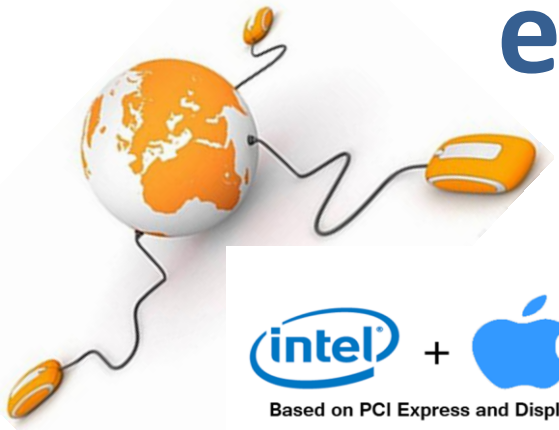
# Heritage Institute Of Technology

## ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT

Presents



# ece – DIARY

*Edition : March, 2012*




## THUNDERBOLT TECHNOLOGY

it take a mere 30 seconds to transfer a full-length HD movies (around 1.5 – 2.5 GB in size)

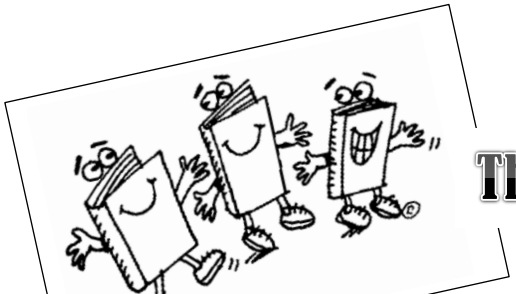
# SYMPHONY' 12

SYMPHONY'12 – The first Techno-Cultural Meet of ECE

An exclusive Coverage


GSM - Jammer

Cell phone operated Land Rover



## The art corner

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## THE ART CORNER

# THUNDERBOLT TECHNOLOGY

You may have heard that Apple has recently refreshed their Macbook Pro product line and the latest arrival comes with a new port, known as the Thunderbolt technology.

**Thunderbolt technology :**

People have always used a USB port before (unless you are still using a 486MHz PC). A USB port allows to plug in a device to your computer and instantly access it from the system. Each USB port only allows one device (while you can use a USB hub to extend it to support multiple devices, it is still theoretically a one-one connection) and every time you buy a new laptop, you have to wonder how many USB ports it comes with. Thunderbolt eliminates all these problems and adds a new dimension to how you connect your external devices to your computer.

Thunderbolt technology is a new breakthrough technology that work like (much better than) the USB port, but allows you to daisy chain multiple devices (up to 6 devices) together. All Thunderbolt devices use the same connector (unlike USB technology that uses a male – female type of connection), so you can connect one device to another with interoperable cables. You just need one Thunderbolt port to chain them all, and you don't have to worry how many USB ports your computer comes with, and whether you need a USB hub or not.

Thunderbolt Technology is a transformational I/O innovation that provides a leap in performance over current I/O technologies with 10 Gbps of full-duplex bandwidth per channel. It significantly simplifies the end-user experience by concurrently supporting data (PCI Express*) and display (DisplayPort) connections over a single cable. Thunderbolt products may be connected using electrical or optical cables. Thunderbolt technology enables flexible and innovative system designs by allowing multiple, high-performance, PCI Express and DisplayPort devices to attach to a computer through a single physical connector.

**The true advantage :**

The ability to daisy chain multiple devices together is only a small part of what Thunderbolt can do. The true advantage of Thunderbolt technology is the communication speed between itself and the connected devices. The Thunderbolt technology can transfer data at the rate of 10Gbps (compared to USB 2.0 – 120MBps and USB 3.0 – 400MBps). To illustrate how fast it is:

- It take a mere 30 seconds to transfer a full-length HD movies (around 1.5 – 2.5 GB in size), or
- A mere 10 minutes to transfer a year of continuous MP3 playback.

That is how fast Thunderbolt technology is. What makes it even better is that it is bi-directional, which means that you can transfer and receive data at the same time, both with the same 10Gbps bandwidth. Best of all, the last device in the daisy chain will enjoy the full bandwidth as well. Imagine the massive library of music and videos you have in your computer, you can now transfer them in/out at lightning speed.

## Using Thunderbolt port for your monitor?

In today's technology, It is still needed to have a dedicated port to connect your monitor to the computer. Be it the obsolete VGA, or DVI or the latest HDMI connection, there is still no way that one can connect the HD-capable monitor to the USB port.

The Thunderbolt port utilizes the Display Port protocol to deliver high display performance on PC. With the use of adapter, it can also support the existing VGA, DVI, DisplayPort and HDMI interface. This means that one can now hook up your monitor onto the Thunderbolt port and enjoy HD performance.

## The benefits - Thunderbolt Technology :

End user will definitely be benefited from the fast transfer speed that comes with Thunderbolt. One can now backup terabytes of data in seconds, or even do video editing and get it to sync on the fly.

In today's technologies, the more powerful your computer is, the bigger is the size of the computer terminal. With Thunderbolt technology, a powerful computer can now come in small-form factor. You no longer need dedicated slots for graphic card, sound card or even a Gigabit Ethernet card. All these hardware can now exist as external devices and hook up via the Thunderbolt port. Your next note book, or mobile device could just be the most powerful Computer in the world. Imagine a dual-core (or quad-core) iPad with a Thunderbolt port; you could hook it up with an external graphics card and HD-capable monitor and use it as a high end gaming machine.

## Protocol Architecture :

Thunderbolt technology is based on a switched fabric architecture with full-duplex links. Unlike bus-based I/O architectures, each Thunderbolt port on a computer is capable of providing the full bandwidth of the link in both directions with no sharing of bandwidth between ports or between upstream and downstream

directions. The Thunderbolt protocol architecture can be abstracted into four layers as shown in Figure 1.

A Thunderbolt connector is capable of providing two full-duplex channels. Each channel provides bi-directional 10 Gbps of bandwidth.

A Thunderbolt connector on a computer is capable of connecting with a cable to Thunderbolt products or to DisplayPort devices. The Thunderbolt connector is extremely small, making it ideal for thin systems and compact cables. Compatibility with DisplayPort

devices is provided by an interoperability mode between host devices and DisplayPort products; if a DisplayPort device is detected, a Thunderbolt controller will drive compatibility mode DisplayPort signals to that device.

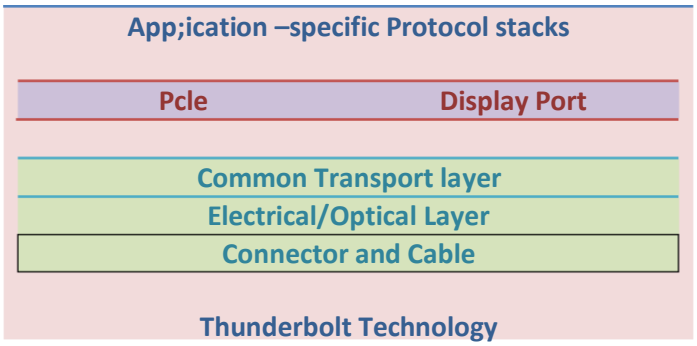



Figure 1 : Thunderbolt Technology Architecture.

Thunderbolt cables may be electrical or optical; both use the same Thunderbolt connector. An active electrical-only cable provides for connections of up to 3 meters in length, and provides for up to 10W of power deliverable to a bus-powered device. And an active optical cable provides for much greater lengths; tens of meters.

The Thunderbolt protocol physical layer is responsible for link maintenance including hot-plug detection, and data encoding to provide highly efficient data transfer. The physical layer has been designed to introduce very minimal overhead and provides full 10Gbps of usable bandwidth to the upper layers.

The heart of the Thunderbolt protocol architecture is the transport layer. Some of the key innovations introduced by the transport layer include:

- A high-performance, low-power, switching architecture.
- A highly efficient, low-overhead packet format with flexible QoS support that allows multiplexing of busty PCI Express transactions with isochronous DisplayPort communication on the same link.
- A symmetric architecture that supports flexible topologies (star, tree, daisy chaining, etc.) and enables peer-to-peer communication (via software) between devices.
- A novel time synchronization protocol that allows all the Thunderbolt products connected in a domain to synchronize their time within 8ns of each other.

DisplayPort and PCI Express protocols are mapped onto the transport layer. The mapping function is provided by a protocol adapter which is responsible for efficient encapsulation of the mapped protocol information into transport layer packets.

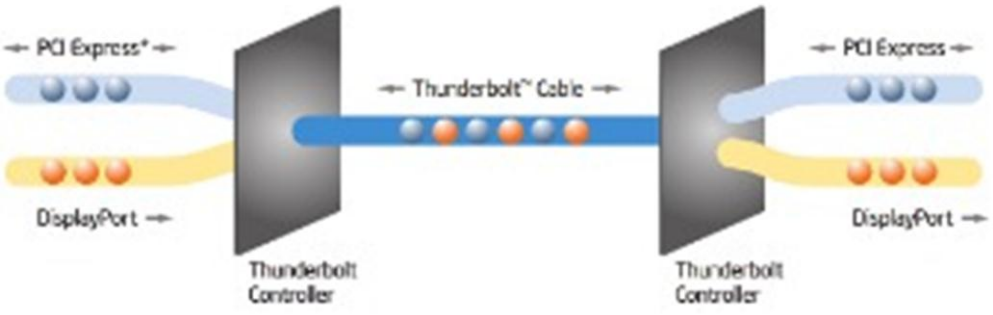



Figure 2. PCI Express* and DisplayPort transported between Thunderbolt™ controllers over a Thunderbolt

Mapped protocol packets between a source device and a destination device may be routed over a path that may cross multiple Thunderbolt controllers. At the destination device, a protocol adapter recreates the mapped protocol in a way that is indistinguishable from what was received by the source device.

The advantage of doing protocol mapping in this way is that Thunderbolt technology-enabled product devices appear as PCI Express or DisplayPort devices to the operating system of the host PC, thereby enabling the use of standard drivers that are available in many operating systems today.

## Controller Architecture

A Thunderbolt controller is the building block used to create Thunderbolt products. A Thunderbolt controller contains:

- A high-performance, cross-bar Thunderbolt protocol switch
- One or more Thunderbolt ports
- One or more DisplayPort protocol adapter ports
- A PCI Express switch with one or more PCI Express protocol adapter ports

The external interfaces of a Thunderbolt controller that are connected in a system depend on the application for which the system is designed. An example implementation of a host-side Thunderbolt controller is shown in Figure 3. Host side Thunderbolt controllers have one or more DisplayPort input interfaces, a PCI Express interface along with one or more Thunderbolt technology interface. By integrating all the features necessary to implement Thunderbolt into a single chip, the host-side controller enables system vendors to easily incorporate Thunderbolt technology into their designs.

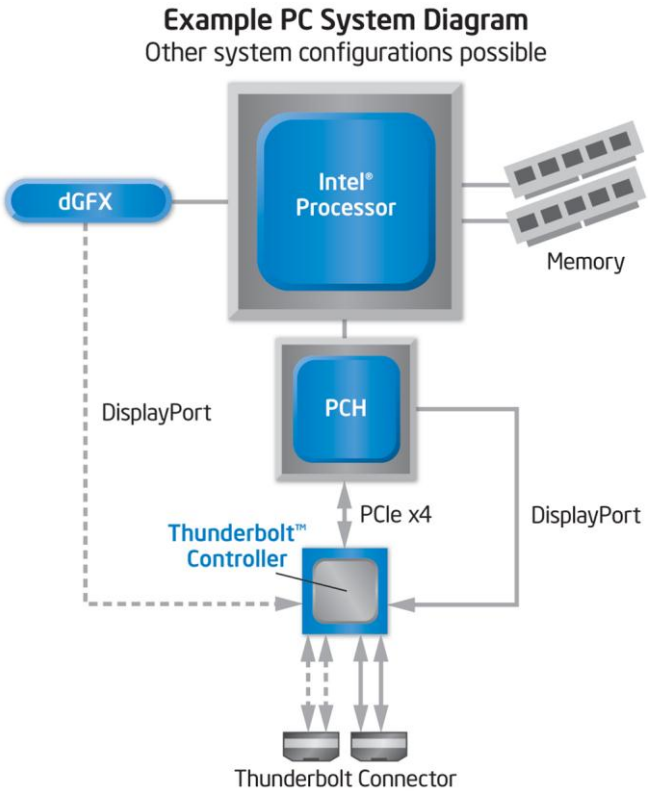



Figure 3. Block diagram of example PC system showing Thunderbolt controller connections.

Thunderbolt technology leverages the native PCI Express and DisplayPort device drivers available in many operating systems today. This native software support means no extra software development is required to use a Thunderbolt technology enabled product.

## Thunderbolt Technology Possibilities :

With Thunderbolt products, performance, simplicity and flexibility all come together. Users can add high-performance features to their PC over a cable, daisy chaining one after another, up to a total of 7 devices, 1 or 2 of which can be high-resolution Display Port v1.1a displays (depending on

the controller configuration in the host PC). Because Thunderbolt technology delivers two full-bandwidth channels, the user can realize high bandwidth on not only the first device attached, but on downstream devices as well.

Users can always connect to their other non-Thunderbolt products at the end of a daisy chain by using Thunderbolt technology adapters (e.g., to connect to native PCI Express devices like eSata, Firewire). These adapters can be easily built using a Thunderbolt controller with off-the-shelf PCI Express-to-“other technology” controllers.

System designers taking advantage of Thunderbolt technology can pursue ever thinner and lighter system designs, using fewer connectors while still achieving high performance between their products and external devices. With Thunderbolt technology, workstation-level performance feature expansion can be packaged as standalone accessories, and is only a cable away. And by leveraging the inherently tight timing synchronization (within 8ns across 7 hops downstream from a host) and low latencies of Thunderbolt technology, broadcast-quality media can be produced using Thunderbolt products.

**Conclusion :**

Thunderbolt technology brings a new balance of performance, simplicity and flexibility to end users and product designers alike. As the fastest PC I/O technology,1 leveraging two key technologies (PCI Express and DisplayPort) on one shared high-performance transport, Thunderbolt technology opens doors to entirely new system and product designs.

# GSM JAMMER

**Introduction :**

AGSM Jammer is a device that transmits signal on the same frequency at which the GSM system operates, the jamming success when the mobile phones in the area where the jammer is located are disabled.

Communication jamming devices were first developed and used by military, Where tactical commanders use RF communication to exercise control of their forces, an enemy has interest in those communications. This interest comes from the fundamental area of denying the successful transport of the information from the sender to the receiver. Nowadays the mobile jammer dvices are becoming civilian products rather than electronic warfare device, since with the increasing number of the mobile phone users the need to disable mobile phones in specific places where the ringing of cell phone would be distruptive has increased. These places include include worship places, university lecture rooms, libraries, concert hall, meeting rooms, and other places where where silence is appreciated.

**Mobile jamming and disablers Technique :**

There are different approaches to prevent mobile phones from ringing in specific area, the main five approaches used or being developed :


1. **Type "A" Device :** In this device we over power cell phone's signal with a stronger signal, This type of device comes equipped with several independent oscillators transmitting 'jamming signals' capable of blocking frequencies used by paging devices as well as those used by cellular/PCS systems' control channels for call establishment . When active in designated area, such devices will (by means RF interface) prevent all pagers and mobile phones located in that area from receiving and transmitting calls. This type of device transmits only a jamming signal and has very poor frequency selectivity, which leads to interference with a larger amount of communication spectrum than it was originally intended to target.

2. **Type "B" Device : T**his device is called "Intelligent Cellular Disablers Device", and it does not transmit an interfering signal on the control channels. The device basically works as a detector, and it capable to communicate with the cellular base station. When the device detects he presence of a mobile phone in the "silent" rom; a prevention of authorization of call establishment is done by the software at the base station. The device signals the base station that the target user is in 'quiet ' room; therefore , do not establish the communication. Messages can be routed to the user's voice-mail box, if the user subscribes to a voice-mail service. This process of detection and interruption of call establishment is done during the interval normally reserved for signalling and handshaking.

3. **Type "C" Device :** This device is called "Intelligent Beacon Disablers" as in the type "B" device it does not transmit an interfering signal on the control channels. the device, when located in a specific "silent" room, functions of 'beacons' and any compatible terminal is ordered to disable its ringer or disables its operation. In the coverage area of the beacon only terminal which have compatible receiver would respond and this should be built on a separate technology from cellular/PCS, for example Bluetooth Technolgy. Also the handset must re-enable its normal function as it leaves the coverage area of the beacon.

4. **Type "D" Device :** This jammer is similar to type "A" , but with a receiver, so that jammer is predominantly in receive mode and when the device detects the presence of a mobile phone in the "silent room"; it will intelligently choose to interact and block the cell phone by transmitting jamming signal. This jam signal would only stay on as long as the mobile continues to make a link with the base station; otherwise there would be no jamming transmission.

5. **Type "E" Device :** This technique is using EMI suppression to make a room into what is called a Faraday Cage. Although labour intensive to construct, the Faraday cage essentially blocks, or greatly attenuates, virtually all EM radiation from entering or leaving the cage or in this case a target room. With current advances in EMI shielding techniques and commercially available products on could conceivably implement this into the architecture of newly designed buildings for so-called "quiet-conference" rooms.

| Type | Emergency call | Efficency | Regularity Approval | Implementation |
|---|---|---|---|---|
| **"A"** | Blocked | Low | Allowed | Very simple |
| **"B"** | Allowed | Medium | Required | Complex(Required third party cellular/PCS) |
| **"C"** | Allowed | High | Required | Complex (Requied Intelligent Handset) |
| **"D"** | Allowed | Medium | Required | Simple |
| **"E"** | Blocked | High(No signal transmitted) | Allowed | Simple |

Table : Comparision between Jammer/ Disabler Techniques

# SYMPHONY- A DREAM CAME TRUE

We dreamt it, believed in it and conquered it. The dream of the students of ECE department of Heritage Institute of Technology has come to reality when SYMPHONY'12 took place at the college premises. Symphony is a techno-cultural meet, organized by Electronics and communication department students of Heritage Institute of Technology on 3rd March 2012. Symphony 2012 was an intra-college cultural event with a touch of technological excellence. The daylong event was a great success as it was surfaced for the 1st time in the college history.

All started 2 months ago. As the semester was over we left with a very little work to do, even chit-chat seemed boring at times, this innovative idea popped up in our mind. I admit, the idea was not to organize an entire meet. We were just in search of a platform to showcase what we can do, that too in an enjoyable way. Unavailability of that kind of platform made us feel claustrophobic. Being rebel, we then thought of creating our own stage, portraying ourselves as performers and also inviting ourselves as a dedicated audience. Visualizing a thing and get that done are two different things and we were trying to build a bridge between this imagination and the reality.

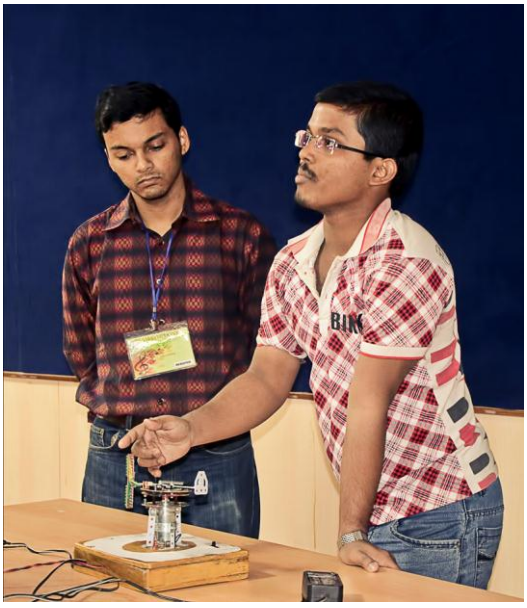
A perfect boat can sail through stormy, dark ocean, but not without the navigation of an experienced sailor. Our department, specially our HOD sir, appeared as our guide to make us drive our thoughts along the correct path. Our hesitation to move forward with our vision was taken care of. Our academic advisor sir encouraged us to live our dream. His catalytic appearance not only gave us a comfort zone to place all our childish demands to him, but also made others realize that Symphony was going to be a reality.

As we were ready to begin our work, we faced a harsh reality- "Money matters". For organizing a techno-cultural meet we had to plan a budget. As we were prepared with our event-list we could sense the need of sponsorships to host those events and competitions properly. We knew that this was the 1st year of Symphony in our college, but to give it an organized touch, was always there in our mind. As this was the maiden event and also only a single department was organizing it, we couldn't approach the big names or brands for the sponsorship. Despite having this sponsorships with a little effort. Thanks to some of our friends and departmental juniors as they gave the contacts of our sponsors. Hotel tree shade( Siliguri) was our title sponsor and our associate sponsor was XESP. IEEE EDS section, Calcutta; Digital Data

Corporation; Bentron Electronics; Aditya Mishra and co.; Pralay Mitra; Electrosteel and steels; were among the other event sponsors. After getting our monetary assurance we moved one step closer to achieve our dream.

But as the day came nearer, we were left with a lot to do. We prepared our final event list. Comprising of competitions on Dramatics, Quiz, Debate, Technical Working-Model exhibition, Solo singing, Parody and Dance. Then we came to know that our auditorium was unavailable due to some academic reason. We were at bay. We have to plan the events again and had to restrict those to one of our seminar room, the GDPI room and one of our lecture class room. As the venue and events were decided, we required participants for each event and some skilled persons to judge them. Though only the Electronics and Communication department of Heritage Institute of Technology was organizing the meet we decided to invite all the students of Heritage to participate. We planned even to make Symphony an inter college meet, but the permission was not granted due to some security reason. This time we realize how many aspects one should consider for hosting an event like this. We then finalized some student coordinators for each event and they were given the responsibility to make the participants registered as many as possible to their respective events. We invited faculty members from our department and other departments to judge the competitions. Even we were caught surprised by seeing such a huge interest building around our vision, Symphony'12. Confirmation from the judges just added to our satisfaction. Having all set we waited for the day to come.


3rd march 2012, Saturday, a holiday in general, Team Symphony had reached college early in the morning. Enthusiasm had grown as we sensed a busy college day while being on the way to college. But for us, the day was the busiest than ever. Putting up banners and flexes, giving the arrow directions to the venue for the participants, opening a registration desk, getting certificates signed by principal sir and lot more to do in a whisker of time. By the clock struck 9 we finished with our work and were surprised to see some of our college juniors from various departments were in search of the registration desk. We had a feeling—"We can do it". Rest of the story is truly a fairytale. It was like we thought, we planned and we achieved. Unlike all our fests, events, meets Symphony was on time. It took off smoothly with a brief explanation of why we were doing this from our Academic Advisor sir. After that it was rolling like an avalanche for us. The 8 hour meet just came to its end in no time, as we were too mesmerized to think about that silly thing ticking around our wrist. All the events starting from the Dramatics, quiz to dance, parody were placed with near perfection. A complimentary lunch for all the participants, coordinators, judges, faculty guests, audiences, security personals and




facility stuffs were arranged by the Team Symphony. A memento was given to each and every faculty guests and judges present. Each participant was provided with a participant certificates and winners were given prizes.

As all the winners should win a prize, being the winners how can Team Symphony stayed without a prize. A guest, acoustic performance by our college band Shades Of Black (SOB) and praise from all the participants, faculty members and friends was the biggest prize for us. A small dream had opened a new facet of ECE department, by giving it its very own annual meet. Though a lot of post Symphony work has to be done, though class test internal examinations took a toll on the audience count, we have earned a faith which will never let us down. We planned it for ourselves and made a thing for all the students of Heritage Institute of Technology. We have a number of people to be thanked separately. But above all we, Team Symphony and all the students of our college thank each other for finding elixir of life for own self and everybody else. Thus we conclude our journey of Symphony'12 with a new beginning, a new hope of Symphony'13, where every different note together can form an orchestra.

By: SOUMYADEEP DAS
ECE 3rd Year

# LAND ROVER CONTROLLED BY CELL PHONE

**C**onventionally, wireless-controlled robots use RF circuits, which have the drawbacks of limited working range, limited frequency range and limited control. Use of a mobile phone for robotic control can overcome these limitations. It provides the advantages 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.

Although the appearance and capabilities of robots vary vastly, all robots share the features of a mechanical, movable structure under some form of control. The control of robot involves three distinct phases: preception, processing and action. Generally, the preceptors are sensors mounted on the robot, processing is done by the on-board microcontroller or processor, and the task (action) is performed using motors or with some other actuators.

**Project overview :**

In this project, the robot is controlled by a mobile phone that makes a call to the mobile phone attached to the robot. In the course of a call, if any button is pressed, a tone corresponding to the button pressed is heard at the other end of the call. This tone is called 'dual-tone multiple-frequency' (DTMF) tone.

Parts list

*Semiconductors:*
IC1 - MT8870 DTMF decoder
IC2 - ATmega16 AVR microcontroller
IC3 - L293D motor driver
IC4 - 74LS04 NOT gate
D1 - 1N4007 rectifier diode
*Resistors (all ¼-watt, ±5% carbon):*
R1, R2 - 100-kilo-ohm
R3 - 330-kilo-ohm
R4-R8 - 10-kilo-ohm
*Capacitors:*
C1 - 0.47µF ceramic disk
C2, C3, C5, C6 - 22pF ceramic disk
C4 - 0.1µF ceramic disk
*Miscellaneous:*
XTAL1 - 3.57MHz crystal
XTAL2 - 12MHz crystal
S1 - Push-to-on switch
M1, M2 - 6V, 50-rpm geared DC motor
Batt. - 6V, 4.5Ah battery

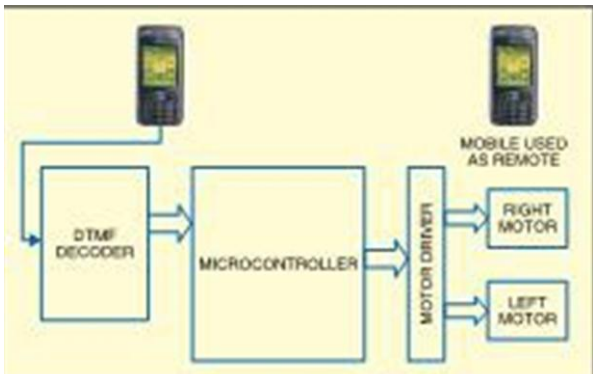



**Fig. 1: Block diagram of cellphone-operated land rover**

with the help of the phone stacked in the robot. The received tone is processed by the ATmega16 microcontroller with the help of DTMF decoder MT8870. The decoder decodes the DTMF tone into its equivalent binary digit and this binary number is sent to the microcontroller. The microcontroller is pre-programmed to take a decision for any given input and outputs its decision to motor drivers in order to drive the motors for forward or backward motion or a turn.

The mobile that makes a call to the mobile phone stacked in the robot acts as a remote. So this simple robotic project does not require the construction of receiver and transmitter units.

DTMF signalling is used for telephone signalling over the line in the voice-frequency band to the call switching centre. The version of DTMF used for telephone tone dialling is known as 'Touch-Tone.'

DTMF assigns a specific frequency (consisting of two separate tones) to each key so that it can easily be identified by the electronic circuit. The signal generated by the DTMF encoder is a direct algebraic summation, in real time, of the amplitudes of two sine (cosine) waves of different frequencies, i.e., pressing '5' will send a tone made by adding 1336 Hz and 770 Hz to the other end of the line. The tones and assignments in a DTMF system are shown in Table I.

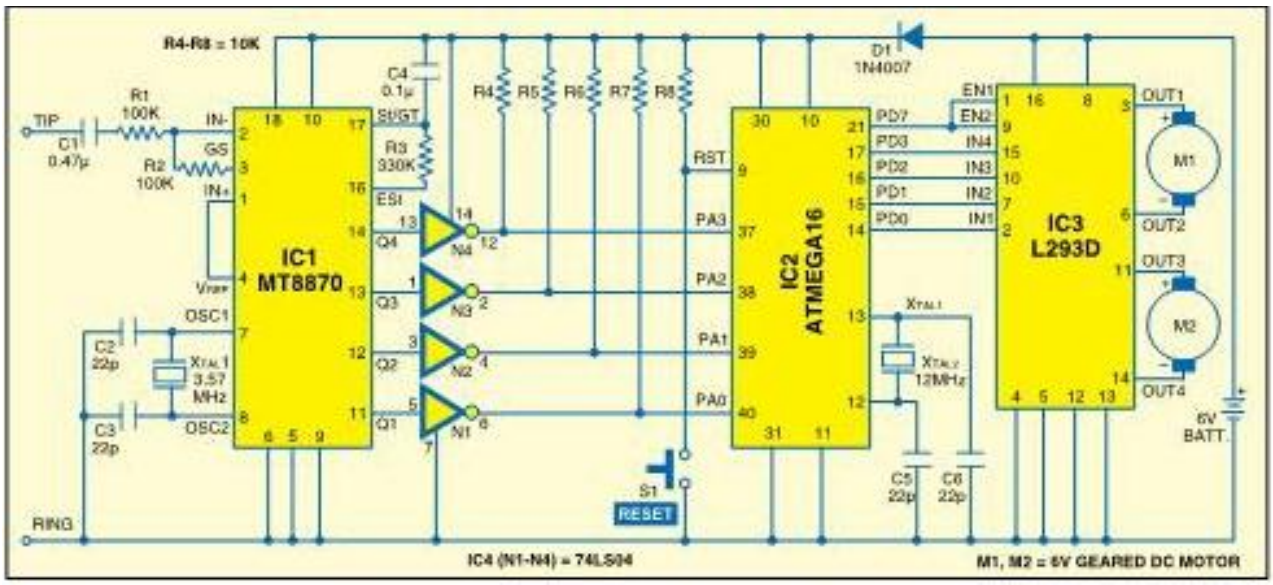



*Fig. 2: Circuit diagram of microcontroller-based cellphone-operated land rover*

**Circuit description :**

Fig. 1 shows the block diagram of the microcontroller-based mobile phone operated land rover. The important components of this rover are a DTMF decoder, microcontroller and motor driver.

**Table I**
**Tones and Assignments in a DTMF System**

| Frequency | 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 |

An MT8870 series DTMF decoder is used here. All types of the MT8870 series use digital counting techniques to detect and decode all the 16 DTMF tone pairs into a 4-bit code output. The built-in dial tone rejection circuit eliminates the need for pre-filtering. When the input signal given at pin 2 (IN-) in single-ended input configuration is recognised to be effective, the correct 4-bit decode signal of the DTMF tone is transferred to Q1 (pin 11) through Q4 (pin 14) outputs.

Table II shows the DTMF data output table of MT8870. Q1 through Q4 outputs of the DTMF decoder (IC1) are connected to port pins PA0 through PA3 of ATmega16 microcontroller (IC2) after inversion by N1 through N4, respectively.

**TABLE II**
**DTMF Data Output**

| Low group (Hz) | High group (Hz) | Digit | OE | O3 | O2 | O1 | O0 |
|---|---|---|---|---|---|---|---|
| 697 | 1209 | 1 | H | L | L | L | H |
| 697 | 1336 | 2 | H | L | L | H | L |
| 697 | 1477 | 3 | H | L | L | H | H |
| 770 | 1209 | 4 | H | L | H | L | L |
| 770 | 1336 | 5 | H | L | H | L | H |
| 770 | 1477 | 6 | H | L | H | H | L |
| 852 | 1209 | 7 | H | L | H | H | H |
| 852 | 1336 | 8 | H | H | L | L | L |
| 852 | 1477 | 9 | H | H | L | L | H |
| 941 | 1336 | 0 | H | H | L | H | L |
| 941 | 1209 | * | H | H | L | H | H |
| 941 | 1477 | # | H | H | H | L | L |
| 697 | 1633 | A | H | H | H | L | H |
| 770 | 1633 | B | H | H | H | H | L |
| 852 | 1633 | C | H | H | H | H | H |
| 941 | 1633 | D | H | L | L | L | L |
| — | — | ANY | L | Z | Z | Z | Z |

The ATmega16 is a low-power, 8-bit, CMOS microcontroller based on the AVR enhanced RISC architecture. It provides the following features: 16 kB of in-system programmable Flash program memory with read-while-write capabilities, 512 bytes of EEPROM, 1kB SRAM, 32 general-purpose input/output (I/O) lines and 32 general-purpose working registers. All the 32 registers are directly connected to

the arithmetic logic unit, allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code-efficient.

Outputs from port pins PD0 through PD3 and PD7 of the microcontroller are fed to inputs IN1 through IN4 and enable pins (EN1 and EN2) of motor driver L293D, respectively, to drive two geared DC motors. Switch S1 is used for manual reset. The microcontroller output is not sufficient to drive the DC motors, so current drivers are required for motor rotation.

**TABLE III**
**Actions Performed Corresponding to the Keys Pressed**

| Number pressed by user | Output of HT9170 DTMF decoder | Input to the microcontroller | Output from microcontroller | Action performed |
|---|---|---|---|---|
| 2 | 0×02<br>00000010 | 0×FD<br>11111101 | 0×89<br>10001001 | Forward motion |
| 4 | 0×04<br>00000100 | 0XFB<br>11111011 | 0×85<br>10000101 | Left turn<br>Right motor forwarded<br>Left motor backwarded |
| 6 | 0×06<br>00000110 | 0XF9<br>11111001 | 0×8A<br>10001010 | Right turn<br>Right motor backwarded<br>Left motor forwarded |
| 8 | 0×08<br>00001000 | 0XF7<br>11110111 | 0×86<br>10000110 | Backward motion |
| 5 | 0×05<br>00000101 | 0XFA<br>11111010 | 0×00<br>00000000 | Stop |

The L293D is a quad, high-current, half-H driver designed to provide bidirectional drive currents of up to 600 mA at voltages from 4.5V to 36V. It makes it easier to drive the DC motors. The L293D consists of four drivers. Pins IN1 through IN4 and OUT1 through OUT4 are input and output pins, respectively, of driver 1 through driver 4. Drivers 1 and 2, and drivers 3 and 4 are enabled by enable pin 1 (EN1) and pin 9 (EN2), respectively. When enable input EN1 (pin 1) is high, drivers 1 and 2 are enabled and the outputs corresponding to their inputs are active. Similarly, enable input EN2 (pin 9) enables drivers 3 and 4.

An actual-size, single-side PCB for cellphone-operated land rover is shown in Fig. 4 and its component layout in Fig. 5.

**Software description :**

The software is written in 'C' language and compiled using Code Vision AVR 'C' compiler. The source program is converted into hex code by the compiler. Burn this hex code into ATmega16 AVR microcontroller.

The source program is well commented and easy to understand. First include the register name defined specifically for ATmega16 and also declare the variable. Set port A as the input and port D as the output. The program will run forever by using 'while' loop. Under 'while' loop, read port A and test the received input using 'switch' statement. The corresponding data will output at port D after testing of the received data.

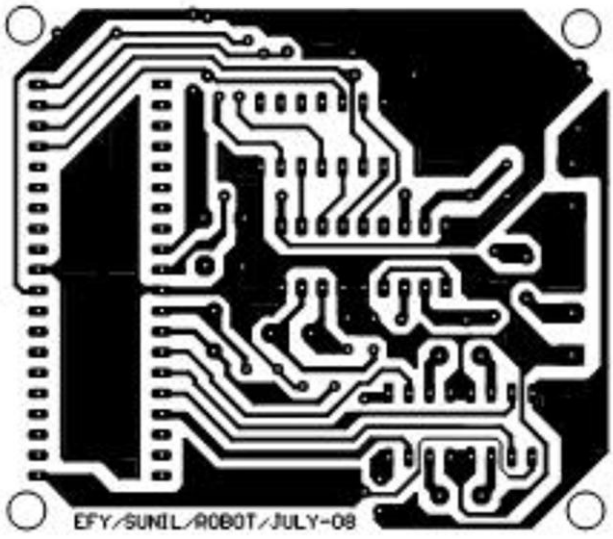


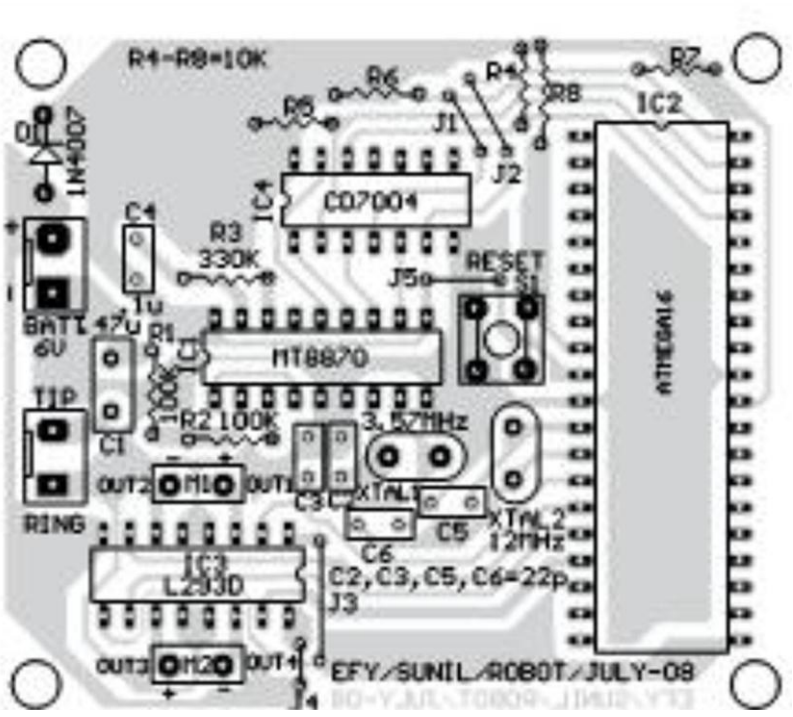
*Fig. 4: An actual-size, single-side PCB layout for cellphone-operated land rover*

**Working :**

In order to control the robot, you need to make a call to the cell phone attached to the robot (through head. phone) from any phone, which sends DTMF tunes on pressing the numeric buttons. The cell phone in the robot is kept in 'auto answer' mode. (If the mobile does not have the auto answering facility, receive the call by 'OK' key on the rover-connected mobile and then made it in hands-free mode.) So after a ring, the cellphone accepts the call.

Now you may press any button on your mobile to perform actions as listed in Table III. The DTMF tones thus produced are received by the cell phone in the robot. These tones are fed to the circuit by the headset of the cellphone. The MT8870 decodes the received tone and sends the equivalent binary number to the microcontroller. According to the program in the microcontroller, the robot starts moving.

When you press key '2' (binary equivalent 00000010) on your mobile phone, the microcontroller outputs '10001001' binary equivalent. Port pins PD0, PD3 and PD7 are high. The high output at PD7 of the microcontroller drives the motor driver (L293D). Port pins PD0 and PD3 drive motors M1 and M2 in forward direction (as per Table III). Similarly, motors M1 and M2 move for left turn, right turn, backward motion and stop condition as per Table III.




**Construction :**

When constructing any robot, one major mechanical constraint is the number of motors being used. You can have either a two-wheel drive or a four-wheel drive. Though four-wheel drive is more complex than two-wheel drive, it provides more torque and good control. Two-wheel drive, on the other hand, is very easy to construct.

Top view of a four-wheel-driven land rover is shown in Fig. 3. The chassis used in this model is a 10×18cm2 sheet made up of parax. Motors are fixed to the bottom of this sheet and the circuit is affixed firmly on top of the sheet. A cellphone is also mounted on the sheet as shown in the picture.

In the four-wheel drive system, the two motors on a side are controlled in parallel. So a single 293D driver IC can drive the rover. For this robot, beads affixed with glue act as support wheels.

**Further applications :**

This land rover can be further improved to serve specific purposes. It requires four controls to roam around. The remaining eight controls can be configured to serve other purposes, with some modifications in the source program of the microcontroller.

***Note.*** The source code of this article has been included in this month's EFY CD.

## ROBOT.C

**Source program:**
**Robit.c**

```
#include <mega16.h>
void main(void)
{
  unsigned int k, h;
  DDRA=0x00;
  DDRD=0XFF;
   while (1)
    {
        k =~PINA;
        h=k & 0x0F;
       switch (h)
        {
        case 0x02: //if I/P is 0x02
          {
PORTD=0x89;//O/P 0x89 ie Forward
break;
          }
      case 0x08: //if I/P is 0x08
        {
PORTD=0x86; //O/P 0x86 ie
Backward
break;
        }
      case 0x04:
        {
PORTD=0x85; // Left turn
break;
        }
      case 0x06:
        {
PORTD=0x8A; // Right turn
break;
        }
     case 0x05:
      {
PORTD=0x00; // Stop
break;
      }
   }
 }
}
```

# STORYTELLER

## *AUTOPSY PART II*

***26th July 2010***
***Karuna and Nisha***

***Karuna was growing agitated with every passing second as she was watching Nisha pack her bags. She was her best friend and Karuna believed to know her more than she did herself. However she couldn't make her out this time…***

***Finally she could no longer remain quiet.***

***"What are you doing Nisha? Are you completely out of your senses?"***

***Nisha remained unperturbed with the sudden accusation.***

***"Why what's wrong Karuna?"***

***"Nisha, where will you go?"***

***"I have already told you…"***

***Karuna was taken aback by the sudden coldness in her voice.***

***"But how will you find him? I admit it's a small town but. . ." she was almost cajolling her now.***

***"I will find him…"***

***"You will find him. You will find him. How? How do you find a man in a town about which you know nothing?? You don't know where he lives...damn it you don't even know what he is called!!!"***

***"I'll just try my luck" the calmness was back in her voice.***

***Karuna went quiet. The calmness in Nisha's voice didn't fool her. She knew it was important for her to find this man. Or she wouldn't have been so determined to go…not in this condition.***

## *Varun and Nisha*

***Varun was waiting outside the house. A deep sense of agony was ruling his mind. He looked up as he heard sound at the front door. Nisha was coming out with her luggage. Seeing her struggle with the bag he went forward to help her.***

***"So you won't change your mind Nisha?" he said dumping the bag at the back of the car.***

***Nisha didn't reply. She just stood at the back door of the car. Varun pulled it open for her and she got in. Varun took a seat beside her.***

***"Thanks for agreeing to drop me Varun" Nisha had a faint smile on her face as she looked up at Varun.***

***Varun turned his face away.***

***"Why can't I stay with you?"***

***"Coz I have to do it alone."***

***Varun felt jealous and traumatized at the same moment.***

***"May I know who this man is without seeing whom you can't…" Varun couldn't say the last word of his sentence but Nisha understood.***

***"Someone very special Varun, someone who has gone through more pain than me in the last three years. He should know now…"***

***"If he is so special then why is he not with you now?"***

***Nisha stayed quiet for a moment. Going away from him was not easy. But she had no choice.***

***"That's because he loved me too much. I couldn't tell him the truth about me. Going away was much easier."***

***Nisha looked out of the car window and looked the familiar roads and buildings pass by. There was a sudden upsurge of grief in her heart. She pressed her face against the glass of the window and devoured the fleeing glimpses of her so familiar city as if seeing them for the last time in her life. A voice echoed somewhere deep inside her mind…it made her heart go heavy.***

***Nisha sank back into her seat, tears rolling down from her eyes.***

# SYMPHONY – A PICTURED JOURNEY



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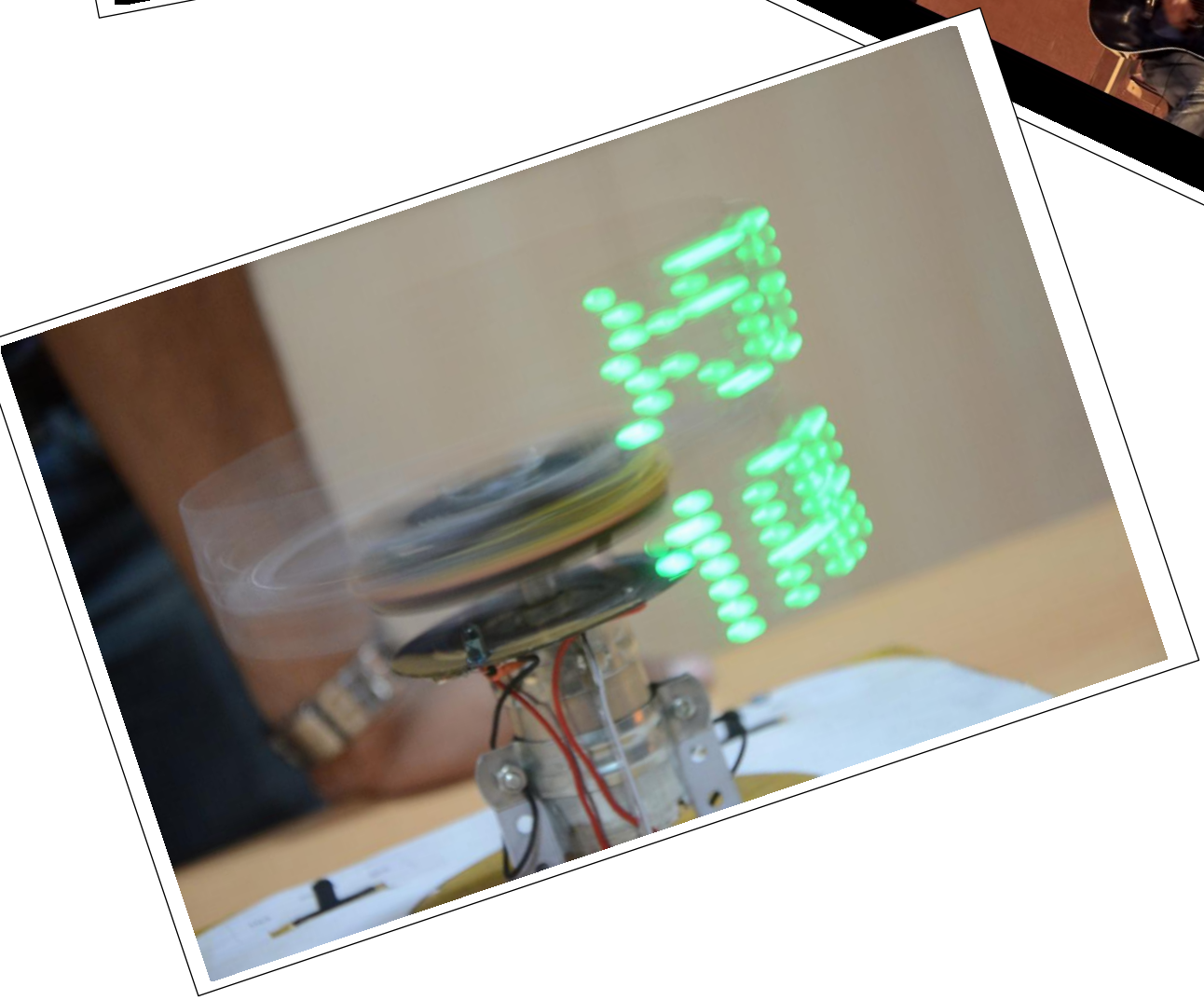


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