of a pair of tones must not exceed +1 dBm, and the minimum strength is -10.5 dBm for the low-group frequencies and -8.5 dBm for the high-group frequencies. When not intentionally sending DTMF tones (including the inter-digit interval), any leakage of these tones must not exceed -55 dBm. The frequencies generated by the transmitter must be nominally within 1.5% of the stated values and the receiver must not accept signals that deviate more than 3.5% from the stated values.

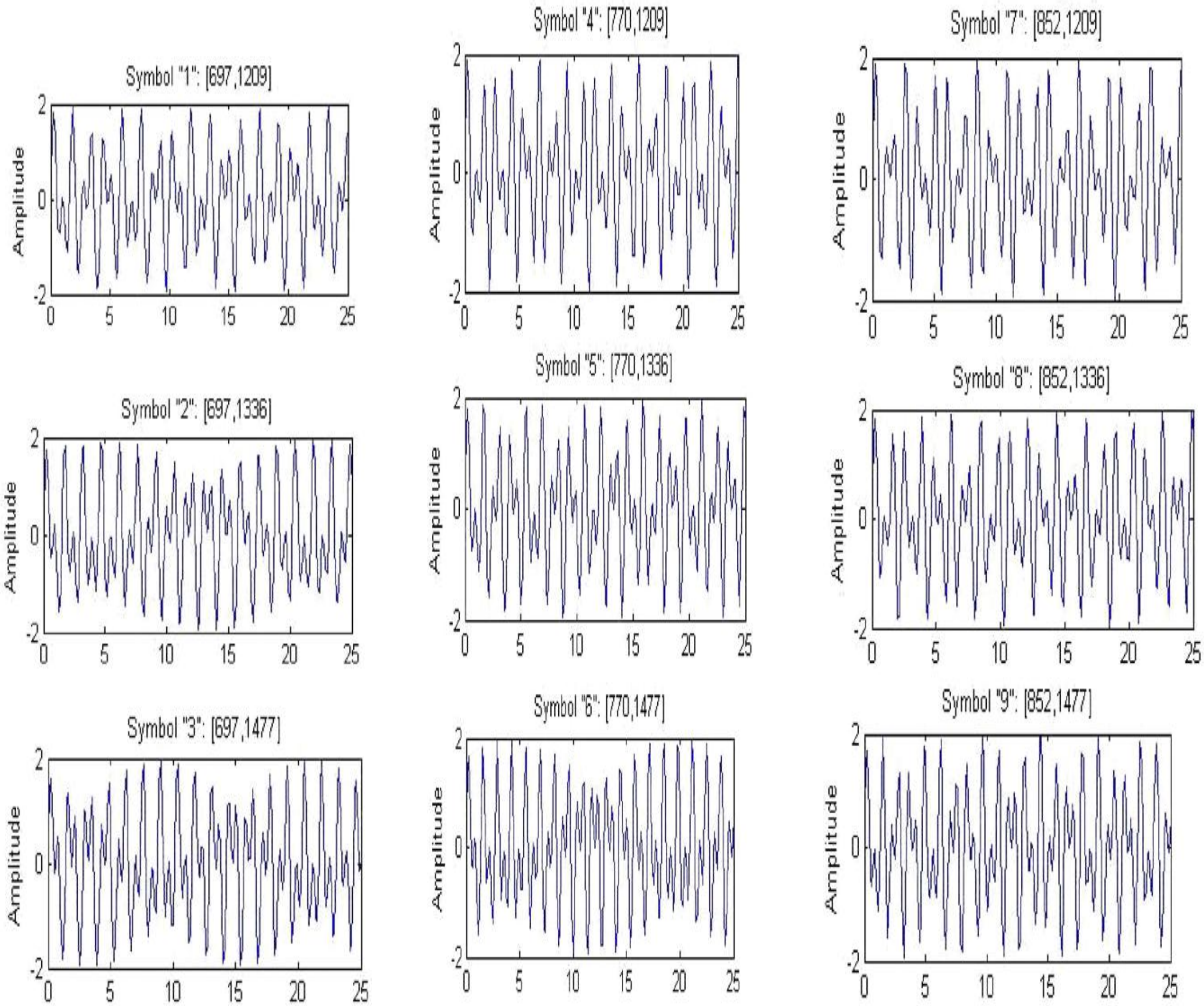


Fig. 3: MATLAB output for all digits in DTMF

CONCLUSION AND FUTURE WORK

By studying and implementing this it is came to know about , DTMF TECHNOLOGY, How DTMF works ,interfacing of DTMF IC with micro-controller ,and its decoding technique and by doing this project we can handle many applications such as listed below and further it can be extend work and add many extra facilities like; Voice mail, Helpdesks, Phone banking, Computer remote login, Remote appliances control, Stock broker buy/sell/inquire, exchange listing mnemonics, Credit card verification and inquiry and answering machine message retrieval. There are some other scopes of where it can be extended like; password protection, controlling the speed of stepper motor, etc.

REFERENCES

[1] The 8051 microcontroller and embedded systems using assembly and C Muhammad Ali Mazidi, Janice Gillespie Mazidi.

[2] N. Sriskanthan, F. Tan, A. Karande," Bluetooth based home automation system" , Microprocessors and Microsystems journal, issue 26 (2002) pages 281– 289, Elsevier Science B.V., 2002

[3] Malik Sikandar Hayat Khiyal, Aihab Khan, and ErumShehzadi, "SMS Based Wireless Home Appliance Control System (HACS) for Automating Appliances and Security", Issues in Informing Science and Information Technology Volume 6, 2009 [4] D. Greaves, "Control Software for Home Automation, Design Aspects"

[4] Somak R. Das, Silvia Chita, Nina Peterson, Behrooz A. Shirazi, MedhaBhadkamkar, "Home Automation and Security for Mobile Devices", Ninth Annual IEEE International Conference on Pervasive Computing and Communications, March 2011.

[5] N. Sklavos, "Securing Communication Devices via Physical Unclonable Functions (PUFs)", Information Security Solutions Europe (isse'13), Brussels, 22-23 October, Belgium, 2013, pp. 253-261, Springer, ISBN: 978-3-658-03370-5.

[6] G. Kalogeridou, N. Sklavos, A.W. Moore, "A Hardware Trojan Detection Framework", proc. of Designing with Uncertainty - Opportunities & Challenges Workshop, UK, 17-19 March 2014.

[7] A.J. Bernheim Brush, Bongshin Lee, RatulMahajan, SharadAgarwal, Stefan Saroiu, and Colin Dixon, "Home automation in the wild: challenges and opportunities", proceedings of the SIGCHI Conference on Human Factors in Computing Systems '11, ACM, USA, 2011.

[8] N. Sklavos, P. Kitsos, O. Koufopavlou, "VLSI Design and Implementation of Homophonic Security System", proceedings of IEEE Computer Society Annual Symposium on VLSI (IEEE ISVLSI'12), Amherst, USA, August 19-21, 2012.

[9] Armando Roy Delgado, Rich Picking, Vic Grout, "Remote-Controlled Home Automation Systems with Different Network Technologies", Centre for Applied Internet Research, University of Wales, UK.

[10] ArnabWaheed Ahmad, Naeem Jan, AsaeedIqbal, Chankil Lee, Ansan Korea, "Implementation of ZigBeeGSM based Home Security Monitoring and Remote Control System", 2011, IEEE Symposium on Circuits and Systems (MWSCAS), Seoul, pp. 1-4.

[11] Pooja S Chinchansure, Charudatta V Kulkarni, "Home Automation System based on FPGA and GSM", 2014, International Conference on Computer Communication and Informatics (ICCCI), Coimbatore, India, pp. 1 – 5

[12] Mahesh.N.Jivani, "GSM Based Home Automation System Using App-Inventor for Android Mobile Phone", 2014, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 3(9), pp. 12121-12128.

[13] Faisal Baig, SairaBaig, Muhammad Fahad Khan, "Controlling Home Appliance Remotely through Voice Command", 2012, International Journal of Computer Applications , Vol. 48(17), pp.1 - 5.

[14] S.R.Bharanialankar, C.S.ManikandaBabu, "Intelligent HomeApliance Status Intimation Control and System Using GSM", 2014, International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 4(4), pp.554 - 556.

[15] RozitaTeymourzadeh,SalahAddinAhmed,KokWai Chan and MokVeeHoong , "Smart GSM Based Home Automation System", 2013, IEEE Conference on Systems, Process & Control, Kuala Lumpur, Malaysia