Bluetooth Based Anti-Loss Device

Project Report submitted in partial fulfillment of the requirement for the degree of

Bachelor of Technology

In

Electronics & Communication Engineering

under the Supervision of

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Certificate

This is to certify that project report entitled "**Bluetooth Based Anti-Loss Device**", submitted by Rohit Kumar Agrawal **(091069), Sahil Chhabra (091051), Siddharth Katoch (091031)** in partial fulfillment for the award of degree of Bachelor of Technology in Electronics & Communication Engineering to Jaypee University of Information Technology, Waknaghat, Solan has been carried out under my supervision.

This work has not been submitted partially or fully to any other University or Institute for the award of this or any other degree or diploma.

Vikas

Date: 29/05/2013

Mr. Vikas Haastir

Lecturer

Acknowledgement

With candor and pleasure we take this opportunity to express our sincere gratitude to our esteemed guide **Mr. Vikas Hastir.** Without his exemplary guidance and co-operation it would not have been possible for us to reach the completion of this project.

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Finally, we gratefully acknowledge the support, encouragement & patience of our families and friends.

Date: 29/05/2013

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Abstract

The project aims at creating an anti-loss device, for safeguarding personal belongings. The device will effectively and efficiently 'keep an eye' on the desired product for the user. It will basically be in a form of a tag coupled with the mobile's Bluetooth. The tag can be attached to anything that needs to be looked after, be it a personal belonging or even a child and it is connected with the mobile phone which will use the basic feature of Bluetooth available in almost all phones today. Thus, a specific tag would be associated to a phone with the help of the Bluetooth module (Bluetooth headset). The logic employed is that while the tagged item is within the specified range of the product, the item is considered secure. Therefore the permitted radius of safe distance shall be kept very short, close to 10 meters (the range of Bluetooth). As soon as the tagged item would leave the permitted distance from the associated phone, the tag would automatically start to beep with an alarming sound. This shall be accomplished by using a small speaker device built in the tag.

CHAPTER 1: INTRODUCTION

Losing your personal belongings can be a painful and heartbreaking experience, especially when the items are important and valuable. Important documents, identity card, hand phones are just representative examples that are lost so easily, but can hardly or impossible to get retrieve back. It happens in everyday: a person lays down a book, backpack or purse and comes back and the belongings are gone. Adequate educations are given, telling people never to leave their personal belongings unattended. True as it is, but the psychological stress of keeping an eye on your stuffs all the time it imposes on the owner is tremendous. Consider the scenario when at 6a.m, you are in the waiting area of the airport, waiting to board the long distance flight to London. Your luggage besides you contain all the important documents, and you keep reminding yourself to stay awake as people around is all suspicious looking and they might take your luggage away at any moment. You can neither take a nap nor read the newspaper as they will take away your attention on the luggage. What a daunting task! It just drives you crazy.

Besides personal items, children, elderly and pets are ever more problematic. Unlike the lug gages, which are stationary, children and elderly can wander off themselves without parents or supervisors noticing them. Once they ran away, have fun on the search operation or call the police to look for them!

In Project, an improved version of the anti-lost device is proposed, design and a functional prototype is to be worked out. The new device uses Bluetooth to link between the owner and his/her personal items. This device is generic in the sense that it can be used for many different applications other for anti-lost purpose, but the software has to be tailored to the specific use. This report will describe the hardware and software specifications of the device.

CHAPTER 2: BLUETOOTH

2.1. Why Use Bluetooth

During the last couples of years, Bluetooth has become a very popular technology for short-range wireless link between handheld devices. Devices regardless of their types can communicate with each other as long as they are Bluetooth enabled, Bluetooth has already secured its position in the market as the recognized standard in short-range wireless links and is still spreading rapidly. The number of Bluetooth chipsets shipped per year has doubled from 2002 to a total of 69 million chipsets in 2003 . The overwhelming popularity of Bluetooth means that the technology is easily accessed and any new products with Bluetooth incorporated will be easily accepted by the public, as they are already familiar and with the technology.

Bluetooth was primarily a cable replacement technology, enabling users to connect to a wide range of computing and telecommunications devices without using cables. However, the real magic of Bluetooth is that the technology can be used for applications other than cable replacement by forming Personal Area Network (PAN) and ad hoc connectivity.

Through the Discovery Service, PAN devices are capable of spontaneously joining into a network as they approach each other. This occurs only while the devices are in close proximity: the devices leave the network as they are removed from proximity. The opportunity for automatic, unconscious connections between mobile devices provides freedom for end-users, and also makes Bluetooth an ideal technology for my application.

2.2. Overview on Bluetooth

This section will cover the basic elements of Bluetooth which are related to my work Topics include the Bluetooth architecture, basic Bluetooth actions like *device discovery* and *service discovery.*

Bluetooth is a low cost, low power, short-range radio technology intended to replace cable connections between cellphones, PDAs and other portable devices. Ericsson Mobile Communications started developing the Bluetooth system in 1994, looking for a replacement to the cables connecting cellphones and their accessories. The Bluetooth system is named after a tenth-century Danish Viking king, Harald Blatand, who united and controlled Norway and Denmark. The first Bluetooth devices hit the market around 1999. The Bluetooth SIG is responsible for further development of the Bluetooth standard. Sony Ericsson, Intel, IBM, Toshiba, Nokia, Microsoft, 3COM, and Motorola are some of the companies involved in the SIG. The composition of the Bluetooth SIG is one of the major strengths of the Bluetooth technology. The mixture of both noticeable software and hardware suppliers participating in the further development of the Bluetooth technology ensures that Bluetooth products are made available to end users.

2.3. Bluetooth Architecture

The Bluetooth specification aims to allow Bluetooth devices from different manufacturers to work with one another, so it is not sufficient to specify just a radio system. Because of this, the Bluetooth specification does not only outline a radio system but a complete protocol stack to ensure that Bluetooth devices can discover each other, explore each other's services, and make use of these services.

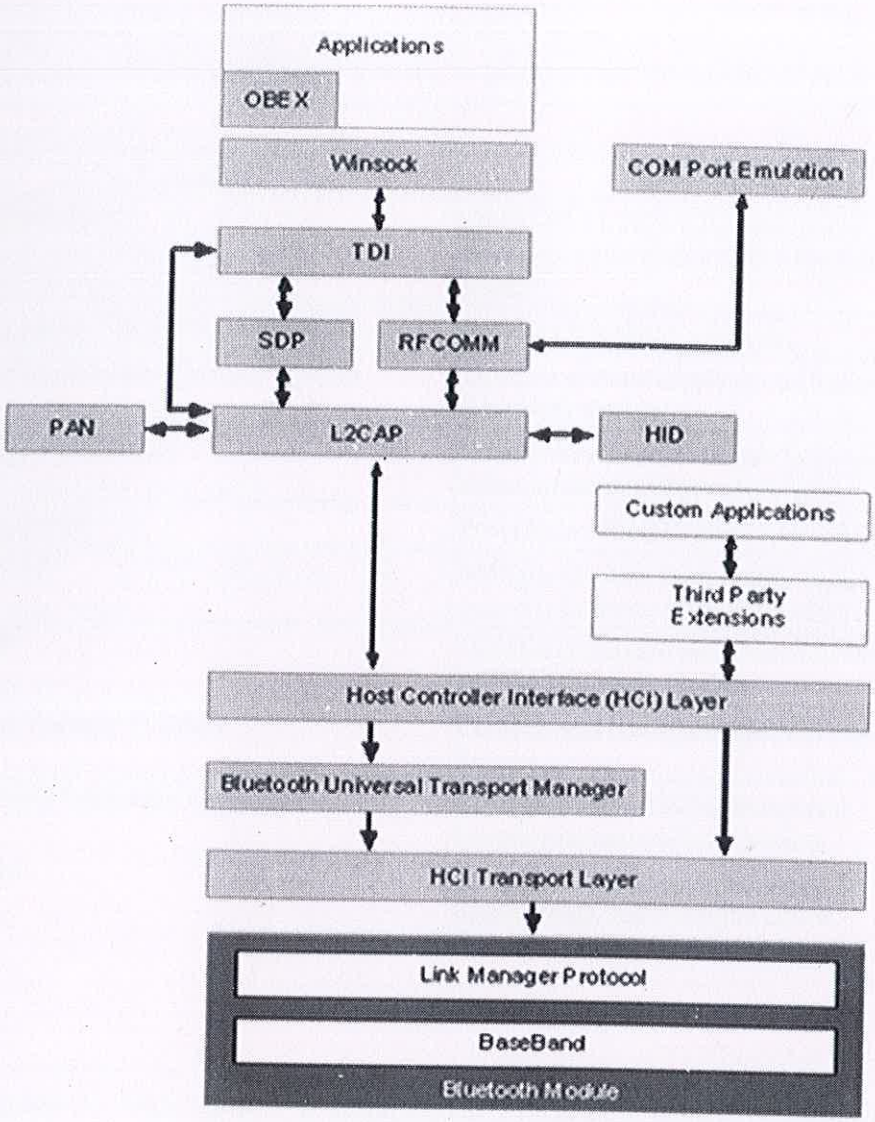

Figure 1:- Bluetooth Architecture

The Bluetooth stack is made up of many layers, as shown in Figure. The HCI is usually the layer separating hardware from software and is implemented partially in software and hardware/firmware. The layers below the HCI are usually implemented in hardware and the layers above the HCI are usually implemented in software. Table 1 gives a short description of each layer shown in Figure 1.

Layer	Description
Applications	Bluetooth profiles guide developers on how applications should use the protocol stack
Telephony Control System (TCS)	Provides telephony services
Service Discovery Protocol (SDP)	Used for service discovery on remote Bluetooth devices
WAP and OBEX	Provide interfaces to higher layer parts of other communications protocols
RFCOMM	Provides an RS-232 like serial interface
L2CAP	Multiplexes data from higher layers and converts between different packet sizes
HCI	Handles communication between the host and the Bluetooth module
Link manager Protocol	Controls and configures links to other devices
Baseband and Link Controller	Controls physical links, frequency hopping and assembling packets
Radio	Modulates and demodulates data for transmission and reception on air

Figure 2:- Description of Each Layer in the Bluetooth Architecture

The Bluetooth radio is the lowest layer of Bluetooth communication. The Industrial, Scientific and Medical (ISM) band at 2.4 GHz is used for radio communication. Note that several other technologies use this band as well. Wi-Fi technologies like IEEE 802.11b/g and kitchen technologies like microwave ovens may cause interference in this band.

The Bluetooth radio utilizes a signaling technique called Frequency Hopping Spread Spectrum (FHSS). The radio band is divided into 79 sub-channels. The Bluetooth radio uses one of these frequency channels at a given time. The radio jumps from channel to channel spending 625 microseconds on each channel. Hence, there are 1600 frequency hops per second. Frequency hopping is used to reduce interference caused by nearby Bluetooth devices and other devices using the same frequency band.

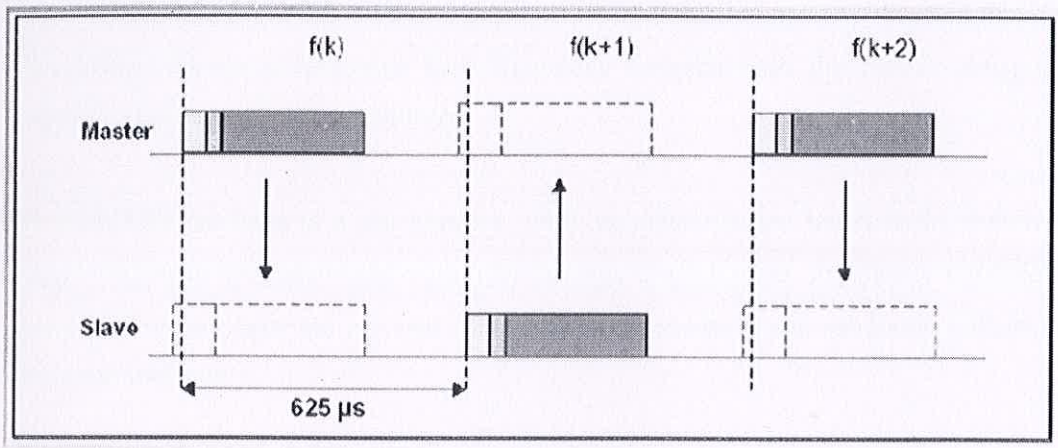

Figure 3:- Channel Allocation between Master and Slave

Every Bluetooth device is assigned a unique Bluetooth address, being a 48-bit hardware address equivalent to hardware addresses assigned to regular Network Interface Cards (NICs). The Bluetooth address is used not only for identification, but also for synchronizing the frequency hopping between devices and generation of keys in the Bluetooth security procedures.

2.4. Piconet

A *piconet* is the usual form of a Bluetooth network and is made up of one *master* and one or more *slaves.* The device initiating a Bluetooth connection automatically becomes the master. A piconet can consist of one master and up to seven active slaves. The master device is literally the master of the piconet. Slaves may only transmit data when transmission-time is granted by the master device, also slaves may not communicate directly with each other, and all communication must be directed through the master. Slaves synchronize their frequency hopping with the master using the master's clock and Bluetooth address.

Piconets take the form of a star network, with the master as the center node, shown in Figure. Two piconets may exist within radio range of each other. Frequency hopping is not synchronized between piconets, hence different piconets will randomly collide on the same frequency.

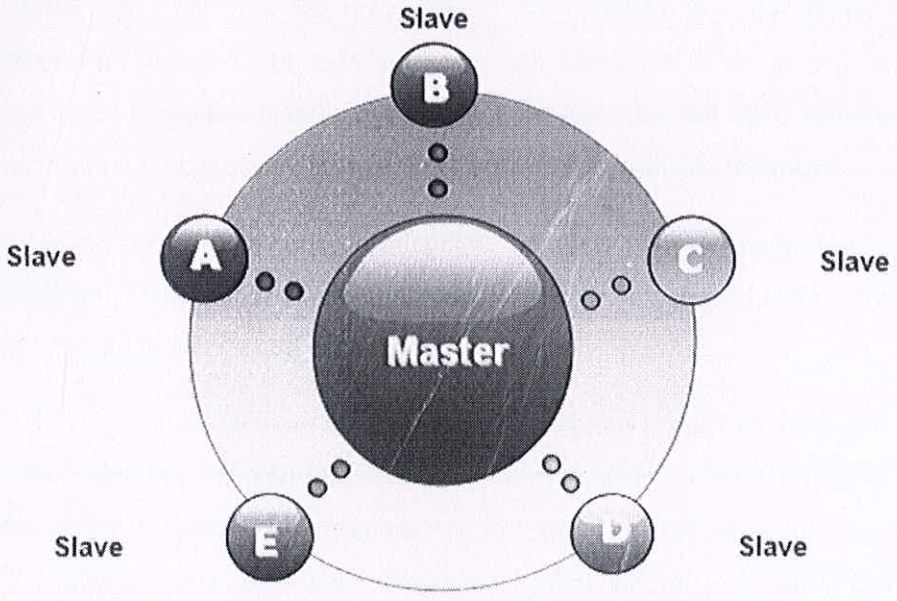

Figure 4:- Piconet structure

CHAPTER 3: DTMF (DUAL TONE MULTI FREQUENCY SIGNALLING)

3.1. Why DTMF?

As we proceeded with our project, we faced a problem that forced us to implement the concept of DTMF in it. As the connection was established between the Bluetooth module and the mobile, there was no data flowing through it, hence the system detected this as a theft. So, we implemented the use of DTMF decoder in our part.

It was useful as now we could send data over the circuit and the problem was solved. This happened by pressing a key through the phone and DTMF decoder circuit decodes the key frequencies into a signal which was fed in the system.

DTMF stands for Dual-Tone-Multi-Frequency. Its standard was developed by Bell Laboratories. And is used for telecommunication signaling over analog telephone lines in the voice frequency band between telephone handsets and other communication devices and the switching center. It is used for tone dialing using push buttons.

Whenever we press push buttons on telephone handsets two pre assigned frequencies will transmit and we can assign some functionality to that key or group of keys by which can control remote devices using DTMF.

The DTMF is a popular signaling method between telephones and switching centers. It is also used for signaling between the Telephone network and computer networks. It uses speech frequency signals. DTMF signals are the superposition of 2 sine waves with different frequencies. Dual Tone Multi Frequency System (DTMF), is a touch pad dialing tone.

It allow users and devices to dial at much higher rate because of the uniformity of numbers. Each digit corresponds to a high frequency and a low frequency and both are transmitted simultaneously. It works by sending two sinusoids for each symbol pressed on the telephone keypad. The tones are divided into two groups

- Low group: 697 Hz, 770 Hz, 852 Hz, and 941 Hz.
- High group: 1209 Hz, 1336 Hz, and 1477 Hz.

3.2 IC MT 8870

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.

This IC detects the dial tone from a telephone line and decodes the keypad pressed on the remote telephone. The dial tone we heard when we pick up the phone set is call Dual Tone Multi-Frequency, DTMF in short. The name was given because the tone that we heard over the phone is actually made up of two distinct frequency tone, hence the name dual tone. The DTMF tone is a form of one way communication between the dialer and the telephone exchange.

A complete communication consists of the tone generator and the tone decoder. In this article, we are use the IC MT8870DE, the main component to decode the input dial tone to 5 digital outputs. These digital bits can be interface to a computer or microcontroller for further application (e.g. remote control, phone line transfer operation, etc.).

The MT-8870 is a full 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. The M-8870-02 can also inhibit the decoding of fourth column digits

3.3 Pin Diagram

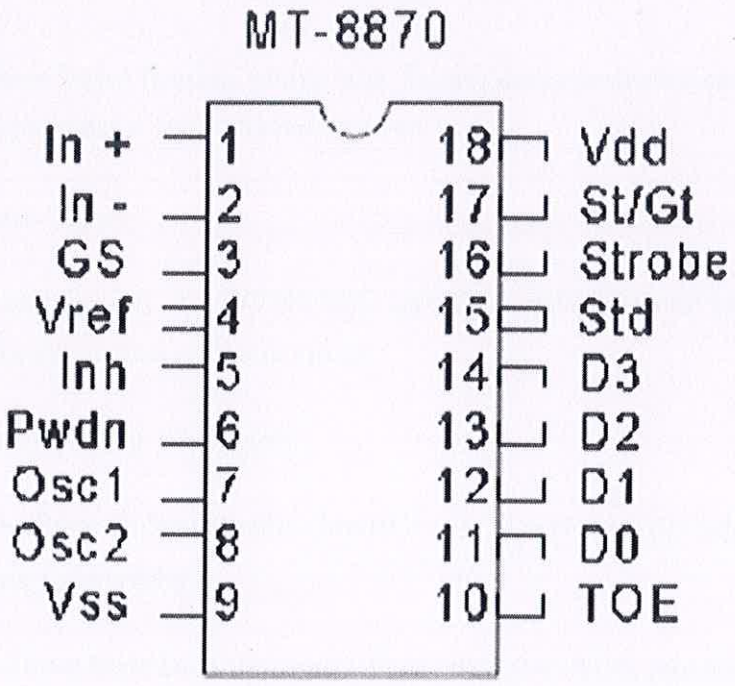

Figure 5:- IC MT8870 Pin Diagram

3.3.1 Pin Description

1. **IN+** **Non-Inverting Op-Amp (Input)**.

2. **IN-** **Inverting Op-Amp (Input)**.

3. **GS** **Gain Select.** Gives access to output of front end differential amplifier for connection of feedback resistor.

4. **V-Ref** **Reference Voltage (Output).** Nominally VDD/2 is used to bias inputs at mid-rail.

5. **INH** **Inhibit (Input).** Logic high inhibits the detection of tones representing characters A, B, C and D. This pin input is internally pulled down.

6. **PWDN** **Power Down (Input).** Active high. Powers down the device and inhibits the oscillator. This pin input is internally pulled down.

7. **OSC1** **Clock (Input)**.

8. **OSC2** **Clock (Output)**. A 3.579545 MHz crystal connected between pins OSC1 and OSC2 completes the internal oscillator circuit.

9. **VSS** **Ground (Input)**. 0 V typical.

10. **TOE** **Three State Output Enable (Input).** Logic high enables the outputs D0-D3. This pin is pulled up internally.

11-14. **D0-D3 Three State Data (Output).** When enabled by TOE, provide the code corresponding to the last valid tone-pair received. When TOE is logic low, the data outputs are high impedance.

15. StD Delayed Steering (Output). Presents a logic high when a received tone-pair has been registered and the output latch updated; returns to logic low when the voltage on St/GT falls below VTSt.

16. ESt Early Steering (Output). Presents a logic high once the digital algorithm has detected a valid tone pair (signal condition). Any momentary loss of signal condition will cause ESt to return to a logic low.

17. St/GT Steering Input/Guard time (Output) Bidirectional. A voltage greater than VTSt detected at St causes the device to register the detected tone pair and update the output latch. A voltage less than VTSt frees the device to accept a new tone pair. The GT output acts to reset the external steering time-constant; its state is a function of ESt and the voltage on St.

18. VDD Positive power supply (Input). +5 V typical

3.3.2 Functional Description

The MT88700 DTMF receiver offers small size, low power consumption and high performance. Its architecture consists of a bandsplit filter section, which separates the high group tones, followed by a digital counting section which verifies the frequency and duration of the received tones before passing the corresponding code to the output bus.

3.3.3 Filter Section

Separation of the low-group and high group tones is achieved by applying the DTMF signal to the inputs of two sixth-order switched capacitor band pass. Filters, the bandwidths of which correspond 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.

3.3.4. Decoder Section

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 standard DTMF frequencies. A complex averaging algorithm protects against tone simulation by extraneous signals such as voice while

Basic Steering Circuit provides tolerance to small frequency deviations and variations. This averaging algorithm has been developed to ensure an optimum combination of immunity to talk-off and tolerance to the presence of interfering frequencies (third tones) and noise. When the detector recognizes the presence of two valid tones (this is referred to as the "signal condition" in some industry specifications) the "Early Steering" (ESt) output will go to an active state. Any subsequent loss of signal condition will cause ESt to assume an inactive state.

3.3.5. Steering Circuit

Before registration of a decoded tone pair, the receiver checks for a valid signal duration (referred to as character recognition condition). This check is performed by an external RC time constant driven by ESt. Logic high on ESt causes vc to rise as the capacitor discharges.

3.4. Table for different inputs at different keys

F_{LOW}	F_{HIGH}	Key (ref.)	OE	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							

Figure 6:- Table showing frequency values for each key and its corresponding digital value.

(Table taken from IC MT 8870 datasheet)

CHAPTER 4: MICROCONTROLLER 8051

Microcontroller is an IC of family 8051 series. This is really specialized IC having all the features available with 8085 and in addition to that other features like processor core, memory, and programmable I/O peripherals. This type of IC is self sufficient, can work solely without any help from other IC's. This Type of IC's are used in Automobile companies, embedded systems, remote control devices.

This type of IC is used to perform function on its own, i.e. Automatic control is handled here. This IC is most advance version of microprocessor which can control other process. This IC has its own memory, I/O controls, interrupts Etc. Microcontroller has inbuilt RAM or ROM and inbuilt timer. It has inbuilt serial port. It has separate memory to store program and data. It consists of many functional pins .In this Boolean operation is directly possible. It takes few instructions to read and write data from external memory.

A designer will use a Microcontroller to

1. Gather input from various sensors
2. Process this input into a set of actions
3. Use the output mechanisms on the Microcontroller to do something useful

The 'general purpose' attribute of a Microcontroller is very significant, and shouldn't be overlooked. A general purpose Microcontroller is a very powerful tool that allows a designer to create a special purpose design. The design becomes partially hardware and partially software. There is great flexibility in the software end, as the designer can create practically unlimited variations on the design by changing the software.

A Microcontroller has several major sections that are pretty typical no matter which type or version of Microcontroller you end up using.

4.1. RAM

RAM means Random Access Memory. It is general purpose memory that can store data or programs. RAM is 'volatile', which means when the power is shut off, the contents of the memory is lost. Most personal computers have several megabytes of RAM. Most microcontrollers have some RAM built into them, but not very much. 256 bytes is a fairly common amount. Some have more, some have less.

4.2. ROM

ROM is Read Only Memory. This is typically memory that is programmed at the factory to have certain values. It cannot be changed, but it can be read as many times as you want. ROM is typically used to store programs and data that doesn't change over time. Many Microcontrollers have lots of ROM. Unfortunately, unless you are ordering thousands of parts, the ROM is useless to you, and in fact is wasting address space. Most individuals stay away from controllers with difference between traditional lights and LED lights.

4.3. Pin Diagram

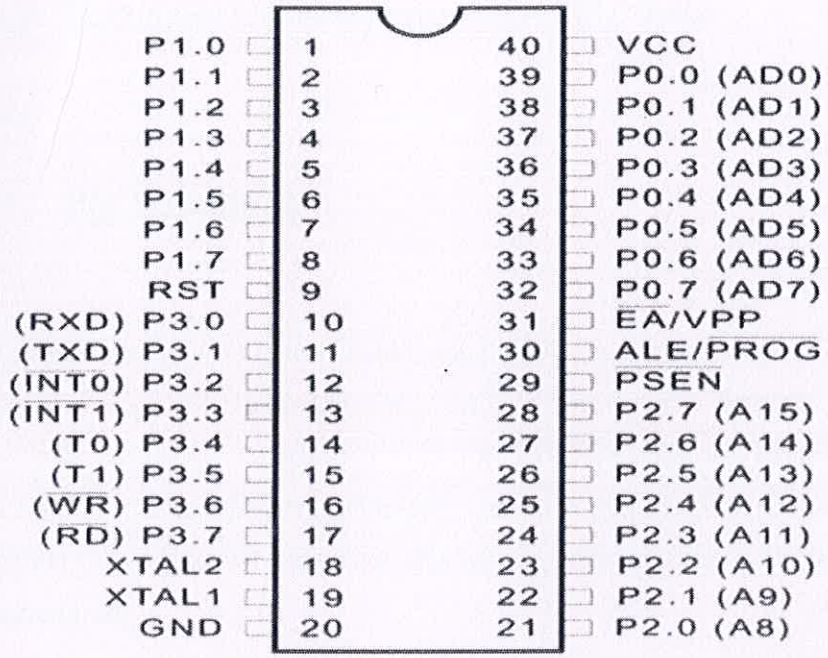

Figure 7:- Pin diagram of IC 8051. (Figure taken from Wikipedia)

4.4. Features

- 64 KB on chip program memory.
- 128 bytes on chip data memory (RAM).
- 128 user defined software flags.
- 8-bit data bus
- 16-bit address bus
- 32 general purpose registers each of 8 bits
- 16 bit timers (usually 2, but may have more, or less).

- 2 internal and 2 external interrupts.
- Bit as well as byte addressable RAM area of 16 bytes.
- Four 8-bit ports, (short models have two 8-bit ports).
- 16-bit program counter and data pointer.
- 1 Microsecond instruction cycle with 12 MHz Crystal.

4.5. Pin Functions

ALE/PROG: Address Latch Enable output pulse for latching the low byte of the address during accesses to external memory. ALE is emitted at a constant rate of 1/6 of the oscillator frequency, for external timing or clocking purposes, even when there are no accesses to external memory. (However, one ALE pulse is skipped during each access to external Data Memory.) This pin is also the program pulse input (PROG) during EPROM programming.

PSEN: Program Store Enable is the read strobe to external Program Memory. When the device is executing out of external Program Memory, PSEN is activated twice each machine cycle (except that two PSEN activations are skipped during accesses to external Data Memory). PSEN is not activated when the device is executing out of internal Program Memory.

EA/VPP: When EA is held high the CPU executes out of internal Program Memory (unless the Program Counter exceeds 0FFFH in the 80C51). Holding EA low forces the CPU to execute out of external memory regardless of the Program Counter value. In the 80C31, EA must be externally wired low. In the EPROM devices, this pin also receives the programming supply voltage (VPP) during EPROM programming

XTAL1: Input to the inverting oscillator amplifier.

XTAL2: Output from the inverting oscillator amplifier.

Port 0: Port 0 is an 8-bit open drain bidirectional port. As an open drain output port, it can sink eight LS TTL loads. Port 0 pins that have 1s written to them float, and in that state will function as high impedance inputs. Port 0 is also the multiplexed low-order address and data bus during accesses to external memory. In this application it uses strong internal pull-ups when emitting 1s. Port 0 emits code bytes during program verification. In this application, external pull-ups are required.

Port 1: Port 1 is an 8-bit bidirectional I/O port with internal pull-ups. Port 1 pins that have 1s written to them are pulled high by the internal pull-ups, and in that state can be used as inputs. As inputs, port 1 pins that are externally being pulled low will source current because of the internal pull-ups.

Port 2: Port 2 is an 8-bit bidirectional I/O port with internal pull-ups. Port 2 emits the high-order address byte during accesses to external memory that use 16-bit addresses. In this application, it uses the strong internal pull-ups when emitting 1s.

Port 3: Port 3 is an 8-bit bidirectional I/O port with internal pull-ups. It also serves the functions of various special features of the 80C51 Family as follows:

Port Pin Alternate Function

P3.0 RxD (serial input port)

P3.1 TxD (serial output port)

P3.2 INT0 (external interrupt 0)

P3.3 INT1 (external interrupt 1)

P3.4 T0 (timer 0 external input)

P3.5 T1 (timer 1 external input)

P3.6 WR (external data memory write strobe)

P3.7 RD (external data memory read strobe)

VCC: Supply voltage

VSS: Circuit ground potential

CHAPTER 5: SYSTEM CONFIGURATION

5.1. System Design

The whole system can be divided into two parts: the host and the tags (Figure). The single host is kept by the owner and is basically a Bluetooth enabled pocket PC. The tags can be multiple in numbers and are to be put together with the items to be protected.

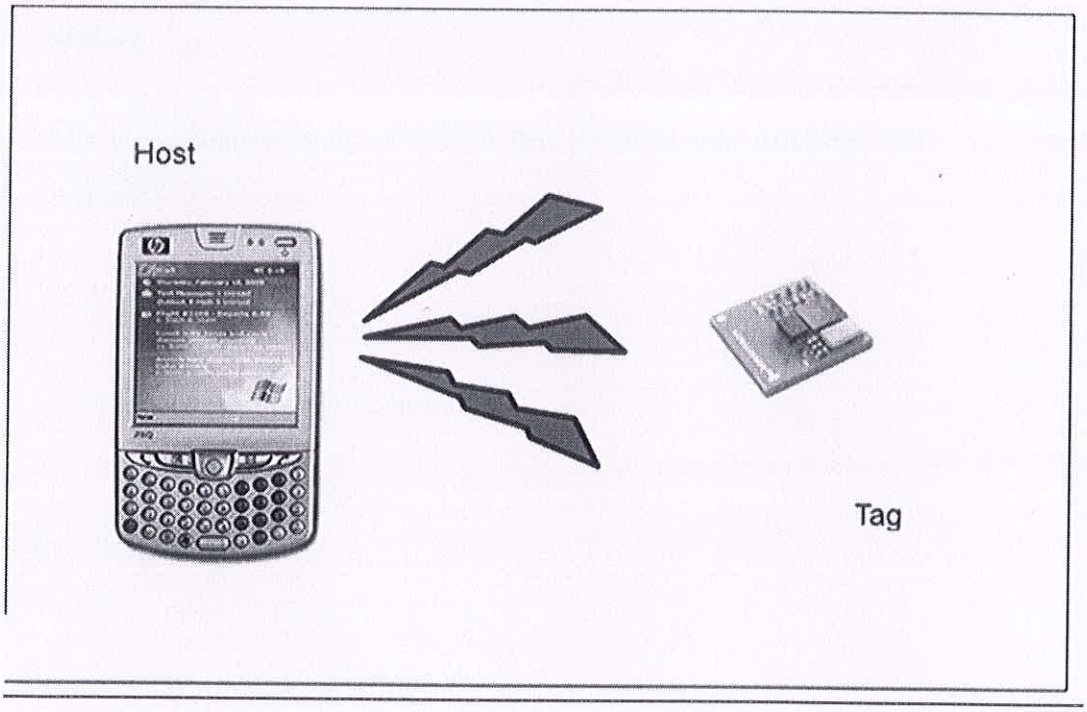

Figure 8:- System Design Showing the Tag and the Host (Mobile Phone)

5.2. System Requirement

The requirement of the system is as follows:

1. When the item has been moved away from the user outside a predefined distance, the host will alert the user by triggering the alarm on the tag.

2. The host should only monitor the tag but not other Bluetooth devices.

3. The tag should be small in size so that it can fit into handbags and luggage.

4. Cannot be jammed easily.

5. Additional functions can be included.

5.3. Tag Design

The tag should serve the following tasks:

1. Wait for a connection from the host.

2. When no connection request or data is received within a certain time period, set-off the alarm.

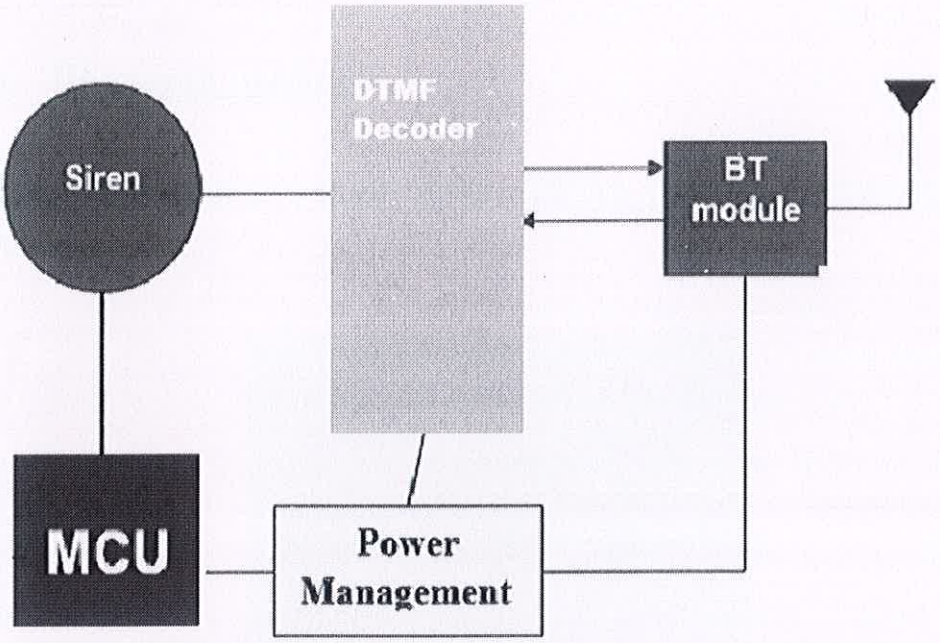

Figure 9:- Tag Design and Its Structure

5.4. Hardware Description

The block diagram of the tag hardware is shown in figure. It consists of 4 main parts:

1. Bluetooth module.
2. Micro controller
3. DTMF decoder.

4. Siren

5. Battery

5.5. Bluetooth module

A Bluetooth module is a single wireless solutions consisting of hardware and software.

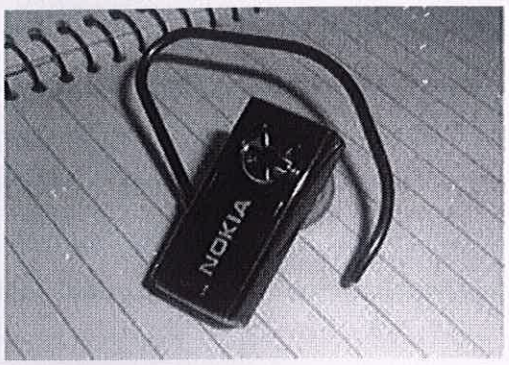

Figure 10:- Bluetooth Headset

The Bluetooth module In standard configuration the module includes a baseband processor with on board Flash memory, a radio front-end, antenna interface, supporting circuitry, together with some higher-level software protocols and applications such as L2CAP, SDP are resided in the Flash.

In our case we have used a Bluetooth headset by nokia. On opening the headset a Bluetooth module was recovered, with a pairing/connecting button. It is powered by an inbuilt battery which is rechargeable and acts as a plus point for our system. The output from the inside circuitry which was acting as an input to the speaker of the headphone, now acts as an input to our system.

5.6. DTMF decoder circuit

The DTMF circuit used decodes the input from the mobile phone, which is the dual tone created by pressing of the key. This input signal reaches the DTMF decoder circuit using the Bluetooth module, which is a Bluetooth headset and creates a frequency.
Now this input is fetched in the DTMF decoder circuit which splits the input and processes it to convert it into a digital signal.
Now, this output from the circuit acts as an input to the micro controller, and following operations are done, which basically include that if there is no key pressed no output is generated, hence the alarm is triggered.

5.7. Micro-controller

Microcontroller used is an IC of family 8051 series. This is really specialized IC having all the features available within 8085 and in addition to that other features like processor core, memory, and programmable I/O peripherals. This type of IC is self sufficient, can work solely without any help from other IC's. These types of IC's are used in Automobile companies, embedded systems, remote control devices.

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program and data. It consists of many functional pins on the IC. In this Boolean operation is directly possible. It take few instructions to read and write data from external memory.

5.8. Siren

Since the tag is usually located inside the luggage, the alarm must be able to generate a noise so that it can catch people attention. Therefore, a siren is driven by the micro-controller. It generates a binary pulse and the siren keeps on buzzing until it is switched off.

5.9. Power Management

The tag is powered by a 9 V lithium battery, which is step down to 5 V by voltage regulator IC 7805. As the DTMF circuit and the micro controller works on 5 V and the siren used is working on 9 V. A battery of 9V is used from which siren is driven and all the parts are driven including the DTMF decoder circuit and the micro controller using the voltage regulator and stepping down it to 5V. .

5.10. Circuit Diagram

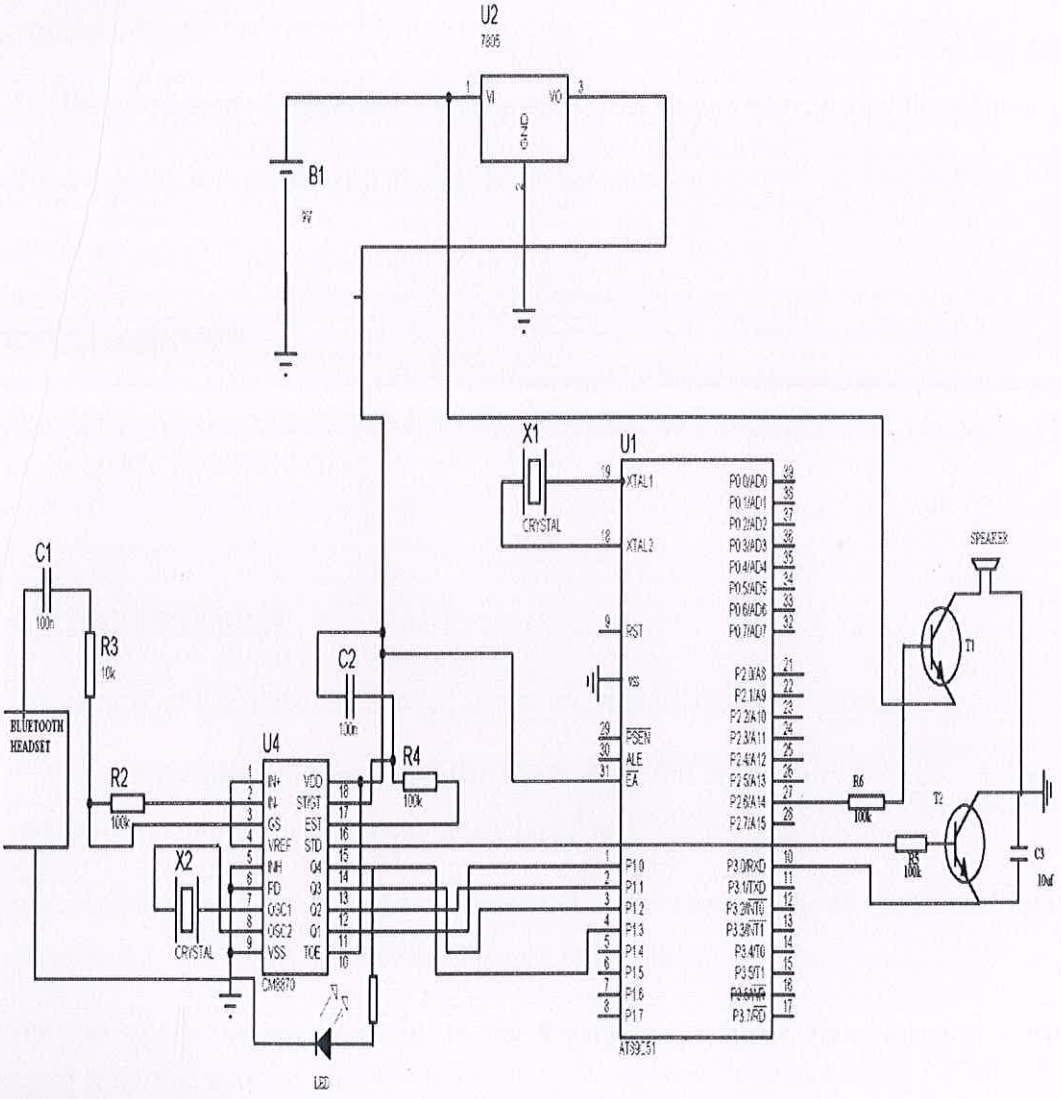

Figure 10:- Circuit diagram of the system, showing the interfacing of components

5.11. Working of The Project

- **DEVICE PAIRING**

The Bluetooth headset is connected to the mobile phone by switching on the Bluetooth and searching for the nearby Bluetooth devices.

The button on headset is pressed continuously so that it pairs with the mobile phone.

Now the headset is paired with the mobile phone.

- **DATA SENDING**

Any key is continuously pressed from the phone and data in the form of frequency is sent to the DTMF decoder circuit.

- **DTMF DECODER**

The input from the Bluetooth headset acts as an input to the DTMF circuit.

It processes the input and convert it into the digital form as the input is an analog signal, and convert it into its corresponding digital output.

For example:- key 2 was pressed , it generated a frequency which was processed by the circuit and a 4 bit digital output was obtained, that is 0010.

The special function of the circuit is that it generates a high output whenever a valid signal is fetched in the system.

	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

Figure 12:- Table showing the corresponding frequency values for each key

- **MICRO CONTROLLER**

The digital output generated from the DTMF circuit is fetched in the micro controller which is drawn from the pin no:-15 of the DTMF decoder circuit.

As this pin is high whenever a valid signal is fetched.

The alarm is not triggered until this pin remains high, which means that signal is being received by the circuit and the device is in the range.

When this input becomes low, this means:

a) Either the device is out of range as data is not received and the alarm will be triggered.

b) Or, the key is not presses which acts as an input and in this case also alarm will be triggered. (Limitation of the project).

- **CODE**

```
$regfile = "8053.dat"

Cls

Aa:

If P3.0 = 1 Then

Cls

P2.6 = 1

Wait 1

P2.6 = 0

Wait 1

P2.6 = 1

Goto Aa

End If

End
```

- **SIREN**

Whenever the alarm is to be triggered a binary pulse is generated by the microcontroller and fed to the siren and it blows alarming the user.

LIMITAITONS

- As the DTMF decoder circuit is used, user need to continuously press the key on his mobile phone so as the data is continuously send for the working of the project.

- The Bluetooth consumes power of the mobile phone and the battery of the mobile phone is discharged soon.

FUTURE WORK

1. Designing of an interface to connect the tag and the mobile phone, which is the developing of the software which will be installed in the phone which connects and monitors the tag automatically, so that user don't have to continuously press the key so as to transmit data.

2. The software can be the android application for the phone.

CONCLUSION

We have successfully built the device and it is working properly. Many problems were encountered, but we were able to overcome them with the only limitation of continuous pressing of the key. This can be taken as a future work done by us or can be done by others, whoever refers or wishes to work on the project.

The device works properly under the range and alarm is triggered whenever it goes out of range.

Also, its small size, low cost, are essential factors which make this device a good product.

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