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Research Article

ELECTRICAL EQUIPMENT WORKING BY DTMF BASED MOBILE

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ABSTRACT

The paper works on the principle of DTMF tone command so received from any phone to remotely switch any electrical load such as agricultural pump, domestic and industrial loads etc. In industries, the loads are spread over a large area and thus, operating these loads is a very tiresome and difficult task. In agricultural fields also, pumps and other loads are connected over a large area and hence it is difficult for the farmer to operate all the loads and similarly for house hold loads. Keeping these problems in mind, the proposed system has been designed which uses DTMF technology to control the loads remotely.

Keywords: DTMF Decoder, GSM, MT 8870, 555 TIMER IC.

INTRODUCTION

A cell phone is interfaced to a DTMF decoder in the system from its audio output socket for receiving tone commands. The receiving cell phone codes are converted into digital commands by using a DTMF Decoder which will identify the frequency of the key and convert that frequency to its equivalent digital code which is then fed to a 555 timer IC. As per the commands sent from the sender's mobile, the DTMF decoder will send signals through a timer to actuate the respective loads by turning the relays ON/OFF¹.

The mobile phones that we use in our day-to-day life have many features that are embedded in it. The major feature that we access is for the purpose of communicating³. This paper deals with the new innovative feature of using the mobile as a remote control. A GSM mobile based application allows the farmers to switch on/control their pumping sets by pressing a few keys on their mobile⁸. Thus assisting the farmers, the backbone of our country, in developing the agriculture sector. The farmer can monitor and check availability of the power at the pump, switch the pump on/off and acknowledge on/off status of the water pump from any place. One of its kinds, is specially designed to be robust to perform efficiently in the rural atmosphere where problems like voltage fluctuations, shock hazards, open wiring and marshy terrain are quiet common. This product is also featured with protection from harsh rural environment and fluctuations in the voltage supply, Anti-theft mechanism in the name of "nanoganesh hanuman" protects the device from being theft by others by acknowledging the farmer using the mobile phone⁶.

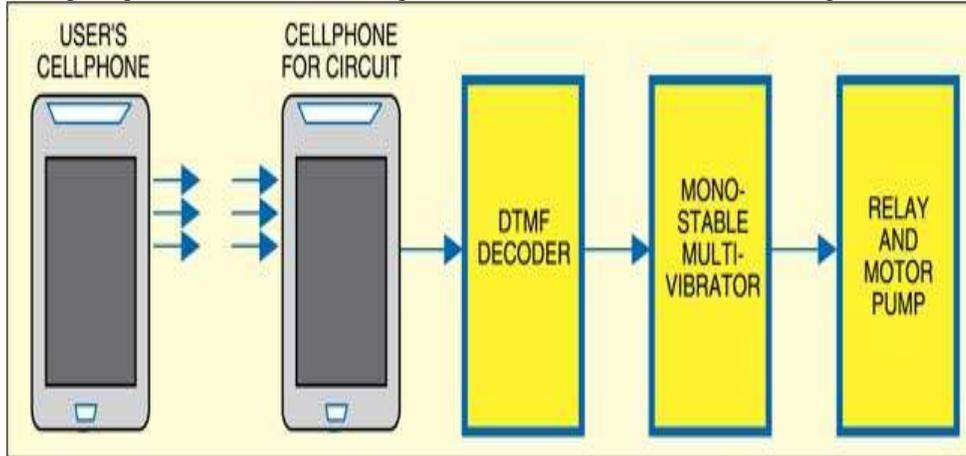
In detail, a DTMF generator generates two frequencies corresponding to a number or code in the number pad which will be transmitted through the communication networks, constituting the transmitter section which is simply equivalent to a mobile set¹⁰. In the receiver part, the DTMF detector IC, for example IC MT 8870 detects the number or code represented by DTMF back, through the inspection of the two transmitted frequencies⁴.

The major occupation of rural India is agriculture. Insufficient rains at various stages of growth are one of major causes of losses to farmers. Irrigation means the action of applying water to land in order to supply crops and other plants with necessary water. Sometimes nutrients may be applied via irrigation as well. Many farmers use induction motor pumps to irrigate their farms from wells, rivers and nearby streams⁹. However, shortage of electric power in many states has resulted in unplanned load shedding of long durations in rural areas. Moreover, in villages, single-phasing connections have been implemented. The electricity companies allocate lower priority to 3-phase power supply to rural areas due to unpaid electricity bills running into millions of rupees. Most of farmers use sprinkler based on surface based irrigation. Three phase induction motors with direct-on-line or star/delta starters are used.

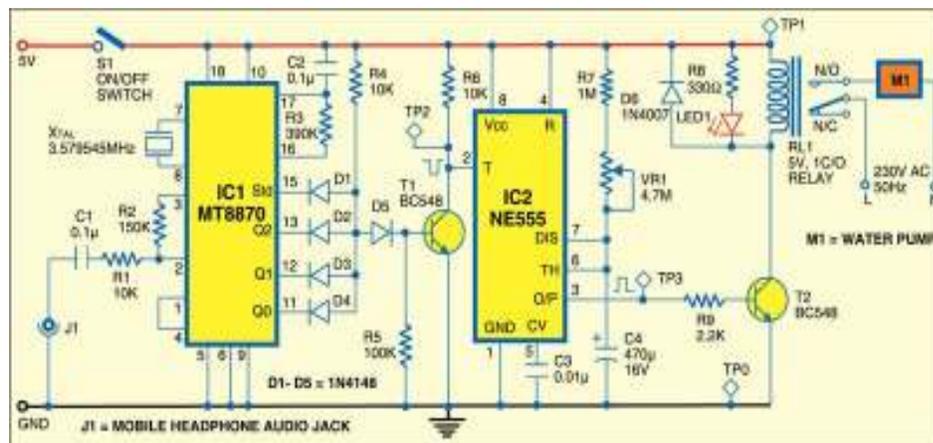
WORKING:

The circuit is built around DTMF decoder IC MT8870 (IC1), timer NE555 (IC2) wired as monostable multivibrator and a few discrete components. The main component of the circuit is IC MT8870. This DTMF decoder has band-split filter and digital decoder functions. We give constant 5 v supply to this

circuit through 7805 voltage regulator. Here the working of DTMF decoder is following-



(Figure: Block Diagram)



(Figure: circuit diagram)

Decoder Section:

This circuit is completely based on Dtmf decoder MT8870. DTMF generation is a composite audio signal of two tones between the frequency of 697Hz and 1633Hz. DTMF MT8870 is an IC which converts the numbers at any mobile to the binary number and each number has a different frequency. The DTMF keypad is arranged such that each row will have its own unique tone frequency and also each column will have its own unique tone. Below is a representation of the typical DTMF keypad and the associated row/column frequencies. When we press any key from keypad it generates specific frequency and a binary code[12].

DTMF (dual tone multi frequency) is the signal to the phone company that you generate when you press an ordinary telephone’s touch keys. In the United States and perhaps elsewhere, it’s known as “Touchtone” phone (formerly a registered trademark of AT&T). DTMF has generally replaced loop disconnect (“pulse”) dialing. With DTMF, each key you press on your phone generates two tones of specific frequencies.[4] So that a voice can’t imitate the tones, one tone is generated from a high-frequency group of tones and the other from a low frequency group.

Here are the signals you send when you press your touchtone phone keys:

Digit	Low Frequency	High Frequency
1	697Hz	1209Hz
2	697Hz	1336Hz
3	697Hz	1477Hz
4	770Hz	1209Hz
5	770Hz	1336Hz
6	770Hz	1477Hz
7	852Hz	1209Hz
8	852Hz	1336Hz
9	852Hz	1477Hz
0	941Hz	1336Hz
*	941Hz	1209Hz
#	941Hz	1477Hz

Once the DTMF signal has been applied, internal interfacing circuits must first separate the two tones into two discrete tones, one from the low group and the other from the high group. Once separated, the signals are applied to two digital filters to decode the exact tone. Since the digital filters operate with internal clock signals, it is necessary to have some sort of clock standard (accurate and stable) to insure consistent filtering and decoding[2]. The clock source for these decoders is an external color burst crystal (3.5795MHz) connected between the OSC1 and OSC2 integrated circuit pins.

Timer Section:

In this circuit when pulse is come from decoder IC to pin no 2 of the timer IC, it high for preset time period. 555 work in monostable mode, in this mode 555 works as one shot mode. When the trigger pin is high, it causes the discharge pin (pin 7) to drain all charge off the capacitor (C in the image above)⁵. This makes the voltage across the capacitor (and the voltage of pin 6) = 0. When the trigger pin gets flipped low, the discharge pin is no longer able to drain current; this causes charge to build up on the capacitor according to the equation below. Once the voltage across the capacitor (the voltage of pin 6) equals 2/3 of the supply voltage (again, as explained in the previous step, this is enough to switch the output of the comparator connected to pin 6), the output of the 555 is driven back low. The output remains low until the trigger pin is pulsed low again, restarting the process I've just described.

CONSTRUCTION:

An actual-size, single-side PCB for cell-phone-based remote controller is use as shown in fig. Suitable connector is provided on the PCB to connect the cell phone. Assemble the circuit on a PCB to minimize time and assembly errors[11]. Carefully assemble the components and double-check for any overlooked error. Use suitable IC socket for MT887 and NE555 ICs to connect mobile we have to make these settings in our mobile: Go to the : Settings > Profiles > General > Personalize > Keypad tones > 3 " maximum "

Do this step for the both mobile, the phone which connected to the circuit and another one which use it to call the old mobile, it is necessary for the two mobiles, and if we know how to put the mobile to automatic answer it is better⁷.

APPLICATION:

- This system can be used in industrial applications.
- This system can be employed in houses ,where people often forget to switch off electrical appliances
- This system can be used to control AC's to set the room temperature when we are outside
- We can extend this circuit to control many electrical devices with some modifications using 4x16 decoder IC.

CONCLUSION

This paper we propose a unique System for automatic switch utilizing Dual Tone Multi Frequency (DTMF) that is paired with a timer IC which on the motor till set time. The primary purpose of the mobile phone is to control electrical appliances using mobile phone keypad which has DTMF decoder. It provides the advantage of robust control, working range as large as coverage area of service provider. We can on or off the motor from anywhere any time.

FUTURE SCOPE:

- Repeater systems/mobile radio.
- Remote control.
- Telephone answering machine.
- We can make cell phone operated robot.
- This paper can be further enhanced to the high voltage A.C applications by changing the rating of the relay. By this we can control and monitor the high speed induction

motors as well as synchronous motors, this can be done in economical way.

- In the space programmed, it can be used to control devices by switching it ON/OFF mode. The spacecraft should have satellite phone that catches GPRS satellite

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