

# A Review Paper on Dual Tone Multi Frequency

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**Abstract:** Dual-tone Multi-frequency (DTMF) Signals are used in touch-tone telephones as well as many other areas. Since analog devices are rapidly changing with digital devices, digital DTMF decoders become important. There are different type of DTMF decoding algorithms, but most of them cannot comply with the related International Telecommunications Union (ITU) and Bell Communications Research, Inc. Bellcore recommendations and are not perfect for real-time implementation. In this survey a brief review of some DTMF detector implementations is given. Although the Goertzel Algorithm is not able to satisfy the standards, it was the best approach in the sense of computational load and memory usage efficiency. It might be possible to use the Goertzel Algorithm with variable window length to satisfy the specifications. The aim of this project is to implement a DTMF detector, which is ITU compliant, on a fixed point low cost DSP. This detector detects DTMF tones in multiple-channels with as much as possible channels.

**Keywords:** DTMF, IC, DECODING

## INTRODUCTION

Dual-tone multi-frequency (DTMF) is an international signalling standard for telephone digits (number buttons). These signals are used in touch-tone telephone call signalling as well as many other areas such as interactive control applications, telephone banking and pager systems. Since analog devices are proportionally changing with digital devices, digital DTMF decoders become important. Digital implementation has several advantages over analog implementation such as greater accuracy, stability, re-programmability and a lower chip count; that is, instead of using many analog chips for decoding multi-channel DTMF tones, using only a digital signal processor (DSP) chip for all channels.

### An Over View Of Technology That Is Being Used

DTMF expands as Dual Tone Multiple Frequency. DTMF is a term frequently used in the telephone industry. DTMF generation requires a composite audio signal which is a combination of two tones between the frequencies of 697Hz and 1633Hz. The DTMF keypad is arranged in such a way that each row and column has its own unique frequency as depicted below.

When any key on the mobile key pad like "1", "2", "\*", "#" etc. is pressed, a corresponding tone to that code is transmitted which consists of a combination of two frequencies among which one is the higher frequency and the second one is the lower frequency.

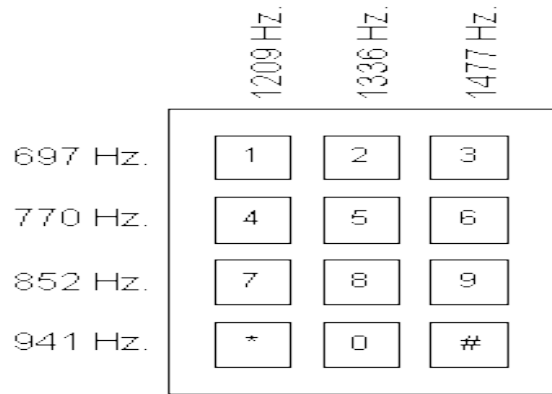


Fig.1. Dual Tone Multi Frequency

A code received by a mobile phone can be made audible through the use of a speaker. Speakers output is connected to IC MT8870 which is DTMF decoder IC used in decoding DTMF code. A four-bit digital output is given i.e. q1, q2, q3, and q4 according to the key received. The following figure shows the equivalent digital output for each key-

S.No.	key	Digital Output			
		Q4	Q3	Q2	Q1
1	1	0	0	0	1
2	2	0	0	1	0
3	3	0	0	1	1
4	4	0	1	0	0
5	5	0	1	0	1
6	6	0	1	1	0
7	7	1	1	1	1
8	8	1	0	0	0
9	9	1	0	0	1
10	0	1	0	1	0

Fig. 2 Equivalent digital output for each key

### A Basic Conceptual Structure of the System

The actions performed by microcontroller are similar to the functions performed by the heart of the body, therefore the microcontroller is known as the heart of the robot, which is configured by programming in Assembly language for 89S52 Microcontroller.

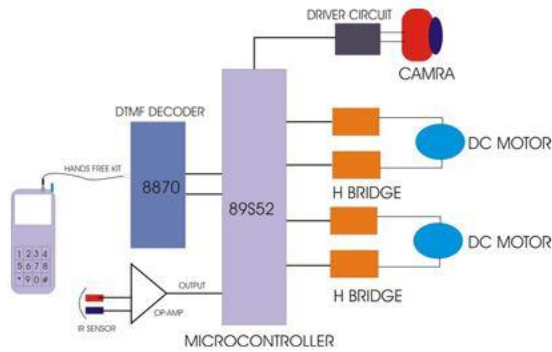


Fig: 3. Block diagram of basic mobile control robot

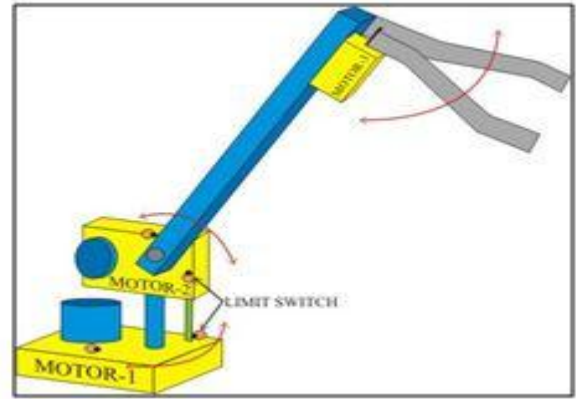


Fig: 4. Robotic Arm

#### Application and Further Scope

- Military use: Used in military for remotely control of military vehicle.
- Search and Rescue: Unmanned Aerial Vehicles (UAVs) play an important role in search and rescue operations.
- Alarm Phone Dialler: By replacing DTMF Decoder IC CM8870 by a 'DTMF Transceiver IC CM8880, DTMF tones are generated from the robot. We can use it as sensing device generating alarms.
- Space exploration: Robotic arms can be used to manipulate a heavy payload or do other work in space.

#### REFERENCES

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#### Vehicle movement

The most important platform of the Robotic Vehicle is said to be the Robot Chassis which, using DTMF circuitry, is connected to a mobile. A mobile phone is circuited to the vehicle through a 3.5mm audio jack which receives calls from the calling mobile. DTMF decoder will get activated and the H-bridge Module will begin its functioning. According to the DTMF frequencies which are generated by the cell phone, the robotic movement is thus being controlled by the caller Robotic Arm for picking and placing.

The design of a robotic arm depends upon the imagination of its maker and can have a wide range of motion. The joint that connects the various parts of the arm can rotate as well as move like a hinge. The end of the robotic arm actually does the work that it is designed for, so is known as the end effectors. Many tasks can be performed like painting, tightening screws and more. Tasks are divided into two categories, one being that these robots are fixed in one place as along an assembly line, or they can be mobile to do a variety of tasks in different places at some distances. Autonomous robotic arms are programmed and then left alone to repeat their tasks that may or may not be independent of human control.

Here, we have connected a robotic arm to the microcontroller with the help of DC geared motors and mount it onto the robot chassis for giving an added facility of picking and placing which can be done according to the instructions provided by the user through dialling and then decoding of DTMF tones. The gripper in the arm can be used for picking light weight objects and then placing them at some distance. This is only one application of the robot. This robot can be made to work for various other applications as discussed in the next section by adding sensors etc.