DTMF Based Home Appliances Control Using Cell Phone

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Abstract— **Aim of this paper is to represent a developed control system which allows user to control his/her home appliances and systems from any location using a cell phone. One has to make a call from his/her cell phone to maintain the home appliances wirelessly. As the cellular communication is available everywhere in the world, it will be much easier to employ this technology in practical life. In the fast growing world, everyone wants to control everything by his hand. This new developed technology will meet up the demand of people by providing them the control of their home. As the world is getting digitalized in every moments, this developed control system will add a new dimension in daily lifestyle. So no more manual control will be existed rather everything will be automatic. Thus the living environment will be much more enhanced and satisfactory.**

Keywords— **DTMF decoder, Wireless control, Home appliances, Relay, Cell phone**

I. INTRODUCTION

Traditionally electrical appliances in a home are controlled via switches that regulate the electricity to these devices. As the world gets more and more technologically advanced, new technology is coming in deeper and deeper into people's lives even at home. In the age of electronic systems it is important to be able to control and acquire information from everywhere [1].

This paper demonstrates an advanced control system which will assist users to monitor their home electric devices such as light, fan, air-conditioner, refrigerator, television etc. through cell phone. The remote control technologies have been used in the fields like factory automation, space exploration, in places where human access is difficult. As this has been achieved in the domestic systems partially, many corporations and laboratories are researching the methods which enable human to control and monitor efficiently and easily in home or outdoor. Controlling the domestic system regardless of time and space is an important challenge.

As the cell phone enables people to connect with the outside devices via cellular communication network regardless of time and space, the cell phone is a suitable device to control domestic systems [1].

II. DESCRIPTION OF THE PROPOSED SYSTEM

This wireless remote control system is developed to control home appliances from any place. The system is operated by an electronic device which is based on dual tone multi frequency (DTMF) technology. In this technology, the cellular communication network is used to control all electric devices wirelessly. One has to send the command by dialling through his cell phone. Then he can easily control the electrical devices according to his necessity.

Duel Tone Multi Frequency (DTMF) tone is used to identify which key is pressed in the keypad of cell phone. keypad is used as password entry device. Pressing any key generates an
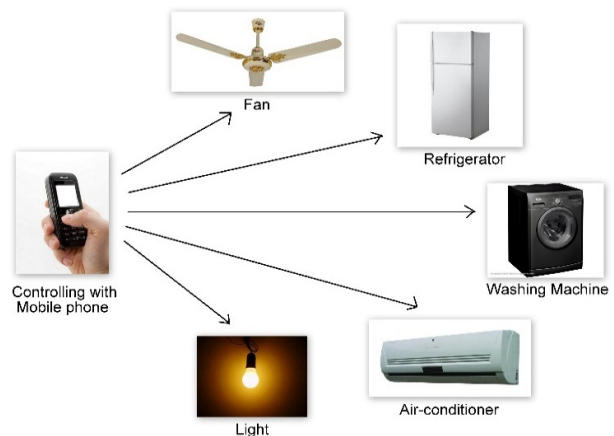

Fig. 1 Using prototype of the proposed system

unique tone which consists of two different frequencies one each of higher and lower frequency range. The resultant tone is convolution of two frequencies. Each of these tones is composed of two pure sine waves of the low and high frequencies superimposed on each other. These two frequencies explicitly represent one of the digits on the cell keypad. Thus generated signal can be expressed mathematically as follows:

$$f(t) = A_H \sin 2\pi f_H t + A_L \sin 2\pi f_L t$$

Where A_H, A_L are the amplitudes & f_H, f_L are the frequencies of high & low frequency range [2].

Properties of DTMF tone frequencies are:
- No frequency is an integer multiple of another.
- The difference between any two frequencies does not equal any of the frequencies.
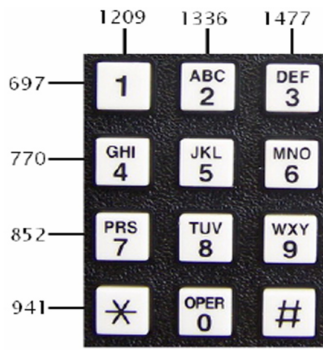- The sum of any two frequencies does not equal any of the frequencies.

Fig. 2 Keypad of cell phone with 12 keys and frequencies (Hz) [5]

To use the DTMF technology, the DTMF decoder IC (MT8870) is used. The decoder circuit filters the signal sent by the users and gives the output. The device has some other components such as transistor (BD135), microcontroller (PIC16F73), relay and cell. Relays are used to drive different kinds of electrical devices. The hardware of the proposed system and the circuit diagram of DTMF decoder are given below at Fig. 3 & 4.
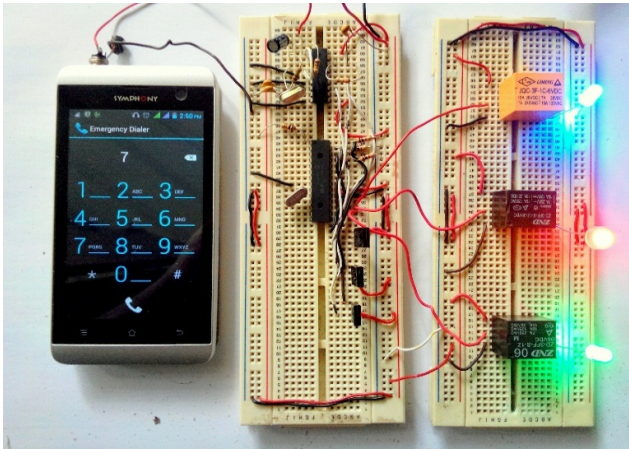

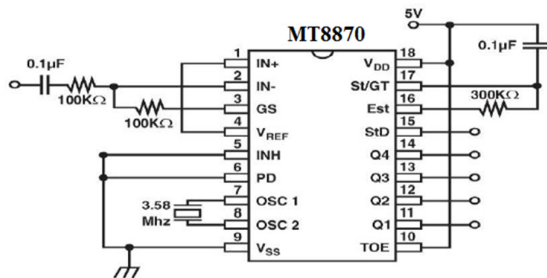Fig. 3 Hardware of the proposed system

Fig. 4 Circuit diagram of DTMF decoder [3]

III. METHODOLOGY

The control of the electric devices of home is monitored by the user through his cell phone. Another cell phone is needed in the controlling device. So first one has to give a call to the cell phone near to the controlling device. This signal is received by the 3.5mm headphone jack connected with that cell phone.
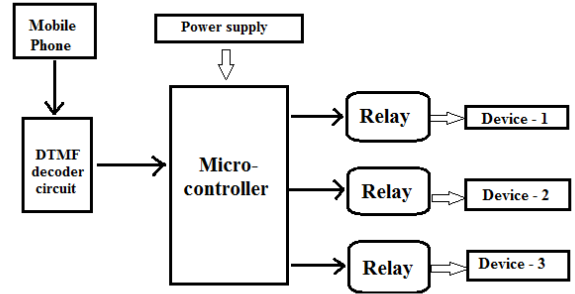

Fig. 5 Block diagram

When the user presses any key of his cell phone, the DTMF tone corresponding to that key is passed to the DTMF decoder circuit through the headphone jack. The DTMF decoder circuit filters the signal and gives the output to the microcontroller. There are four outputs which are denoted by Q1, Q2, Q3 and Q4. The table of the output for the different keys is given below.

TABLE I
OUTPUT FOR DIFFERENT KEYS

Button	Low Frequency(Hz)	High Frequency(Hz)	Q1	Q2	Q3	Q4
1	697	1209	0	0	0	1
2	697	1336	0	0	1	0
3	697	1477	0	0	1	1
4	770	1209	0	1	0	0
5	770	1336	0	1	0	1
6	770	1477	0	1	1	0
7	852	1209	0	1	1	1
8	852	1336	1	0	0	0
9	852	1477	1	0	0	1
0	941	1209	1	0	1	0
*	941	1336	1	0	1	1
#	941	1477	1	1	0	0

The outputs are switched by the transistor (BD135) and then sent to the microcontroller according to the key pressed by the user. The micro-controller then sends the voltage to the relay. By this relay is being switched and drives the different kinds of electric devices. Relay is used in this circuit because it can drive the high voltage devices also. So all kind of electrical devices which are used by the people at home can be easily controlled by this electronic controlling device.

IV. RESULTS & DISCUSSIONS

To implement this system in practical life, three relays are taken and for the indication of the outputs, three light emitting diodes (LED) are used. Then some of the keys of the cell

keypad are used to experiment the control system by getting the outputs corresponding to the pressed key.

TABLE II
IMPLEMENTED COMMANDS

Pressed key	Results
1	Turn on device 1
2	Turn on device 2
3	Turn on device 3
7	Turn on all 3 devices
5	Turn off all 3 devices

The DTMF technology used in this system device is very fast. So the control of the electric devices is very easy with this system. As the cost of the project is low and the network of the cellular communication is wide-spread, the users should experiment this technology in their home. As it is based on wireless cellular communication, they can control their home appliances from any part of the world by pressing keys of their cell phone.

V. CONCLUSION

The project has been done for the benefit of people by making their life more advanced. As it is a wireless remote control system, this allows the people to control their home by their hand from any place of the world. Again cell phone has become an important part in daily life. So it can be easily utilized to enhance the quality of daily lifestyle. Last of all, this try of the wireless control of home appliances is done for the people's benefit by applying this technology in their life.

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