WIRELESS SPEED CONTROL OF AC MOTORS USING DTMF

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ABSTRACT

Dual-tone-multi-frequency DTMF, also known as touch-tone are the audible sounds you hear when you press keys on your phone. You can actually hear the tones through the speaker. The bottom circuit uses the IC 8870 to decode a tone and display its associated number on the 7-segment LED. Touch-tone is familiar to many (telephone), it is a mature technology, and readily available with off-the-shelf, single-chip, low-cost components. For these reasons DTMF is often used in remote control applications that typically use telephones. The main objective of this project is to control speed of AC motor at lower cost and efficient performance. Induction machine, the most widely used motor in industry, have been traditionally used in open loop control applications, for reasons of cost, size, reliability, ruggedness ,simplicity , etc. main work is to control the speed of induction motor using power devices and DTMF technique.

Keywords: DTMF, IC MT8870, TRIAC

INTRODUCTION

For lightning and general purposes in homes, offices, shops, small factories single phase system is widely used as compared to three phase system as the single phase system is more economical and the power requirement in most of the houses, shops, offices are small which can be easily meet by single phase system. The single phase motors are simple in construction, cheap in cost, reliable and easy to repair and maintain. Due to all these advantages the single phase motor finds its application in vacuum cleaner, fans, washing machine, centrifugal pump, blowers, washing machine, small toys etc.[2]
In this study, remote control of single phase AC motor will be implemented by using a standard DTMF mobile phone.[1] To drive the motor a digitally controlled drive system will be use. Then a tone decoder circuit and IC 8870 will be added between output of a mobile phone and the drive system of the motor. This system is flexible to be controlled with DTMF based phones. With the developed drive and control system the overall control of the motor will be achieve.[1]
Now a days our day to day life becomes very vast, so its not possible in industries to go at work place and control motor working. So that we decide to control the motor from any place. According to recent trends one can use GSM for control of the motor or other devices from any remote places. One can receive the system status and information via SMS with little change in hardware and software, this design concept can be use in robotics also.
Here we use mobile receiver, DTMF decoder, DTMF IC 8870 filter, power device TRIAC and single phase capacitor start capacitor run induction motor. DTMF decoder will encode the data coming from system mobile.

DTMF:
Now a day, most telephone equipment uses dual tone multi frequency (DTMF) receiver IC. One common DTMF receiver IC is the MotorolaMT8870 that is widely used in electronic communications circuits. The MT8870 is an 18-pin IC.
DTMF is used for telecommunication signalling over analog telephone lines in the voice-frequency band between telephone handsets and other communications devices and the switching center.
Multi frequency signal is a group of signalling methods that use a mixture of two pure tone (pure sine wave) sounds. The earliest of these were for in band signalling between switching centers, where long distance telephone operator used a 16-digit keypad to input the next portion of the destination telephone number in order to contact the next

downstream long-distance telephone operator. This semi-automated signalling and switching proved successful in both speed and cost effectiveness. Based on this prior success with using MF by specialists to establish long-distance telephone calls, (DTMF) signalling was developed for the consumer to signal their own telephone-call's destination telephone number instead of talking to a telephone operator.[9] The DTMF system uses eight different frequency signals transmitted in pairs to represent sixteen different numbers, symbols and letters - as detailed below. Here there are mobile keys, which serve the purpose of increasing or decreasing the speed of the motor. This speed of the motor varies in steps according to the selection of key over the particular range.

Keypad

The DTMF keypad is laid out in a 4×4 matrix, with each row representing a *low* frequency, and each column representing a high frequency. Pressing a single key (such as"1") will send a sinusoidal tone for each of the two frequencies (697 and 1209 hertz (Hz)). The original keypads had levers inside, so each button activated two contacts. The multiple tones are the reason for calling the system multi-frequency. These tones are then decoded by the switching center to determine which key was pressed.[9]

The audio output from the cell phone is connected to the input of DTMF decoder. The incoming call is answered by the cell phone. DTMF detection and decoding is provided by DTMF decoder block. An IC MT 8870 is able to detect and decode all 16 DTMF tone pairs into a 4-bit code. When a valid DTMF digit is detected the 4-bit code is available at the output pins and a valid signal output, is set to logic high. In DTMF there are 16 distinct tones. 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. For example the "2" key is row (R1) and column (C2). Thus using the above table, "2" has a frequency of 770 + 1336 = 2106 Hz. The "9" is row (R3) and column (C3) and has a frequency of 852 + 1477 = 2329 Hz.[9]

Motorola MT IC8870:

Features
 ➤ Operating voltage: 2.5V~5.5V.
 ➤ No external filter is required.
 ➤ Low standby current (on power down mode).
 ➤ Excellent performance.

General Description
 The M-8870 series are Dual Tone Multi Frequency (DTMF) receivers integrated with digital decoder and band split filter functions. TheM-8870 types supply power-down mode and inhibit mode operations. All types of the M-8870series use digital counting techniques to detect and decode all the 16 DTMF tone pairs into a 4-bit code output. Highly accurate switched capacitor filters are employed to divide tone (DTMF) signals into low and high group signals.[5]

Frequency	1209 Hz	1336 Hz	1477 Hz	1633 Hz
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	0	#	D

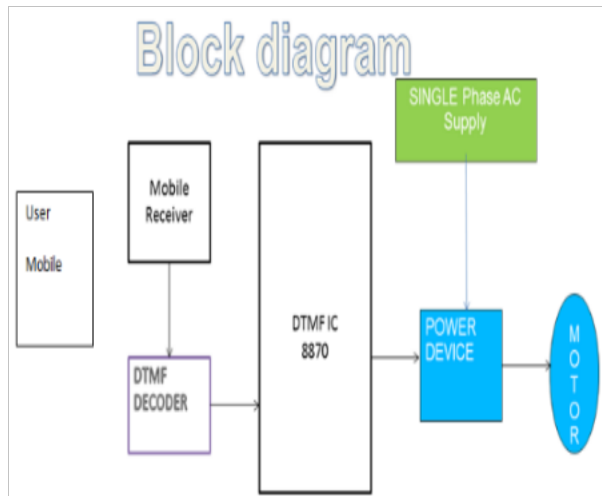RESEARCH METHODOLOGY TO BE EMPLOYED

Fig: Block diagram of wireless control of AC motor using DTMF

Here user telephone is used which serves main part of this system. From the block diagram we can see that two phones have been used, one is with the user side and other in the system side which may be placed at any distance from user.

Then the respective keys are pressed depending on the requirement to move the motor.

This system uses dual tone multi frequency technology of our telephone set. Every telephone have this facility.

In a telephone system two types of dialling facilities are available:-
1) Tone dialling mode
2) Pulse dialling mode

Here develop system will use tone dialling mode. When the user makes a call, the local system services the call as it is always in auto receiving mode. Thus the user and system are connected. Now if user press any key on the keypad DTMF tone is generated which is receive by system telephone and this signal decoded by DTMF decoder. DTMF decoder convert data into binary digits and given to IC8870 filter. According to its output gate of TRIAC will trigger then motor receive the signal from TRIAC and motor perform operation. For the protection of IC8870 we will use relay circuit between IC8870 and TRIAC.

ADVANTAGES:
➢ Quick response is achieved.
➢ Construction is easy.
➢ Easy to maintain and repair.
➢ Comparatively the operation cost is less.
➢ Power consumption is low.
➢ Controlling electrical devices wirelessly.
➢ No coding is required.
➢ Anyone who knows the phone number and code can control electrical appliances, hence provide security.

APPLICATIONS:
➢ This can be practically implemented in real time to control electrical power in industries or small factories.
➢ It is also apply for home appliances to control AC's to set the room temperature.
➢ This system can be employed in houses, where people often forget to switch off electrical appliances.

CONCLUSION:

To control the speed of an AC motor by wireless communication using DTMF decoder technique. The applications for DTMF signalling are tremendous. DTMF offers highly reliable, cost effective signalling solutions which require no development effort on the user's part. Wireless control from remote places, ease of operation by using any mobile possible to on/off motor. Man mistake has been reduced Speed of motor varies simple pressing remote mobile buttons. Display the status of current operation. Reduce maintenance. Fault detection is easy.

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