

Remote Control of Smart Household Based on DTMF Using PSOC Mixed Signal Array

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ABSTRACT

Now-a-Days Automation is playing an important role in each and Every field such as Industrial, Home, Rural and Agricultural Areas. Usually we used to control the industrial equipment by manual operation, which increases the human effort and maintenance cost. In order to overcome this problem, the system is designed to control devices at remote place.

INTRODUCTION

Sometimes unfortunately we may forget switch off the appliances while going to the outside and we face the problems to switch off these devices when we are out of home. To solve these types of problems this article explains you how to design a simple circuit, which will on the devices remotely and devices can be off using remote place access.

Till now we have seen so many home automation projects that control the devices or appliances from the remote place but the main advantage of this circuit is simple.

AIM OF THE WORK

The aim of this project is to extend a device that allows for a user to somewhat control and monitor multiple home appliances using a cellular phone. This system will be a powerful and flexible tool that will offer this service at any time, and from anywhere with the constraints of the technologies being applied. Many times a situation occurs when we have to control various devices from a long/remote location according to our choice. Consider following examples 1) If, we are working in some industry and have to reach at workplace at the earliest to turn on some electrical

device like boiler or conveyor belt. 2) In our normal day to day life we go out of home and forgot to turn off fan/light 3) In summer season we want to turn on Fan or AC — Air cooler before we reach home. For all above situations, we need a device / controller which can turn on / off the devices. To implement this system, the consumer should send a unique code accompanied by the required function to his home control system through GSM.

LITERATURE SURVEY

IR BASED APPLIANCES CONTROL

This is an interesting project built with an IR sensor and a decade counter. By using this project, one can control his lights / fans / AC / any electrical appliance with a TV Remote. CD4017 is a CMOS Decade counter. It can detect a clock pulse and the BCD out put will be incremented by one for each CLK pulse. If we observe the BCD numbers, the LSB (Least Significant Bit) of BCD complemented every time. This project uses this LSB to switch ON / OFF an electrical appliance.



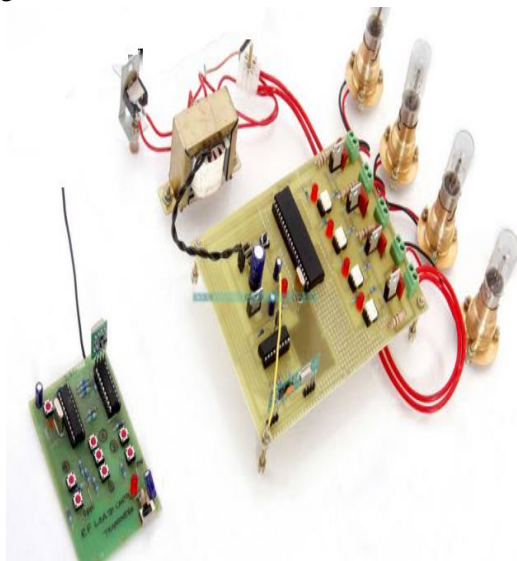
DRAWBACK:

Needs line of sight

RF BASED HOME AUTOMATION

Radio frequency or RF remote control technology based home automation is another technique for implementing remote controlled home appliances. It consists of RF transmitter circuit and RF receiver circuit.

The RF transmitter circuit block diagram consists of 6V battery that provides power supply to the RF remote. 8051 microcontroller to which the load switches or switches of home appliances are interfaced. Based on the switch or push button pressed, the microcontroller sends commands signals to encoder block. This data is encoded and transmitted through the antenna of the RF transmitter.



DRAWBACK:

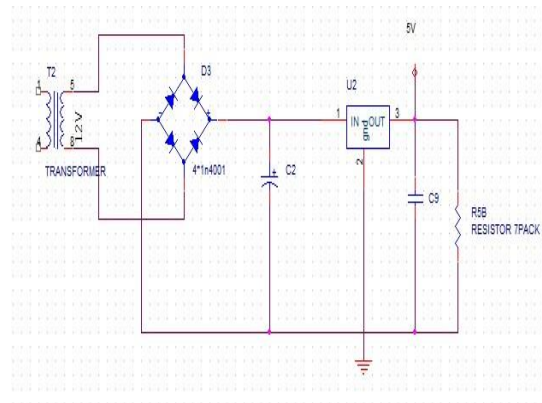
Distance range

PROPOSED SYSTEM

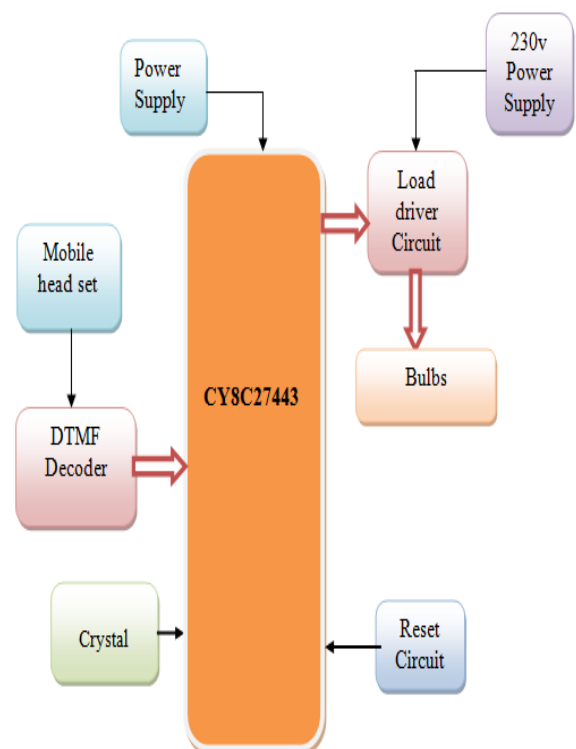
To control the devices from remote place we are using a DTMF technique. DTMF (Dual Tone Multi Frequency) is used which converts the desired frequency in to analog signals which is received by DTMF Decoder and given to microcontroller.

The microcontroller is used for switching the load equipment according to the frequency received by the DTMF receiver by using a combination of MOC (Opto Coupler) 3021 and TRIAC (BT136) is used for Load driving.

This project uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.



Block Diagram:

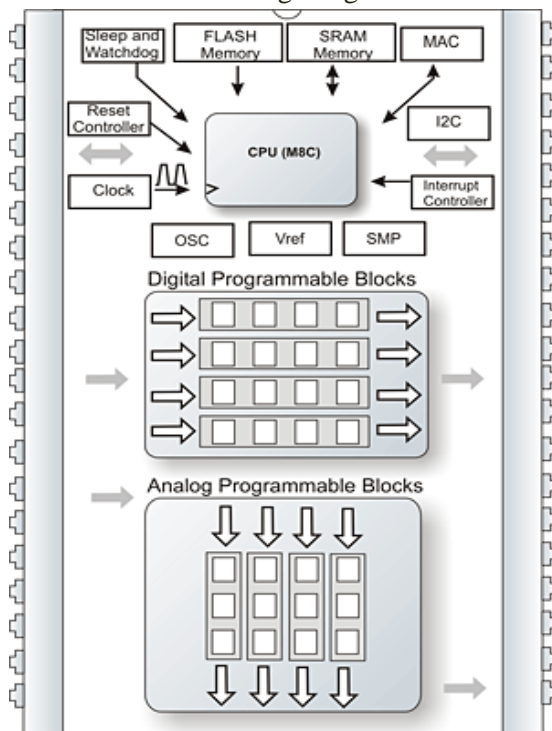


CHARACTERISTICS OF PSoC MICROCONTROLLERS

Some of the most prominent features of PSoC microcontrollers are:

- MAC unit, hardware 8x8 multiplication, with result stored in 32-bit accumulator,
- Changeable working voltage, 3.3V or 5V,
- Possibility of small voltage supply, to 1V,
- Programmable frequency choice.

PSoC microcontrollers are based on 8-bit CISC architecture. Their general structure with basic blocks is presented in the following image:



DTMF

Dual-tone multi-frequency signaling (DTMF) 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**. It was first used by AT&T in commerce as a registered trademark, and is standardized by ITU-T Recommendation Q.23. It is also known in the UK as *MF4*.

Features

- Complete DTMF Receiver
- Low power consumption
- Internal gain setting amplifier
- Adjustable guard time
- Central office quality
- Power-down mode
- Inhibit mode
- Backward compatible with MT8870C/MT8870C-1

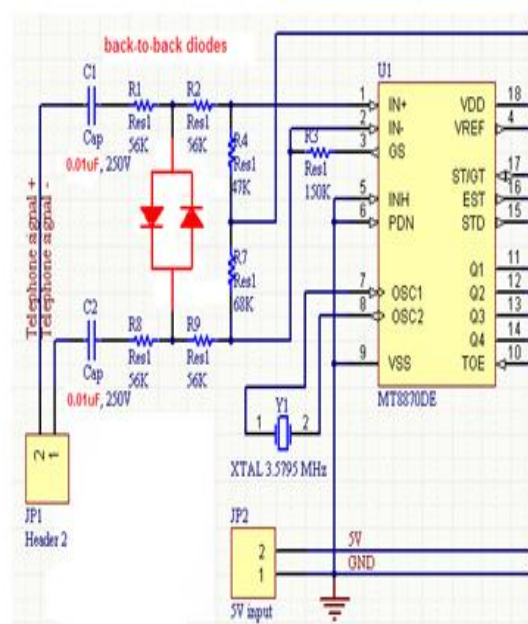


Table showing DTMF Low and High frequency tones and decoded output

Button	Low DTMF frequency (Hz)	High DTMF frequency (Hz)	Binary coded output			
			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	1336	1	0	1	0
*	941	1209	1	0	1	1
#	941	1477	1	1	0	0

FUTURE ENHANCEMENT OF THE PROJECT

1. It can be used as controlling speed of fan.
2. It can be used to control room temperature.
3. It can be also used for security purposes burglary, gas detection, smoke detection.

CONCLUSION

In this project, the home appliances are controlled by a mobile phone that makes a call to the mobile phone attached to the robot. It receives DTMF tone with the help of the phone attached to the robot. The received tone is processed with the help of DTMF decoder. The DTMF decoder then transmits the signal to the microcontroller to operate the triac. 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 a project which is capable of receiving & decoding the commands and control signals from the distant areas and can work according to our instructions.

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