International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 07 | July-2016 www.irjet.net p-ISSN: 2395-0072

Speed Control of AC Motor using DTMF Technique

Sudharani[1], Prof.Nagbhushan patil[2]

[1]*Student, Dept. of Power Electronics, Poojya Doddappa Appa college of Engineering Gulbarga, Karnataka ,India*
[2]*Professor, Dept .of Electrical and Electronics, Poojya Doddappa Appa college of Engineering Gulbarga , Karnataka, India*

Abstract - *This project works on the principle of DTMF tone command so received from any phone to remotely switch and control 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 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. Thus to overcome these problems , the proposed system has been designed which uses DTMF technology to control the loads remotely.*

Key Words: **DTMF Decoder, MT 8870, AC motor, LCD Module.**

1. INTRODUCTION

Now-a-Days Automation is playing an important role in each and Every field such as Industrial, Home, Rural and Agricultural Areas. Security is prime concern in our day-to-day life. Everyone wants to be as much as secure as to be possible. An access control systems forms a vital link in a security chain. The micro controller based mobile operated speed control of ac motor allows remote control of motor. This system is best suitable for agricultural purposes, home security and automation.

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 communicating. 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 mobile. Thus assisting the farmers, the back bone 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.

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 AT89S52 microcontroller. The microcontroller is used for switching the AC motor according to the frequency received by the DTMF receiver. By using this project AC motor can be rotate clockwise, anti clock wise, anywhere from the planet. A 16X2 LCD is interfaced with microcontroller to have the display. Speed controlling is also done for this motor. This project uses regulated 5V, 1A 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.

2. Block diagram description

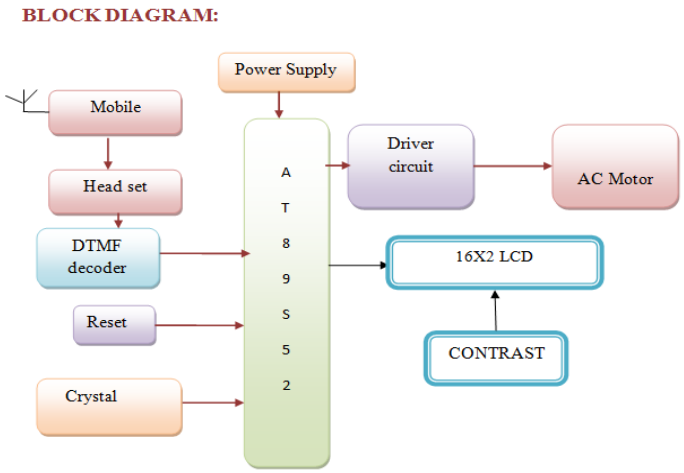

Fig -1: Block diagram

2.1 Power Supply

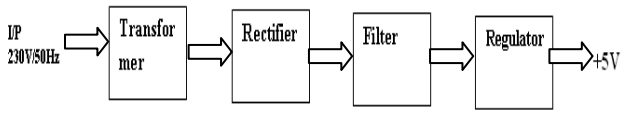

Fig -2: Block diagram for power supply

The output from transformer is 9V Ac we require for our circuit because all the circuit work only DC. So with the help of rectifier we rectify & filter this signal so as to get pure DC from this circuit. Out from rectifier & filter circuit is unregulated so by using regulator output from this is fixed 5v is maintained by this block.

2.2. AT89S52 Microcontroller

The AT89S52 is a low-power, high-performance CMOS 8-bit micro controller with 8Kbytes of in-system programmable flash memory. The device is manufactured by Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 micro controller. AT89S52 is a powerful micro controller, which provides a highly flexible and cost effective solution to any embedded control applications.

The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

Features:

- Compatible with MCS-51 Products
- 8K Bytes of In-System Programmable (ISP) Flash Memory
  - Endurance: 1000 Write/Erase Cycles
- 4.0V to 5.5V Operating Range
- Fully Static Operation: 0 Hz to 33 MHz
- Three-level Program Memory Lock
- 256K Internal RAM
- 32 Programmable I/O Lines
- 3 16-bit Timer/Counters
- Eight Interrupt Sources
- Full Duplex UART Serial Channel
- Low-power Idle and Power-down Modes
- Interrupt Recovery from Power-down Mode
- Watchdog Timer
- Dual Data Pointer
- Power-off Flag

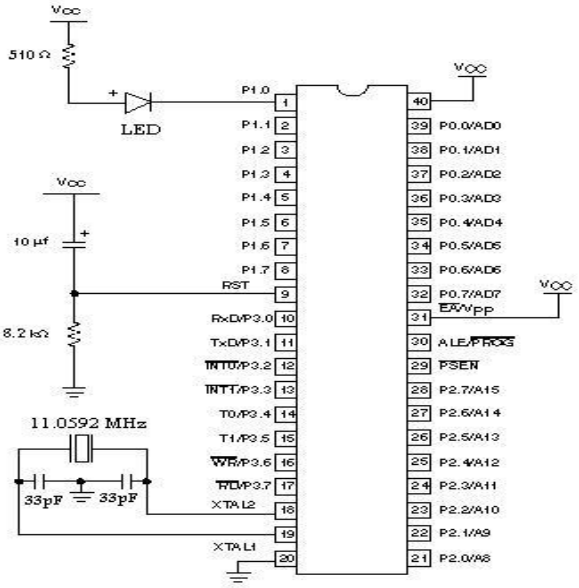

Fig -3: Pin diagram of 89s52 microcontroller

2.3 LCD Display

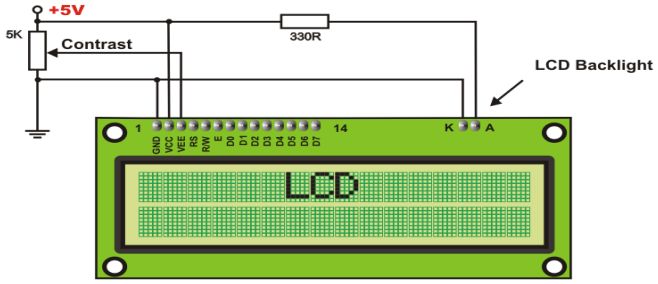

Fig -4: LCD display

Various display device such as seven segment display. LCD display, etc can be interfaced with microcontroller to read the output directly.

LCD screen consists of two lines with 16 characters each. Each character consists of 5x7 dot matrix. Contrast on display depends on the power supply voltage and whether messages are displayed in one or two lines. For that reason, variable voltage 0-Vdd is applied on pin marked as Vee. Trimmer potentiometer is usually used for that purpose. Some versions of displays have built in backlight (blue or green diodes). When used during operating, a resistor for current limitation should be used (like with any LE diode).

General specifications:

- Drive method: 1/16 duty cycle
- Display size: 16 character * 2 lines
- Character structure: 5*8 dots.
- Display data RAM: 80 characters (80*8 bits)
- Character generate ROM: 192 characters
- Character generate RAM: 8 characters (64*8 bits)
- Both display data and character generator RAMs can be read from MPU.

- Internal automatic reset circuit at power ON.
- Built in oscillator circuit.

Pins functions:
There are pins along one side of the small printed board used for connection to the microcontroller. There are total of 14 pins marked with numbers (16 in case the background light is built in). Their function is described in the table below:

Table -1: LCD pin functions

Function	Pin Number	Name	Logic State	Description
Ground	1	Vss	-	0V
Power supply	2	Vdd	-	+5V
Contrast	3	Vee	-	0 – Vdd
Control of operating	4	RS	0 1	D0 – D7 are interpreted as commands D0 – D7 are interpreted as data
	5	R/W	0 1	Write data (from controller to LCD) Read data (from LCD to controller)
	6	E	0 1 From 1 to 0	Access to LCD disabled Normal operating Data/commands are transferred to LCD
data / commands	7	D0	0/1	Bit 0 LSB
	8	D1	0/1	Bit 1
	9	D2	0/1	Bit 2
	10	D3	0/1	Bit 3
	11	D4	0/1	Bit 4
	12	D5	0/1	Bit 5
	13	D6	0/1	Bit 6
	14	D7	0/1	Bit 7 MSB

2.4 DTMF Decoder 8870

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.Other multi-frequency systems are used for internal signaling within the telephone network.

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.

Features of M-8870 DTMF Receiver

- Low power consumption
- Adjustable acquisition and release times
- Central office quality and performance
- Power-down and inhibit modes (-02 only)
- Inexpensive 3.58 MHz time base
- Single 5 volt power supply
- Dial tone suppression
- Applications include: telephone switch equipment, remote data entry, paging systems, personal computers, credit card systems

The M-8870 is a full DTMF Receiver that integrates both band split filter and decoder functions into a single 18-pin DIP or SOIC package. Manufactured using CMOS process technology, the M-8870 offers low power consumption (35 mW max) and precise data handling. Its filter section uses switched capacitor technology for both the high and low group filters and for dial tone rejection. Its decoder uses digital counting techniques to detect and decode all 16 DTMF tone pairs into a 4-bit code. External component count is minimized by provision of an on-chip differential input amplifier, clock generator, and latched tri-state interface bus. Minimal external components required include a low-cost 3.579545 MHz color burst crystal, a timing resistor, and a timing capacitor. The M- 8870-02 provides a “power-down” option which, when enabled, drops consumption to less than 0.5 mW.

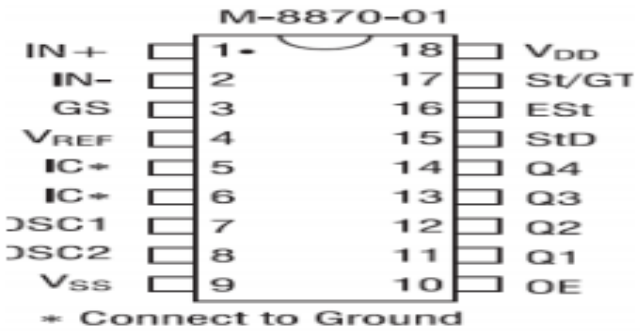

Fig -5: Pin diagram of 8870

Table -2: DTMF input and decoder output table

F_{LOW}	F_{HIGH}	Key (ref.)	QE	Q4	Q3	Q2	Q1
697	1209	1	H	0	0	0	1
697	1336	2	H	0	0	1	0
697	1477	3	H	0	0	1	1
770	1209	4	H	0	1	0	0
770	1336	5	H	0	1	0	1
770	1477	6	H	0	1	1	0
852	1209	7	H	0	1	1	1
852	1336	8	H	1	0	0	0
852	1477	9	H	1	0	0	1
941	1336	0	H	1	0	1	0
941	1209	*	H	1	0	1	1
941	1477	#	H	1	1	0	0
697	1633	A	H	1	1	0	1
770	1633	B	H	1	1	1	0
852	1633	C	H	1	1	1	1
941	1633	D	H	0	0	0	0
ANY	ANY	ANY	L	Z	Z	Z	Z
L = logic low, H = logic high, Z = high impedance							

Table -3: DTMF keypad frequencies

DTMF keypad frequencies (with sound clips)

	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

3. Results

Speed control of motor using mobile phone is microcontroller based project work on low voltage circuit. In this work motor speed, motor ON/Off & Load is switched from anywhere from the world.

In this if we call to our mobile circuit then following functions will be done
If we press 1 then motor will ON with Low speed around 730rpm.
If we press 2 then motor will ON with MID speed around 880rpm.
If we press 3 then motor will ON with HIGH speed around 1200rpm.
If we press 0 then motor will turn off.

In this the speed of motor i.e. voltage control method by using mobile phone. In this work we use DTMF 8870 IC for detecting of mobile signal pressed by caller from remote place. The mobile output signal is RF this signal is converted in to binary digital form using this 8870 IC.

Mobile button 1 - Data Out from 0001h
Mobile button 2 - Data Out from 0010h
Mobile button 3 - Data Out from 0011h
Mobile button 0 - Data Out from 0000h
The output of binary numbers from DTMF IC is compared with microcontroller stored value & takes the corresponding decision. I.e. Speed of motor & load on / off etc.

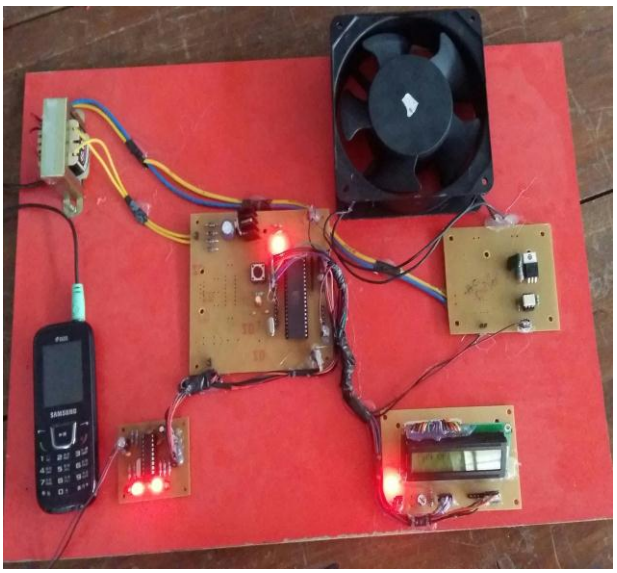

Fig -6: Project circuit

4. Advantages

- Wireless Control from Remote places.
- Easy of operation.
- By using any mobile possible to on/off motor.
- Speed of motor varies simple pressing remote mobile buttons.
- Display the status of current operation.

5. Applications

- 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.
- This system can be used for agricultural purposes.

6. CONCLUSIONS

This project presents a DTMF based AC motor speed control and it is designed and implemented with Atmel 89S52 MCU in embedded system domain. Experimental work has been carried out carefully. The result shows that higher efficiency is indeed achieved using the embedded system. The proposed method is verified to be highly beneficial for the security purpose and industrial purpose.

REFERENCES

[1] The 8052 Microcontrollers & Embedded systems Using assembly & C by Muhammad Ali mazidi, Janice Gillispie Mazidi, Rolin D.Mckinlay, second edition.

[2] Power Semiconductor Application Philips Semiconductor.

[3] Digital Logic & computer Design by M.Morris Mano.

[4] www.wikipedia.com

[5] Application Note Applications of the MT8870Integrated DTMF Receiver.

[6] B. K. Bose, Adjustable Speed AC drives, A technology status review, Proc. IEEE, Vol. 70, No. 2, pp 116 - 135, Feb. 1984.

[7] B. Koyunch, "PC remote control of appliances by using telephone lines", IEEE Trans. Consumer Electron., Vol. 41, pp. 201-209, 1995.

[8] Sharma R, Kumar K, and Viq SS, DTMF Based Remote Control System," IEEE International Conference ICIT, 2006; 2380-2383.

[9] Speed Control and Monitoring of an AC Motor by Wireless Communication Using DTMF Decoder Technique Mr.Burali Y. N RESEARCH INVENTY: International Journal of Engineering and Science ISSN: 2278-4721, Vol. 1, Issue 7 (November 2012), PP 10-18