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MODELING & DESIGN OF DTMF TECHNIQUE BASED AUTOMATIC MOBILE SWITCHING & CONTROL OF ANY MACHINERY

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Abstract- The main scope of project is to send commands from one cell phone to be received by another cell phone mounted on the kit to receive the DTMF (Dual Tone Multi Frequency) mode commands which are then decoded. The corresponding codes are then fed to a microcontroller, programmed to recognize those codes to operate a relay as per the sent commands from sender's mobile and connected device will operated.

The aim of the proposed system is to develop a cost effective solution that will provide controlling of devices such as industrial devices, home appliances remotely and enable home security against intrusion in the absence of homeowner. The system provides availability due to development of a low cost system. The home appliances control system with an affordable cost was thought to be built that should be mobile providing remote access to the appliances and allowing home security.

Index Terms- DTMF (Dual Tone Multi Frequency), control system, home security, ICs.

1. INTRODUCTION

1.1 OVERVIEW

In this system, we are going to develop a cellular phone based home/office appliance. This system is designed for controlling arbitrary devices, it includes a cell phone (not included with the system kit, end user has to connect his/her cell phone to the system) which is connect to the system via head set. To active the cellular phone unit on the system a call is to be made and as the call is answered , in response the user would enter a two/three digit password to access the system to control devices. As the caller press the specific password , it results in turning on or off specific devices. The device switching .[2]

2. METHODOLOGY

2.1 Working Principle

Power supply of 230 volt is fed in to the transformer which step down that voltage in to 12volt supply. A full wave bridge rectifier is used to convert ac voltage in to dc value , then this
12 volt dc value fed in to voltage regulator which operates at 12volt dc which converts unregulated dc value in to regulated dc value. Voltage regulator is also used here to make good performance of transistors and ics what here used. Now a cell phone is connect with the circuit, when caller make call on that cell phone) ICs to generate DTMF corresponding to a number or code in the number pad and to detect the same number or code from its corresponding DTMF. In detail, a DTMF generator generates two frequencies corresponding to a number or code in the number pad which will be transmitted through the communication networks, constituting the transmitter section which is simply equivalent to a mobile set. In the receiver part, the DTMF detector IC, for example IC MT 8870 detects the number or code represented by DTMF back, through the inspection of the two transmitted frequencies. Now that frequency generated is fed in to microcontroller then transmit to relays after receiving necessary operating voltage relay starts switching on and off process of devices.

2.2 EMBEDDED SYSTEM

2.2.1 Introduction

An Embedded System is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. An embedded system is a microcontroller-based, software driven, reliable, real-time control system, autonomous, or human or network interactive, operating on diverse physical variables and in diverse environments and sold into a competitive and cost conscious market.[5]

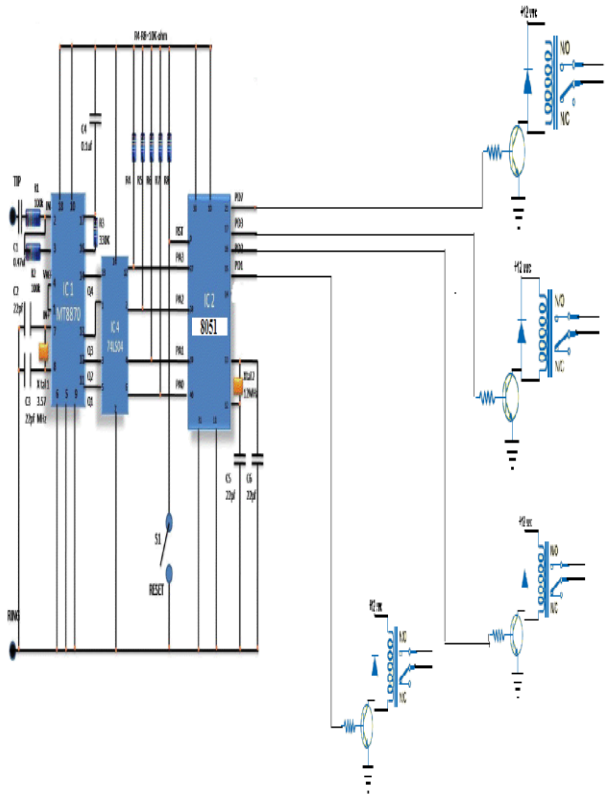

Figure-Working Diagram

2.3 Characteristics of Embedded System

- An embedded system is any computer system hidden inside a product other than a computer.
- They will encounter a number of difficulties when writing embedded system software in addition to those we encounter when we write applications
- Power consumption – Portable systems must run on battery power, and the software in these systems must conserve power

2.4 Classification

- Real Time Systems.
- RTS is one which has to respond to events within a specified deadline.
- A right answer after the dead line is a wrong answer.
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RTS CLASSIFICATION

- Hard Real Time Systems
- Soft Real Time System
-

HARD REAL TIME SYSTEM

- "Hard" real-time systems have very narrow response time.
- Example: Nuclear power system, Cardiac pacemaker.

SOFT REAL TIME SYSTEM

- "Soft" real-time systems have reduced constrains on "lateness" but still must operate very quickly and repeatable.
  Example: Railway reservation system – takes a few extra seconds the data remains valid.

User interface

Embedded systems range from no user interface at all dedicated only to one task to complex graphical user interfaces that resemble modern computer desktop operating systems. Simple embedded devices use buttons, LEDs, graphic or character LCDs (for example popular HD44780 LCD) with a simple menu system.[6]

2.5 Applications

- Mastering the complexity of applications.
- Reduction of product design time.
- Real time processing of ever increasing amounts of data.
- Energy production control
- Telephone switches
- Rocket & satellite control.
- Intelligent, autonomous sensors.
- Air Traffic Control

3. MICROCONTROLLER

3.1 Introduction

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many 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, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. [6]

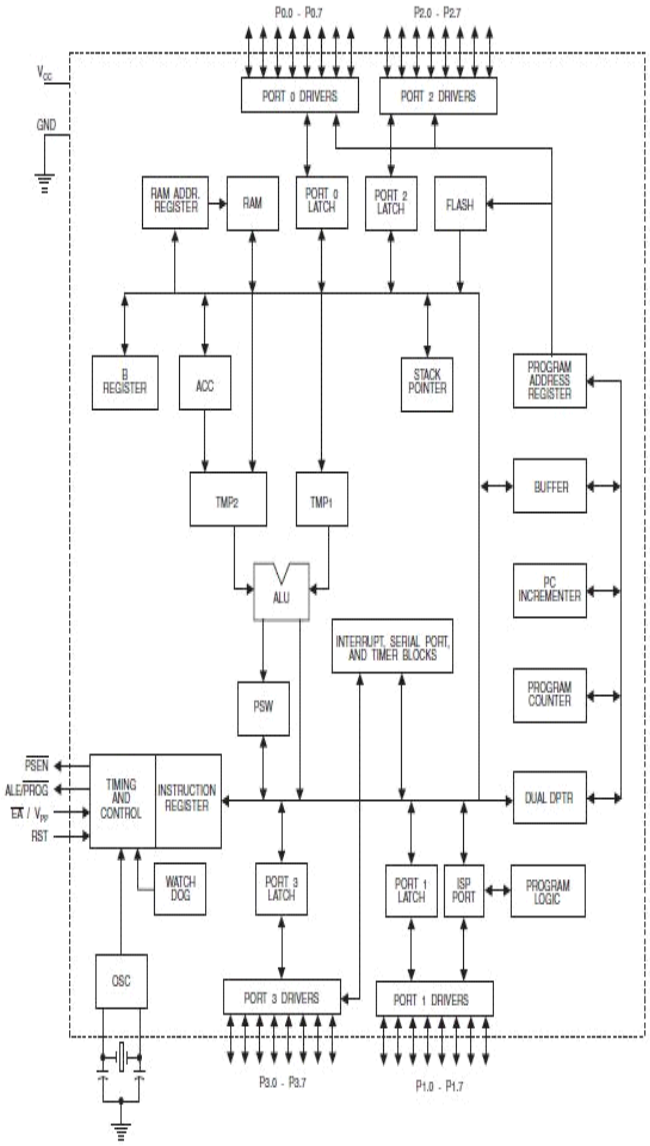

Fig. Architecture diagram of microcontroller

Oscillator Characteristics

XTAL1 and XTAL2 are the input and output, respectively, of an inverting amplifier which can be configured for use as an on-chip oscillator,. Either a quartz crystal or ceramic resonator may be used. To drive the device from an external clock source, XTAL2 should be left unconnected while XTAL1 is driven.

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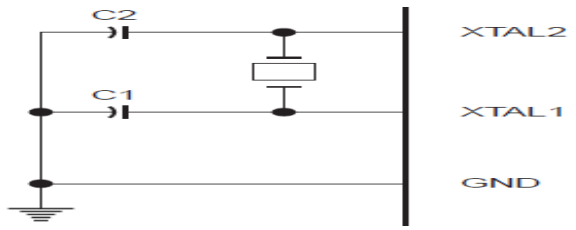


Figure- Oscillator Connections

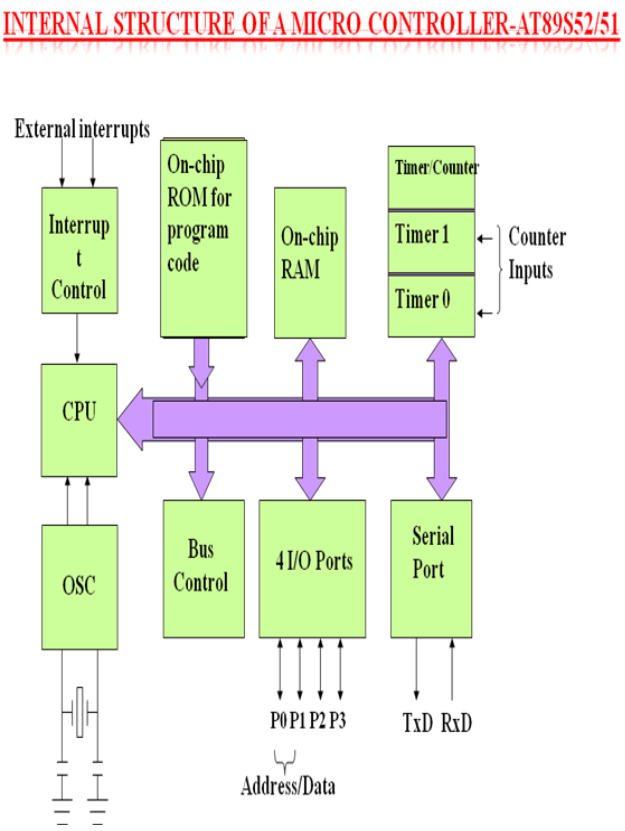
4. HARDWARE DISCRIPTION

4.1 Transformer(230/12)

In this project we use step down transformer, which converts 230/12 V ac, 1A .Three wires are used in output. One Green and yellow wire gives 500mA and another green and yellow wire gives 500mA.so, total output currant is 1A.[6]

4.2 Full Wave Central Tap Rectifier

For a positive half cycle of the input voltage, the polarities of the secondary voltages are shown in figure. This condition forward biases diode D1 and reverse biases diode D2. The current path is through D1 and the load resistor RL.



For a negative half cycle of the input voltage, the voltage polarities on the secondary are shown. This condition reverse biases D1 and forward biases D2. The current path is through D2 and RL. Because the output current during both the positive and negative portions of the input cycle is in the same direction through the load the

output voltage developed across the load resistor is a full wave rectified dc voltage.[5]

4.2.3 Wave form and circuit diagram

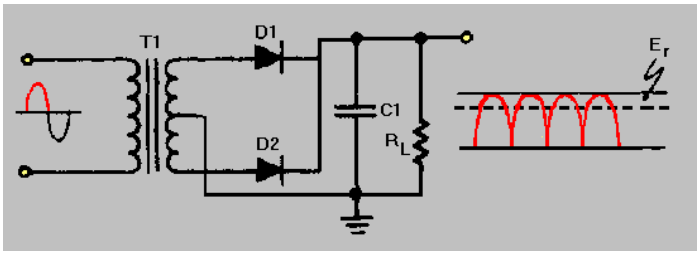


Figure- output waveform

4.3 Voltage Regulator

Any electrical or electronic device that maintains the voltage of a power source within acceptable limits. The voltage regulator is needed to keep voltages within the prescribed range that can be tolerated by the electrical equipment using that voltage.[5]

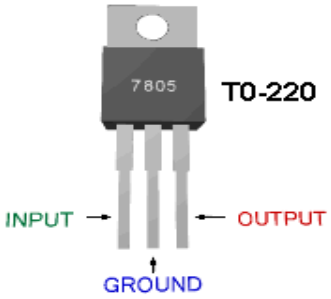


Fig. voltage regulator

4.4 DTMF Decoder

4.4.1 Description

Dual Tone Multiple Frequency (DTMF) codec is used to encode and decode the key strokes in a telephone. It can also be used to perform a basic data transfer operation. The MT8870D/MT8870D-1 is a complete DTMF receiver integrating both the band split filter and digital decoder functions. The filter section uses switched capacitor techniques for high and low group filters; the 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 on chip provision of a differential input amplifier, clock oscillator and latched three-state bus interface.[3]

4.4.2 Working

Telephone signaling is based on encoding keypad digits using two sinusoidal of different frequencies, hence the name DTMF. Each digit is represented by a low frequency and a high frequency sinusoid. The frequencies used were recommended by AT&T such that no two frequencies are integral multiples of each other. This facilitates correct decoding even in the presence of non linearity of filters which cause higher harmonics to be present.

4.4.3 Diagram

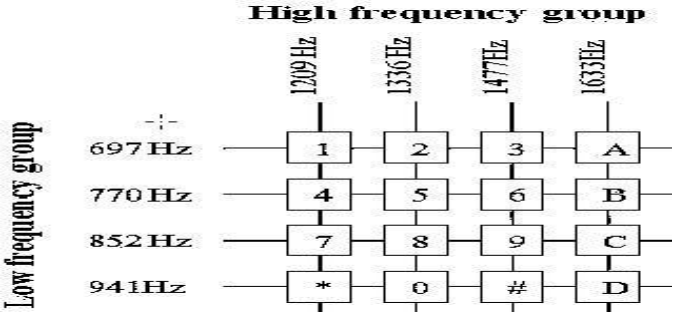


Fig. DTMF generator kit

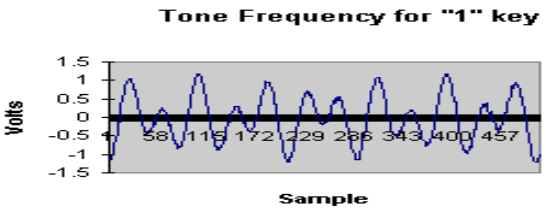


Fig: DTMF generated signal

It was also necessary to replicate the generation section of code in order to produce two sine waves. These two waves were then added together, and sent to the analog interface circuit ready for transmission. DTMF, or Dual Tone Multi Frequency, is a method of sending and receiving control information over a communications channel. The reader is probably most familiar with DTMF tones as heard on a modern push-button telephone.

4.4.4 Features

- Complete DTMF Receiver
- Low power consumption

- Internal gain setting amplifier
- Adjustable guard time

4.5 Inverter IC 7404

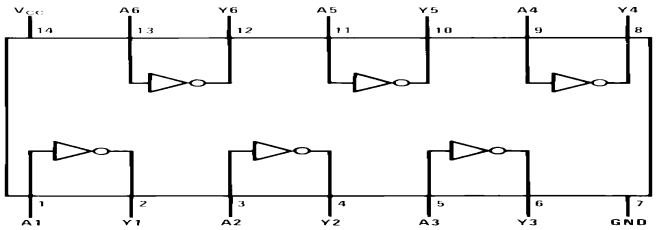


Figure Inverter IC 7404

4.5.2 Description

Outputs of one gate can be connected to inputs of another within the same chip or to another chip as long as they share the same ground. The figure to the left illustrates a basic circuit showing how to wire inputs and using LEDs to display outputs.

4.6 Diode 1N4007

Diodes are used to convert AC into DC these are used as half wave rectifier or full

wave rectifier. Three points must he kept in mind while using any type of diode.

- Maximum forward current capacity
- Maximum reverse voltage capacity
- Maximum forward voltage capacity

The number and voltage capacity of some of the important diodes available in the market are as follows: Diodes of number IN4001, IN4002, IN4003, IN4004, IN4005, IN4006,forward current capacity of 1 Amp. [6]

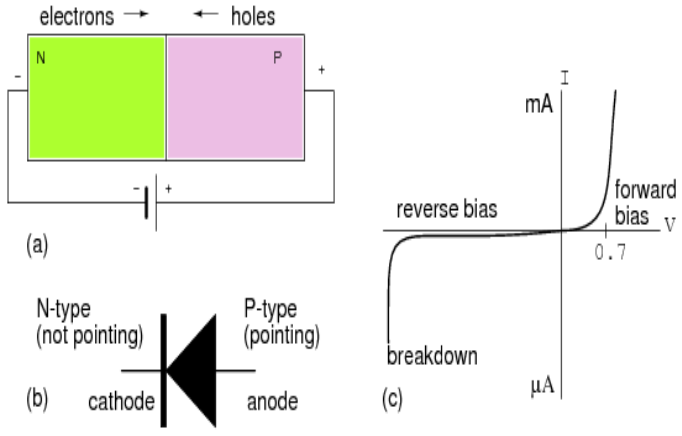


Fig. V-I characteristic of diode [6]

4.7 Capacitors

A capacitor or condenser is a passive electronic component consisting of a pair of conductors separated by a dielectric. When a voltage potential difference exists between the conductors, an electric field is present in the dielectric. This field stores energy and produces a mechanical force between the plates. The effect is greatest between wide, flat, parallel, narrowly separated conductors.[7]

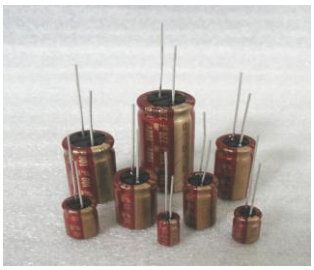


Figure Electrolytic Capacitor

4.8 Resistors

A resistor is a two-terminal electronic component designed to oppose an electric current by producing a voltage drop between its terminals in proportion to the current, that is, in accordance with Ohm's law:

$$V = IR \quad [5]$$

4.9 LED

A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices, and are increasingly used for lighting. When a light-emitting diode is forward biased (switched on), electrons are able to recombine with holes within the device, releasing energy in the form of photons.

Types of LED'S

Electronic Symbol:

Symbol of LED

5. APPLICATIONS

1. INDUSTRIAL CONTROL:

It is used to control or switch on any automatic process control machinery. Electric grid could be controlled remotely. Automatic production machinery could be controlled even during odd hours with your mobile phone.

2. HOME AUTOMATION:

To monitor status of home appliances. To control(ON/OFF) the home appliances according to there status when we are going away from home.

3.FARM AUTOMATION:

To control & monitor the various irrigation equipments in the farm.

6. ADVANTAGES

- Eliminates the continuous monitoring of appliances.
- Commands can be given through remote place, directly to the machine.
- By further modification security system can be added.
- Entire control is password protected.
- Easy to install & simple in operation.
- Low cost, high reliability & flexibility.

7. CONCLUSION

In the advancing world of 21st century there need to be controlling devices in almost all the places viz. home [controlling of various appliances], office [electronic authentication for access to a specific cabin, restricted area etc.], factory [control and instrumentation], public places [traffic signal control automatic railway crossing signal control etc.] etc. All these controls should be achieved via easily available public level interface like power line, telephone line or through internet. And the medium through which the objective is to be achieved depends on the device to be controlled and the placement of the device. For our project we have decided to use mobile as a medium for controlling devices since we are basically devising a system that will be user friendly, would be used to control the appliances from any corner of the world and will still maintain privacy and restrict access to the unauthorized user.

According to the recent trends we can use GSM for controlling the home appliances from anywhere in the world. With the help of GSM we can receive the system information via SMS. But compared to DTMF the cost of GSM is very high and hence in our project we are using DTMF.

8. FUTURE SCOPE

- Data logging facility can be included.
- Computer can be interfaced.
- System reliability can be improved.
- Wide spread of automation.

9. MODEL STRUCTURE

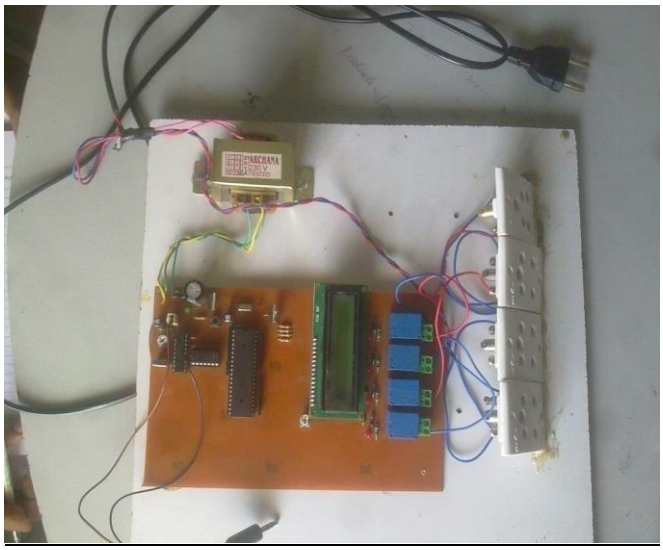


Figure. Block diagram

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