Dtmf Remote Appliance Control System Using Mobile Phone

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ABSTRACT *In modern days, we must use various high-tech machineries and equipments to get our jobs done and make the life easier. These machineries should be controlled by the home-owner from any location as the home-owner might be away from home at workplace or traveling in a different place in the weekend. Thus a system of remote monitoring and controlling are very much necessary. Smart home is one of these types of system equipped with home appliances which we wish to control smartly from anywhere. Some products are commercially available which allow remote home appliance controlling through internet which is undoubtedly emerging. We designed and constructed a cell phone controlled house automation system. The system allows users to send commands from their cell phones to control both a LIGHT and cooler & various other devices. Commands are sent via a cell phone's numeric code dialing capability. The system is equipped with DTMF decoder and relay driver for controlling any appliance. The design is modular hence we can expand the system for more switches. The main advantage of the circuit is its vast range it can control any device from anywhere in the world. The reliability of the circuit is greatly enhanced due to availability of low cost cell phones and interfacing connectors. Our design met all the intended objectives however; improvements can still be made in the algorithm to make it more users friendly and reliable. Overall, the final price of implementation was kept low due to simplicity of the circuit. All the components are locally available. However, if this product were to be produced and sold, further cuts would be needed to make the end price competitive.*

1. INTRODUCTION

This project "DTMF REMOTE APPLIANCE CONTROL SYSTEM USING MOBILE PHONE" is used to control appliances which are far away from the user using mobile phone. The aim of the proposed system is to develop a cost effective solution that will provide controlling of home appliances remotely and enable home security against intrusion in the absence of home-owner. The devices connected as home and office appliances consume electrical power and they should be controlled as well as turn on /off if required. Most of the time, it was done manually. Now it is a necessity to control devices more effectively and efficiently at anytime from anywhere. Take an instant when we are going to office and suddenly remembered that to switch off the microwave oven we fell convenient if we could switch off without going back to home, in such situations this project comes to our rescue. In this system, we are going to develop a cellular phone based home/office appliance controller for controlling arbitrary devices. This includes a mobile phone which is connected to the system via head set. To activate the mobile phone unit on the system, a call is to be made and as the call is answered (auto answer mode), in response the user would enter a password to access the system to control devices. As the caller presses the specific button on the keypad, it results in turning ON or OFF specific device and the device switching is achieved by relays [1].In this project, we designed a basic model and it is used to control 4 lights using a mobile phone, micro-controller and transceiver. The maximum number of devices that can be operated will be the number of buttons present on the keypad of mobile phone.
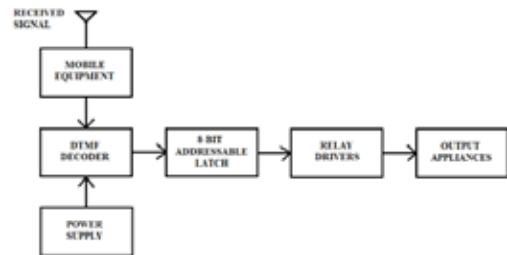
2. BLOCK DIAGRAM

Fig.1 Block Diagram Mobile Operated Appliances

Conventionally wireless controlled switch appliances use R.F. circuits which have the drawbacks of limited working range, limited frequency range which limiting the control. To Use of mobile phones for switching appliances control can overcome these limitations. It provides the advantages of robust control, working range as large as the coverage area of the service provider, no interference with other controller up to the 12 controls. In order to control the switches, you need to make a call to the cell phone attached to the desired circuit (in which phone is attached) to a system. (through headphone) from any phone, which sends a DTMF tune on pressing the numeric button. The cell phone in the system is kept in 'AUTO ANSWERING' mode (if the mobile phone does not have the auto answering facility, then receive the call by pressing 'OK' key on the switch appliances connected mobile & switch to its handsfree mode) so, after a ring the cell phone accepts the call. Now you may press any button on your mobile to perform desired action as listed. The DTMF tones thus produced are received by the cell phone in the system. These tones are fed to the circuit by the headset of the cell phone as soon as the call is made as the phone is in the auto answering mode corresponding frequency is generated according to the press key. The MT8870 decodes the

received tone and sends the equivalent binary number to the 8-bit addressable IC CD4099. When you pressed key 4, the binary equivalent (0100) is generated through mobile phone is referred. The 8-bit addressable latch in which output pin 13 is in logic high states, then the number 4 relay is switched on and the appliance connected to it turns on. When you press key 5,6,7 then appliances on respective relays 5,6,7 turn on. But when you press keys 8 it gets turn off.

3. Working

When you press keys in your Phone, the other person will hear some tones with respect to keys pressed. This tones are based on the DTMF technology. Data is transmitted in terms of pair of tones. The receiver detects the valid pair and gives the appropriate BCD code as the output of the DTMF decoder IC. The output of the DTMF IC is given to the 4x16 decoder IC. We have 12 signals possible because we have 12 keys (including * and #) in mobile keypad. The decoder are outputs are then given to D F-F. The outputs toggle whenever a key is pressed. In DTMF there are 16 distinct tones[5][6][7]. Each tone is the sum of two frequencies: one from a low and one from a high frequency group. There are four different frequencies in each group. Your phone only uses 12 of the possible 16 tones. If you look at your phone, there are only 4 rows (R1, R2, R3 and R4) and 3 columns (C1, C2 and C3). The rows and columns select frequencies from the low and high frequency group respectively. The exact value of the frequencies are listed in Table 1 below:

LOW FREQUENCIES

ROW #	FREQUENCY (HZ)
R1: ROW 0	697
R2: ROW 1	770
R3: ROW 2	852
R4: ROW 3	941

HIGH-FREQUENCIES

COL #	FREQUENCY (HZ)
C1: COL 0	1209
C2: COL 1	1336
C3: COL 2	1477
C4: COL 3	1633

C4 not used in phones
Table 1. The exact value frequencies of row & column of DTMF devices.

Thus, to decipher what tone frequency is associated with a particular key, look at your phone again. Each key is specified by its row and column locations. For, example the "2" key is row 0 (R1) and column 1 (C2). Thus using the above table, "2" has a frequency of 770 + 1336 = 2106 Hz The "9" is row 2 (R3) and column 2 (C3) and has a frequency of 852 + 1477 = 2329 Hz.The frequency of the tone is about 1900 Hz - close to the 1906 Hz predicted by Table.1 (697+1209).
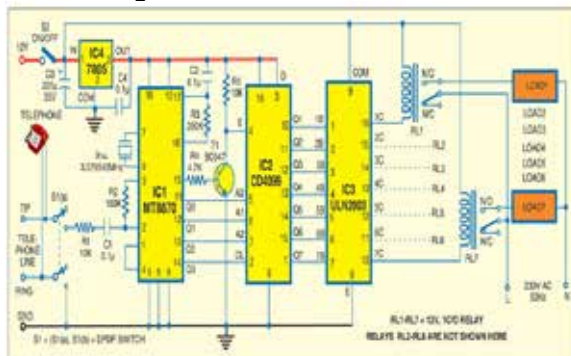
4. Circuit Diagram

Fig 2. Circuit Diagram DTMF Remote Appliance Control System Using Mobile Phone.

Using this circuit, you can control up to seven electrical appliances through a telephone. The circuit can switch on/off the appliances in two modes. In the first mode, all seven or selected appliances can be switched on individually but switched off simultaneously by pressing a single button on the telephone's keypad. In the second mode, individual appliances can be switched on and off sequentially. The circuit is built around dual-tone multiple-frequency (DTMF) IC MT8870 (IC1), 8-bit addressable latch IC CD4099 (IC2), relay driver ULN2003 (IC3), voltage regulator IC 7805 (IC4), seven relays and a few discrete components. Connect the appliances to mains through the relays, e.g., bulb (load 1) to relay RL1, fan (load 2) to relay RL2 and so on. Also, assign digit keys to the appliances, say, key 1 to bulb, key 2 to fan, key 3 to television, etc.[4]

Working of the circuit is simple. When you lift the handset from the cradle and press any key (1 through 7), the respective binary output of IC1 goes low while pin 15 goes high. Transistor T1 conducts to enable the latch (IC2), making its corresponding output pin high. The binary outputs of IC1 (Q0 through Q2) are connected to the inputs of IC2 (A0 through A2). IC2 converts the binary input into its decimal equivalent, which is available at its output pins Q1 through Q7. The output of IC2 is fed to relay driver IC3. Pressing of keys 1 to 7 (assigned to different loads) causes latching of the corresponding relays via relay driver IC3. When key 8 is pressed, IC2 resets, de-energising all the relays. It means all the appliances can be switched on independently one by one and switched off simultaneously. [3]

Suppose you want to switch on the bulb (load 1). Lift the handset from the cradle and press key 1. Relay RL1 energises to switch on the bulb. The bulb continues to glow even when you put the handset back on the cradle. To switch off the bulb (de-energise relay RL1), you'll have to again lift the handset and press key 8.

5. Applications

- **TURN ON-OFF LIGHTS :-** We can turn on & off the lights at a required place from the distinct location (whatever the distance may be) during the day as well as night.
- **WATERING PLANTS :-** It is possible with the help of a single phone call. By making a call, the circuit gets activated and watering of plants start for a stipulated period of time.
- **PARKING GATES :-** Whenever a person needs to open the gate for driving the vehicle outside or parking it inside, it can be done by just making a call and thus activating the circuit.[2]
- **ADDITIONAL PROGRAMMING :-** An additional programming circuit may help you to receive a call or a pre-defined message through the phone attached to the circuit, on your phone. Thus, if someone tries to enter your house by opening the window or a door, then you will receive a pre-defined opening of a window or a door, then you will receive a pre-defined message so that you can take immediate action and prevent a possible theft.
- **INDUSRTIAL APPLIANCES :-** It can be used to operate industrial appliances where too much smoke or harmful gases may harm humans. This project finds immense importance.

6.Result & Conclusion

In these my making these the circuit as the device is connected to a corresponding circuit, its gets activated as soon as the call is made to the circuit in which mobile or equivalent GSM module is present to perform a specific operation as per the relay device is connected. In these as the keypad has 12 different key, it can perform 12 distinct operation as per connected to a relay. It can also made off by pressing 8.

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