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Mobile Operated Landrover Using DTMF Technology

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Abstract: In this project, we present the controlling of a Robot using DTMF technique .The robot is controlled by a mobile phone that calls the other mobile phone attached to the robot. In the course of the call, if any button is pressed, the tone corresponding to the button pressed is heard at the other end. This tone is called "Dual Tone Multi Frequency tone (DTMF)".Using DTMF code, direction of motion of the robot can be controlled by mobile phone. The above system can be used for military purpose as 'bomb detector' and as 'spy robot' and also for surveillance. The received tone is processed by the microcontroller with the help of DTMF decoder. The microcontroller then transmits the signal to the motor driver ICs to operate the motors & our robot starts moving Conventionally, Wireless-controlled robots use RF circuits, which have the drawbacks of limited working range, limited frequency range and the limited control. Use of a mobile phone for robotic control can overcome these limitations. It provides the advantage of robust control, working range as large as the coverage area of the service provider, no interference with other controllers and up to twelve controls. DTMF assigns a specific frequency (consisting of two separate tones) to each key s that it can easily be identified by the electronic circuit. The signal generated by the DTMF encoder is the direct algebraic submission, in real time of the amplitudes of two sine (cosine) waves of different frequencies, i.e., pressing any button in DTMF will send a tone made by adding 1336 Hz and 770 Hz to the other end of the mobile.

Keywords: Dual Tone Multi Frequency tone (DTMF), Robot, Mobile Operated, Embedded System.

1. INTRODUCTION

1.1 General Overview:

Technology is the word coined for the practical application of scientific knowledge in the industry. The advancement in technology cannot be justified unless it is used for leveraging the user's purpose. Technology, is today, imbibed for accomplishment of several tasks of varied complexity, in almost all walks of life.

The society as a whole is exquisitely dependent on science and technology. Technology has played a very significant role in improving the quality of life. One way through which this is done is by automating several tasks using complex logic to simplify the work.

1.2 Project Overview:

The aim of our project is to give smartness to the existing system. The objective of this project is to control the robot using a smart phone. The Dtmf module is interfaced with the micro-controller and it helps the robot to move in the required direction.

1.3 Significance of Project Work:

During the course of our project we developed a smart mobile innovation to control a robot using a DTMF module. We can even operate it for larger distances using higher end modules. It can be integrated with a GPS to find the location of the bot.

We can even connect an internet protocol Cam to the bot so that we could watch the relay in the mobile itself. We can use different sensors attached to the robot based on the requirement of the user.

2. EMBEDDED SYSTEM

2.1 Embedded System:

An embedded system is a computing device, which is a combination of both hardware and software used to perform a specific task at specific intervals of time.
E.g: Microwave oven, washing machines, vcd players etc….

2.2 Introduction to Embedded System:

Embedded systems are controlled by one or more main processing cores that are typically either microcontroller or digital signal processors (DSP). The key characteristic, however, is being dedicated to handle a particular task, which may require very powerful processors. Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance.

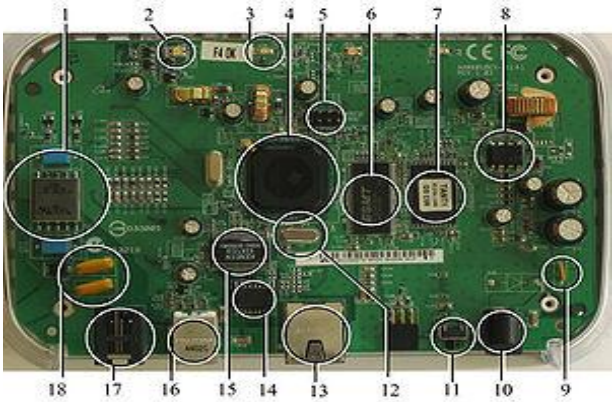

Fig 2.1: A modern example of an embedded system.

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Some embedded systems are mass-produced, benefiting from economies of scale. The modern example of an embedded system is shown in figure.

2.3. Need For Embedded System:
Embedded systems often reside in machines that are expected to run continuously for years without errors and in some cases recover by them if an error occurs. Therefore the software is usually developed and tested more carefully than that for personal computers, and unreliable mechanical moving parts such as disk drives, switches or buttons are avoided.

Specific reliability issues may include:

- The system cannot safely be shut down for repair, or it is too inaccessible to repair. Examples include space systems, undersea cables, navigational beacons, bore-hole systems, and automobiles.
- The system must be kept running for safety reasons. "Limp modes" are less tolerable. Often backups are selected by an operator. Examples include aircraft navigation, reactor control systems, safety-critical chemical factory controls, train signals, engines on single-engine aircraft.
- The system will lose large amounts of money when shut down: Telephone switches, factory controls, bridge and elevator controls, funds transfer and market making, automated sales and service.
- A variety of techniques are used, sometimes in combination, to recover from errors both software bugs such as memory leaks, and also soft errors in the hardware:az
- Watchdog timer that resets the computer unless the software periodically notifies the watchdog.

2.4 .Applications of Embedded Systems:
- Industrial machines
- Automobiles
- Medical equipments
- Cameras
- Household appliances
- Airplanes
- Vending machines

3. ROBOTICS

A robot is a mechanical or virtual artificial agent, usually an electro-mechanical machine that is guided by a computer program or electronic circuitry. Robots can be autonomous, semi-autonomous or remotely controlled and range from humanoids such as ASIMO and TOPIO to Nano robots, swarm robots, and industrial robots. By mimicking a lifelike appearance or automating movements, a robot may convey a sense of intelligence or thought of its own. The branch of technology that deals with robots is called robotics.

Robotics is the branch of technology that deals with the design, construction, operation, and application of robots, as well as computer systems for their control, sensory by nature contributing to the field of bio-inspired robotics.

The concept of creating machines that can operate autonomously dates back to classical times, but research into feedback, and information processing. These technologies deal with automated machines that can take the place of humans in dangerous environments or manufacturing processes, or resemble humans in appearance, behavior, and/or cognition. Many of today's robots are inspired the functionality and potential uses of robots did not grow substantially until the 20th century.

Throughout history, robotics has been often seen to mimic human behavior, and often manage tasks in a similar fashion. Today, robotics is a rapidly growing field, as technological advances continue; research, design, and building new robots serve various practical purposes, whether domestically, commercially, or militarily. Many robots do jobs that are hazardous to people such as defusing bombs, exploring shipwrecks, and mines.

4. ATMEGA8 MICROCONTROLLER

The Atmel® AVR® ATmega8 is a low-power CMOS 8-bit microcontroller based on the AVR RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega8 achieves through puts approaching 1MIPS per MHz, allowing the system designed to optimize power consumption versus processing speed.

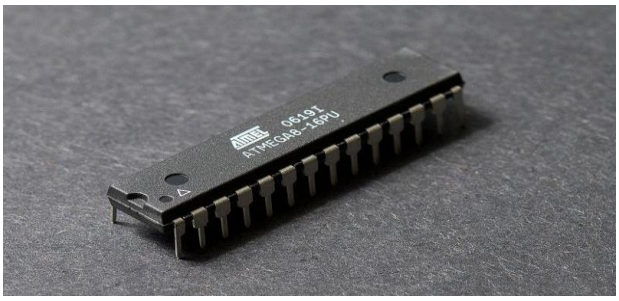

Figure 4.1: ATmega8 Microcontroller

4.1 Features:
• High-performance, Low-power Atmel®AVR® 8-bit Microcontroller

• Advanced RISC Architecture
– 130 Powerful Instructions – Most Single-clock Cycle Execution
– 32 × 8 General Purpose Working Registers
– Fully Static Operation
– Up to 16MIPS Throughput at 16MHz
– On-chip 2-cycle Multiplier

• High Endurance Non-volatile Memory segments
– 8Kbytes of In-System Self-programmable Flash program memory
– 512Bytes EEPROM

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4.2 Pin Configurations:

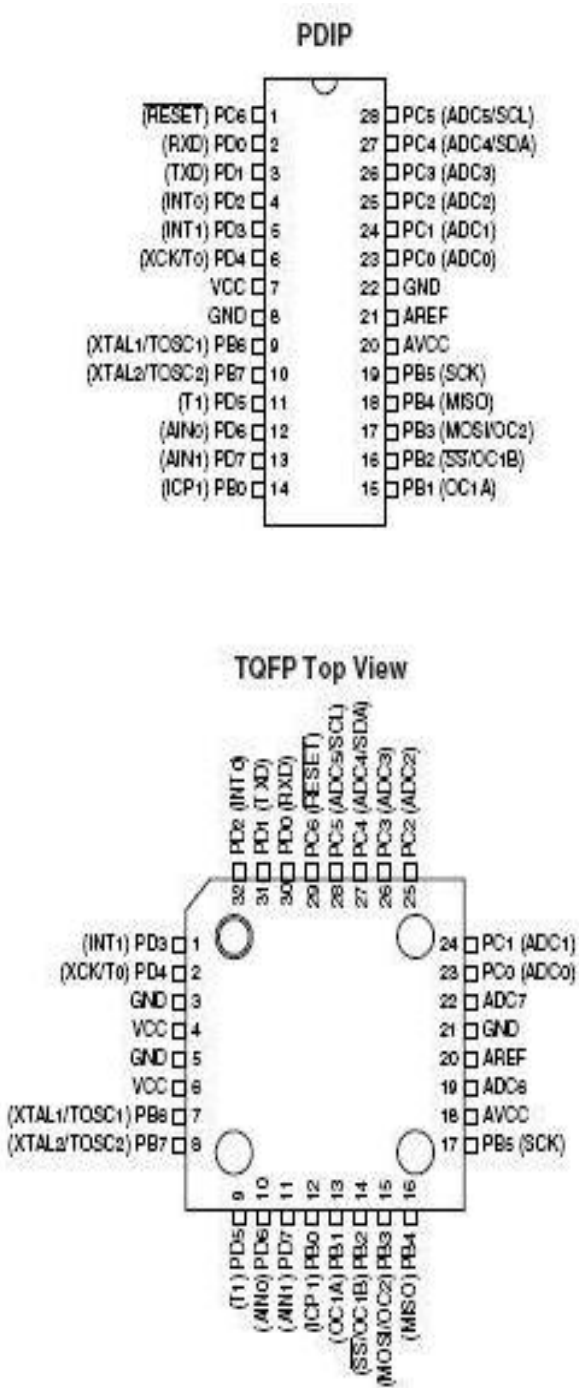

Figure 4.2: Pin Configurations of AT mega.

4.3 Overview of ATmega8 Microcontroller:

I/O Ports:
23 I/O line can be obtained from three ports; namely Port B, Port C and Port D.

SPI (Serial Peripheral interface):
ATmega8 holds three communication devices integrated. One of them is Serial Peripheral Interface. Four pins are assigned to Atmega8 to implement this scheme of communication.

USART:
One of the most powerful communication solutions is **USART** and ATmega8 supports both synchronous and asynchronous data transfer schemes. It has three pins assigned for that. In many projects, this module is extensively used for PC-Micro controller communication.

TWI (Two Wire Interface):
Another communication device that is present in ATmega8 is Two Wire Interface. It allows designers to set up a commutation between two devices using just two wires along with a common ground connection, As the TWI output is made by means of open collector outputs, thus external pull up resistors are required to make the circuit.

Analog Comparator:
A comparator module is integrated in the IC that provides comparison facility between two voltages connected to the two inputs of the Analog comparator via External pins attached to the micro controller.

Analog to Digital Converter:
The ATmega8 features a 10-bit successive approximation ADC. The ADC is connected to an 8-Channel Analog Multiplexer which allows eight single-ended voltage inputs constructed from the pins of Port C. The single-ended voltage inputs refer to 0V (GND). The ADC contains a Sample and Hold circuit which ensures that the input voltage to the ADC.

4.4 Block Diagram:
The Atmel® AVR® core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle.

An H-bridge is an electronic circuit which enables DC electric motors to be run forwards or backwards. These circuits are often used in robotics. H-bridges are available as integrated circuits, or can be built from discrete components.

The two basic states of a H-bridge. The term "H-bridge" is derived from the typical graphical representation of such a circuit. An H-bridge is built with four switches (solid-state or mechanical). When the switches S1 and S4 (according to the first figure) are closed (and S2 and S3 are open) a positive voltage will be applied across the motor. By opening S1 and S4 switches and closing S2 and S3 switches, this voltage is reversed, allowing reverse operation of the motor.

Using the nomen clature above, the switches S1 and S2 should never be closed at the same time, as this would cause a short circuit on the input voltage source. The same applies to the switches S3 and S4. This condition is known as shoot-through.

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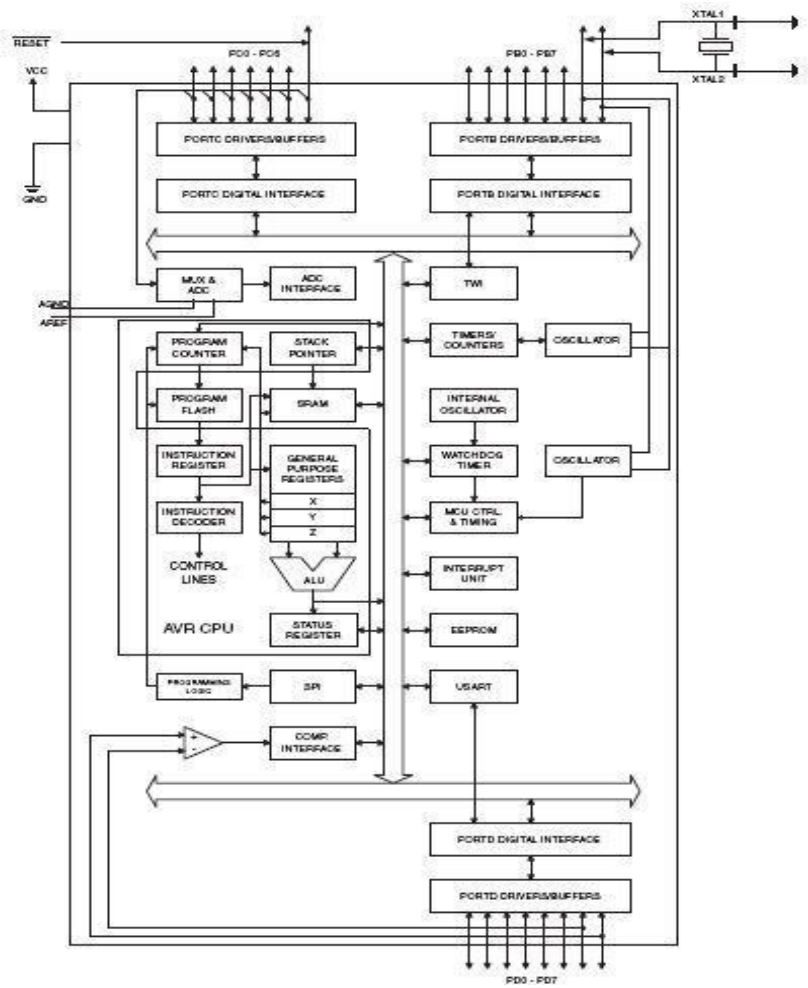

Figure 4.3: Block Diagram of ATMEGA 8

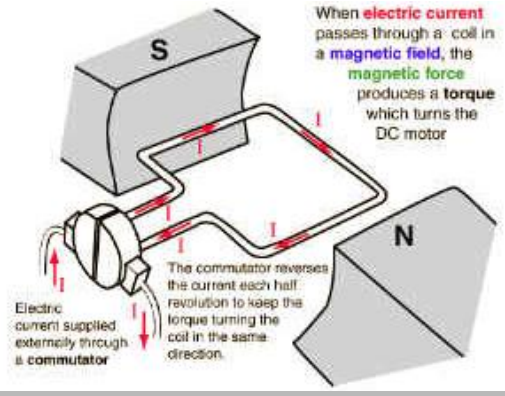

Figure 1: Force in DC Motor

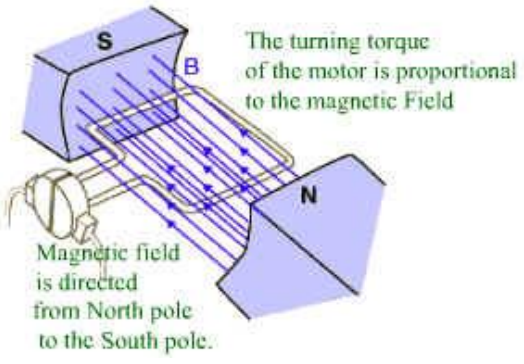

Figure 2 : Magnetic Field in DC Motor

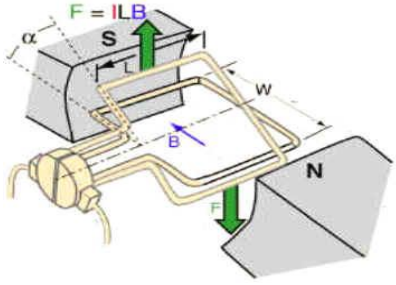

Figure 3 : Torque in DC Motor

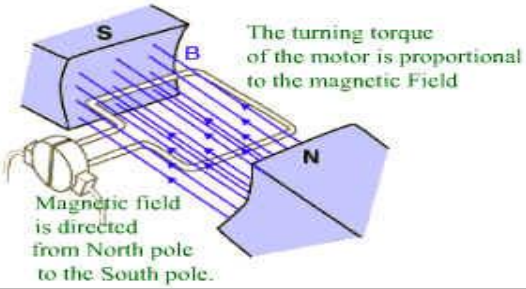

Figure 4 : Current Flow in DC Motor

FIG 4.4: DC MOTOR WORKING

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Operation:
The H-Bridge arrangement is generally used to reverse the polarity of the motor, but can also be used to 'brake' the motor, where the motor comes to a sudden stop, as the motors terminals are shorted, or to let the motor 'free run' to a stop, as the motor is effectively disconnected from the circuit. The following table summarizes operation.

Table: 4.1 DC Motor operations

S1	S2	S3	S4	Result
1	0	0	1	Motor moves right
0	1	1	0	Motor moves left
0	0	0	0	Motor free runs
0	1	0	1	Motor brakes

DESCRIPTION:
The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoides, DC and stepping motors) and switching power transistors. To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included. This device is suitable for use in switching applications at frequencies up to 5 kHz.

Tab: 4.2 Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_S	Supply Voltage	36	V
V_{SS}	Logic Supply Voltage	36	V
V_i	Input Voltage	7	V
V_{en}	Enable Voltage	7	V
I_o	Peak Output Current (100 µs non repetitive)	1.2	A
P_{tot}	Total Power Dissipation at T_{pins} = 90 °C	4	W
T_{stg}, T_j	Storage and Junction Temperature	-40 to 150	°C

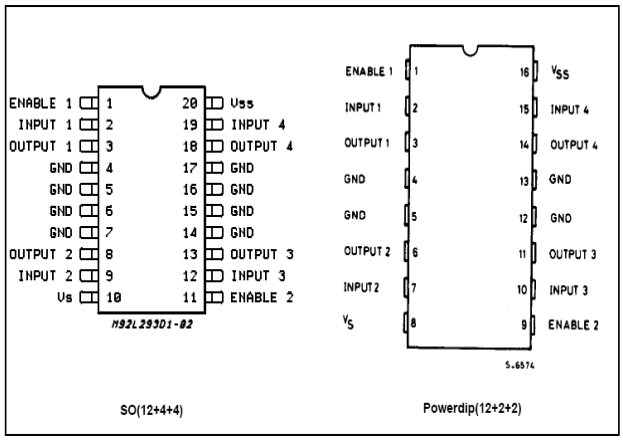

Fig: 4.6 pin connection

The L293D is assembled in a 16 lead plastic package which has 4 center pins connected together and used for heat sinking The L293DD is assembled in a 20 lead surface mount which has 8 center pins connected together and used for heat sinking.

5. DTMF TONE

The DTMF technique outputs distinct representation of 16 common alphanumeric characters (0-9, A-D, *, #) on the telephone. The lowest frequency used is 697Hz and the highest frequency used is 1633Hz.

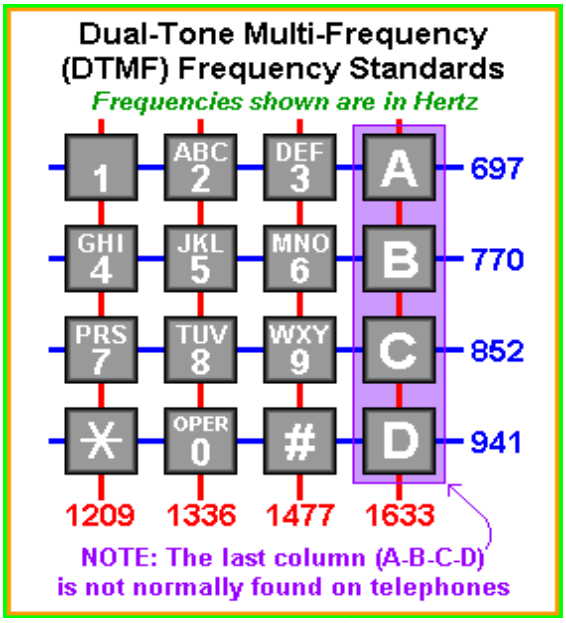

FIG 5.1: DTMF MODULE

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 frequency. Above is a representation of the typical DTWMF keypad and the associated row/column frequencies. By pressing a key, for example 5, will generate a dual tone consisting of 770 Hz for the low group and 1336 Hz for the high group.

5.1 DTMF DECODER:

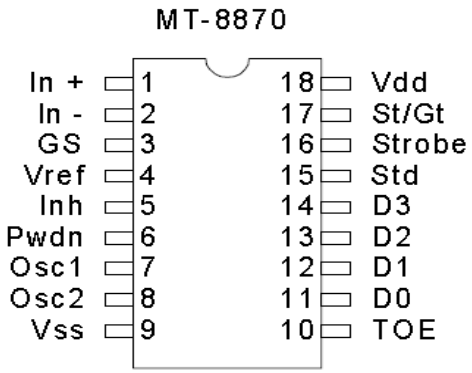

FIG 5.2: MT-8870

The MT-8870 is a DTMF Receiver that integrates both band split filter and decoder functions into a single 18-pin

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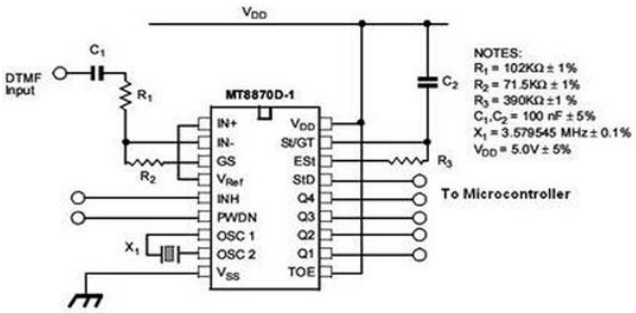
DIP or SOIC package. It is manufactured using CMOS process technology. The MT-8870 offers low power consumption (35 mW max) and precise data handling. Its filter section uses switched capacitor technology for both the high and low group filters and for dial tone rejection. Its decoder uses digital counting techniques to detect and decode all 16 DTMF tone pairs into a 4-bit code. Minimal external components required includes a low-cost 3.579545 MHz color burst crystal, a timing resistor, and a timing capacitor.

The filter section is used for separation of the low-group and high group tones and it is achieved by applying the DTMF signal to the inputs of two sixth order switched capacitor band pass filters, the bandwidths of which corresponds to the low and high group frequencies. The filter section also incorporates notches at 350 and 440 Hz for exceptional dial tone rejection. Each filter output is followed by a single order switched capacitor filter section which smoothes the signals prior to limiting. Limiting is performed by high-gain comparators which are provided with hysteresis to prevent detection of unwanted low-level signals. The outputs of the comparators provide full rail logic swings at the frequencies of the incoming DTMF signals. Following the filter section is a decoder employing digital counting techniques to determine the frequencies of the incoming tones and to verify that they correspond to the standard DTMF frequencies.

5.2 TEST CIRCUIT:



Following are the outputs produced by the DTMF decoder when the respective keys are pressed:

F_{LOW}	F_{HIGH}	KEY	TOW	Q_4	Q_3	Q_2	Q_1
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	1209	0	H	1	0	1	0
941	1336	-	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	L	Z	Z	Z	Z

L = logic Low, H = Logic High, Z = High Impedance

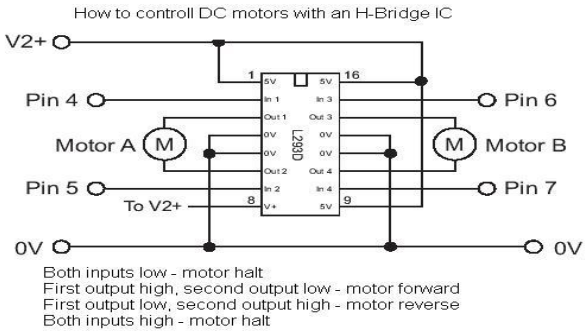
Program required to control the robot is written and burnt into this controller and when the required input gets into the controller it produces the desired output as per our logic written in the program it is to be noted that each and every motor has two terminals one of them represents positive terminal and other represents negative. Taking this point into account the logic is formed in the following way.

	Motor1 (left)	Motor2(right)
For moving forward	Clockwise	Clockwise
For moving backward	Anticlockwise	Anticlockwise
For turning left	Off	Clockwise
For turning right	Clockwise	Off

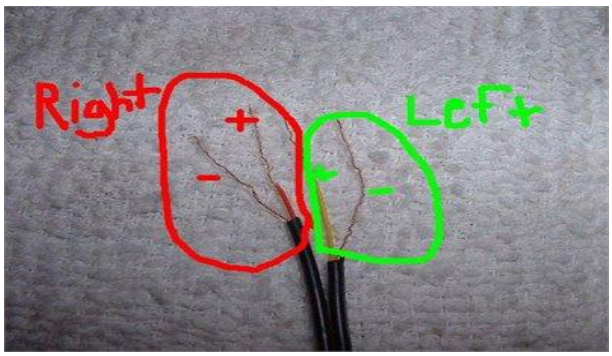
Direction	Logic
Clockwise	10 10
Anti Clockwise	01 01
Left	00 10
Right	10 00

The following table gives you the logic to drive the dc motors.
1=5 v, 0= Gnd

The output from this micro controller is taken and given to a motor driver circuit which will amplify the incoming signal to the required level we use l293d Ic as motor driver. The following circuit gives you the circuit.



Mobile phone is connected to ear phones and the earphones are dissected in the following way



Positive terminal –Tip
Negative terminal-Ring
Above mentioned terminals are connected as per the circuit.

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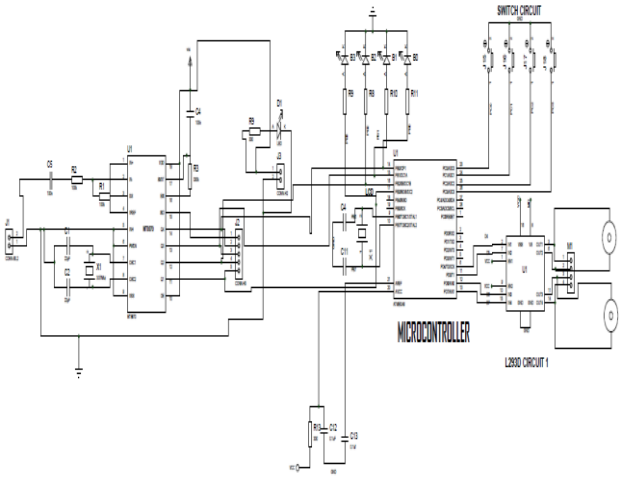

FIG 5.3: Circuit Diagram

6. SOFTWARE CODING

```
/*MAIN AIM OF THIS PROJECT IS TO CONTROL
THE ROBOT WITH THE PHONE USING DTMF
* dtmf_simple.c
 *
 * Created: 5/4/2013 12:50:34 PM
 *  Author: Technotran
 * Microcontroller: ATMega8
 * Frequence: 12MHz
 The main aim of this project is to control the robot by
using MObile. */
#define F_CPU 1200000UL
#include <avr/io.h>
#include <util/delay.h>
/* Q1,Q2,Q3,Q4 PINS OF DTMF board ARE
CONNECTED TO PB0,PB1,PB2,PB3 PINS OF THE
CONTROLLER MOTORS ARE CONNECTED TO PD4,
PD5, PD6, PD7 */
int main(void)
{
DDRB=0x00;              //DECLARING PORTB as
input
DDRD=0xF0;              //DECLARING PORTD as
output
   while(1)
   {
if((PINB & 0x02)==0x02) //if we press Button 2 from
Phone
          {
PORTD=0x50;             //robot will move in forward
direction
                          //delay
}
else if((PINB & 0x08)==0x08)      //if we press Button 8
from Phone
{
PORTD=0xA0;                       //robot will move in
Backward direction
}
else if((PINB & 0x04)==0x04)      //if we press Button 4
from Phone
{
PORTD=0x10;    //robot will move in left direction
}
else if((PINB & 0x06)==0x06)      //if we press Button 6
from Phone
{
PORTD=0x40;    //robot will move in right direction
}
 else if((PINB & 0x05)==0x05)     //if we press Button 5
from Phone .
{
PORTD=0x00;                       //robot will
stop
}
else if((PINB & 0x0a)==0x0aa)     //if we press Button 5
from Phone .
{
PORTD=0x00;                       //robot will stop
}
 }          //end of while loop
}          //end of main
```

7. RESULTS

7.1. Result:

This project "BLUETOOTH CONTROLLED ROBOT WITH HOME AUTOMATION USING ANDROID" used AT89S52 microcontroller. Wireless technology has brought one of the most important technological advances in today's communication field. By this project we developed a simple means to operate a robot by interfacing Bluetooth with microcontroller. Using different sensors we made the robot multipurpose and could be used in many applications depending on the requirement.

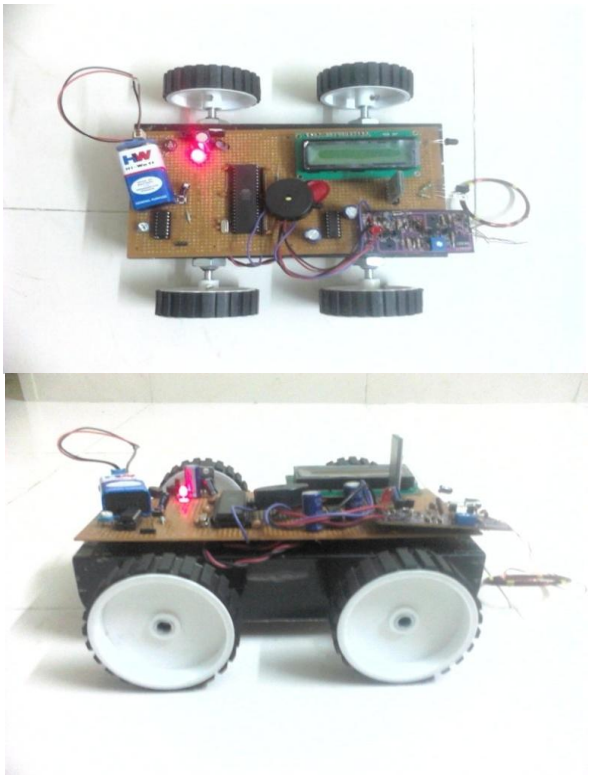

FIG 1: PROTOTYPE OF PROJECT

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8. CONCLUSION

8.1 Conclusion:

We have successfully implemented the entire circuit on the PCB with obstacle detection feature. Since all we need is a mobile call establishment to instruct the robot due to the cell phone's unending and cheap availability, this is highly feasible. The level of sophistication is quite low and hence its working is user friendly. Project can also be subjected to standardization and hence has a good future scope.

8.2. Future Scope:

This project is very useful in future, because in future the robots plays very important role so our project is very simple to construct by adding other features to this project leads to smarter than this one. The feature aspects are IR Sensors, Password protection, alarm phone dialer, and finally adding a camera (like a detector).

REFERNCES

[1] Embedded Systems-Mazidi and Mazidi, Pearson Publications,4th Edition.
[2] Wireless Communication-T.S.Rappaport, Prentice Hall Publications,2nd Edition.
[3] 3. Principles of Communication Engineering- J. M. Wozencraft and I. M. Jacobs,John Wiley Publications,3rd Edition
[4] [4] Schenker, L, "Pushbutton Calling with a Two-Group Voice-Frequency Code" The Bell system technical journal, vol 14,no. 2, Jan 2006.
[5] [5] M. Ali Yousuf, R. Montúfar Chavez Nava, and V. de la Cueva Cueva Hernández, "Robotic projects to enhance student participation, motivation and learning", Hernández Current Developments in Technology-Assisted Education ,pp 922-952, July 2008.
[6] [6] Robert Siwy, "Generation and Recognition of DTMF Signals with the Microcontroller MSP430", Texas Instruments Deutschland, October 2005.
[7] [7] "Cell phone based land rover" Liu, Simon & Silverman, Mark. November 2009 [online] Available: http://www.instructables.com/id/Cellphone-operated-Robot/ [accessed: Jan 2013].
[8] [8]http://www.datasheetcatalog.com/datasheets_pdf/M/T/8/8/MT8870.shtml
[9] [9]http://www.alldatasheet.com/datasheetpdf/pdf/STMICROELECTRONICS/L298.html
[10] [10]http://robosapiensindia.com/robomart/index.php?product_id=218&page=shop

Websites:

1. www.wikipedia.com
2. www.allaboutcircuits.com
3.www.electronics4u.com

BIOGRAPHIES

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