MIXED SIGNAL

EC MADE EASY

MODEL ENGINEERING COLLEGE

MIXEDSIGNALS NEWSLETTER October 2007

Dear friends...

With the technological changes taking place at a breathtaking pace, it has become essential for students like us to keep abreast of the latest developments and advancements in the field of science and technology. Keeping this in mind, we the members of MIXED SIGNALS are bringing out this newsletter, which we hope will provide you with a wide range of useful information.

Knowledge is not only about knowing facts, it is also about understanding and analyzing them to develop one's own perception of those pieces of information, and then sharing that very distinct approach with others to broaden the spread of information obtained.

With this venture, we try achieving this very exchange of ideas and concepts and we hope that you would also be a part of it. Only with a whole hearted co-operation from your side would this newsletter be a success.

Many of our friends have taken pains to contribute relevant information on a wide spectrum of topics for which we are grateful and we take this opportunity to thank all of them individually. We also express our sincere gratitude to our teachers and seniors for all their support and guidance.

While you go through this newsletter, you peregrinate through the minds of the engineers of tomorrow and realize how differently and distinctly a person thinks.

Every page is an imprint of a young, intelligent mind freighted with a strong opinion and offers you information galore!

Editorial Board,
EC Made Easy
Mixed Signals

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TOP 10 STRATEGIC TECHNOLOGIES FOR IT WORLD IN `08

Editorial By Dr. Mini M.G, HOD-EC

Green power, Unified Communications, Virtualization, and mash ups are among the most important strategic technologies for 2008.

Green power is taking a bigger role for many reasons, like an increased awareness of environmental danger; concern about power bills; regulatory requirements; government procurement rules; and a sense that corporations should embrace social responsibility.

Chip designers have realized that lowering pre-core performance by 20% actually cuts power usage by half so, adding cores can improve chip performance and efficiency. But IT is still responsible for 2 % of the total carbon releases, and it is coming from many sources. Fast memory is becoming a surprisingly high energy consuming item. One of the next steps is utilising the power-saving features of mobile devices such as phones and laptops and bringing them to more computing platforms.

Unified communications functionality is drawing from five core markets: voice mail, PBXs, e-mail and calendaring, IM, and conferencing and collaboration. Communications becoming IP-based, analog systems switching to digital, and growing integration among voice, network, storage, sensors and video technologies are the recent trends.

Virtualization simplifies the installation and movement of applications, makes it easy to move work from one machine to another, and allows changes to be made without impacting other IT systems, which tend to be rigid and interlinked. There are also disaster recovery benefits since the technology lets you restack virtual systems in different orders in recovery centers, providing more flexibility.

Mashups, a web technology that combines content from multiple sources, has grown from being a virtual unknown among IT executives to being an important piece of enterprise IT systems. U.S. Army intelligence agents are using mashups for situational awareness by bringing intelligence applications together .Enterprises can use mashups to merge the capabilities of complementary applications.

The other strategic technologies for 2008 include metadata management, business process management and social software. Metadata is the foundation for information infrastructure and is found throughout your IT systems: in service registries and repositories, Web semantics, configuration management database (CMDB), business service registries and in application development. BPM is more of a business discipline than a technology, but it is necessary to make sure that the technology of service-oriented architectures (SOA) deliver business value. Social software podcast , videocasts blogs, wikis and social networking tools often referred to as Web2 is changing the way people communicate with both social and business settings.

The real world web is augmenting reality with information specific locations. The Computing fabrics that treats the memory processor and I/O cards as components in a pool, which combines and recombines them as the user wishes, and the Web Oriented Architecture are the remaining strategic technologies for 2008.

Rewritable Discs

Compact disc (CD) is so easy and cheap to produce that it is used to store music, data etc all over the globe. Rewritable CD (CD-RW) can be erased and rewritten. Recordable CD (CD-R) is a simple piece of injection-molded polycarbonate plastic of thickness 1.2 mm. Then we have the photosensitive dye over which a layer of reflective aluminium is kept. A thin acrylic layer is sprayed over the aluminum for protection.CD has a single spiral track of data, circling from the inside of the disc to the outside. On these spiral tracks impressions are made by melting the dye by a write laser such that it turns opaque. The pits represent 0s and the flat surfaces represent 1s corresponding to the digitized data. The distance between the tracks is approx. 0.6 micron. The CD player has a read laser source that traverses these spirals and finds out the pit positions (since reflections of the laser beam are present only at the points where dye is not melted) thus arriving at

digitized version of our data which is then converted to the analog form for use. CD-RW discs have an in built erase function. They are available with disc capacities such as 650MB and 700MB. These discs are based on phase-change technology. The phase-change element is a chemical compound of silver, antimony, etc.We can change its form by heating it to certain temperatures. When the compound is in a crystalline state, it is translucent, so light is reflected at the metal boundary back to the laser assembly, indicating a 1.When the compound is melted into an amorphous state, it becomes opaque, making the area non-reflective thus indicating a 0. During the erase operation, the erase laser restores the compound to its crystalline state, effectively erasing the encoded 0.
But these discs have some drawbacks. CD-RWs have considerably lower reflectivity than CD-Rs, requiring more sensitive laser optics. Also it has higher per-unit price, lower recording and reading speeds. Furthermore its compatibility with CD reading units is a major issue.

GREAT MINDS

Erwin Schrödinger (1887-1961) was an Austrian Catholic who left Germany in 1933 in response to Nazi policies. After the Nazi takeover, he and his wife then fled Austria with a single suitcase to take refuge first in the Vatican and, later, in Ireland. Schrödinger's theory replaced the definite atomic particles of classical theory with an equation for a wave function which is related to the probability of physical events. Oddly, Schrödinger was unhappy with his own invention and spent great effort in formulating objections to his theory. Schrödinger was a widely talented individual who not only wrote popularizations of science, but also contributed works on genetic structure, ancient Greek philosophy, and the history and philosophy of science.

ELECTRONICS ANTIQUE

Leyden Jars (The First Capacitor)

In 1745 a new physics and mathematics professor at the University of Leyden (spelled *Leiden* in modern Dutch), *Pieter van Musschenbroek (1692 - 1791)* and his assistants Allmand and Cunaeus from the Netherlands invented the 'capacitor' (electro-static charge or capacitance actually) but did not know it at first. His condenser was called the 'Leyden Jar' (pronounced: LY'duhn) and named so by Abbe Nollet. This Leyden jar consisted of a narrow-necked glass jar coated over part of its inner and outer surfaces with a conductive metallic substance; a conducting rod or wire passes through as insulating stopper (cork) in the neck of the jar and contacts the inner foil layer, which is separated from the outer layer by the glass wall. The Leyden jar was one of the first devices used to store an electric charge. If the inner layers of foil and outer layers of foil are then connected by a conductor, their opposite charges will cause a spark that discharges the jar.

IC ON FOCUS - ISD5008

ISD5008, manufactured by Winbond Electronics Corporation is a fully integrated single chip providing enhanced features of voice record and playback for digital cellular phones (GSM, CDMA, TDMA, PDC, and PHS), automotive communications, GPS/navigation systems, and portable communication products. This low-power, 3-volt product enables customers to quickly and easily integrate 4 to 8 minutes of voice storage with features such as one-way and two-way call record, voice memo record, and call screening/answering machine functionality. For enhanced voice features, ISD5008 eliminates external circuitry by integrating an automatic gain control (AGC), a power amplifier/speaker driver, volume control, summing amplifiers etc. Input level adjustable amplifiers are also included. ISD5008 device is designed for use in a microprocessor or microcontroller based system. Address, control and duration selection are accomplished through a serial peripheral interface (SPI) in order to minimize pin count. Recordings are stored in on-chip nonvolatile memory cells, providing zero-power message storage.

Features:

- Storage of natural uncompressed voice.
- High quality voice and music reproduction.
- Voice memo record, playback.
- 100,000 record cycles (typical)
- Operating current: I_{CC} Play = 15 mA (typical),I_{CC} Rec = 25 mA (typical)
- Most stages can be individually powered down for minimum power consumption.
- For Details: http://www.winbond-usa.com/en/content/view/157/287/

Capacitive Touch Sense

By Anup Mohan

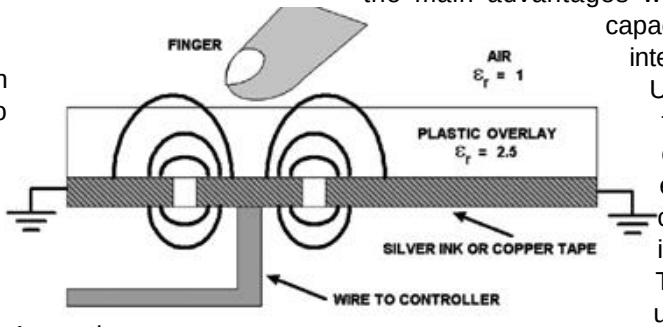
Capacitive sensing replaces the mechanical buttons, switches, and sliders in systems from all phones & cars to notebooks, pc's, white goods & industrial applications. Touch sensors are hidden below the surface and the device now appears clean and uncluttered. An effortless finger touch can access the product features. Immune to environmental wear & tear, capacitive sensing brings elegance, economy & functionality to designs.

Basic Principle

Tissue of human body is filled with conductive electrolytes covered by a layer of skin, a lossy dielectric. It is the conductive property of fingers that makes capacitive touch sense possible. In a capacitive system, some of the energy spills over the area outside the plates. The electric fields associated with this are called fringing fields. In a sensor a set of printed circuit traces is designed to direct the fringing fields into an area accessible to the user. Placing a finger near fringing electric field adds to the conductive surface area of the capacitive system. The capacitance known as Finger capacitance increases, which when processed suitably finger can be sensed

Construction

The cross sectional view of the PCB layout of a capacitive sensor is as shown



The main aim is to direct the fringing fields through the overlay material. A continuous 250-kHz excitation square wave is applied to the source (SRC) side of the sensor, to set up the electric field in the capacitive sensor. The stimulus creates an electric field in the sensor that partially protrudes through the overlay plastic. The capacitance-input side (CIN) is connected to the input of the capacitance-to-digital converter.

Measuring Technique

The most common and accurate method of determining a sensor contact is by using a capacitance to digital converter.

The analog output from the sensor is converted into digital codes by the converter. An upper threshold and lower threshold values are specified for different ranges of codes. If the sensor output is above the lower threshold then it can be considered as a user contact. The advantage of this method is that the converter can sense the ambient nature of sensor and redefine the threshold levels to avoid erroneous results due to environmental effects.

Capacitive Touch Screen

The advantages of capacitive touch screen over resistive are,

No pressure is required to activate the capacitive sensor, hence it doesn't damage the screen & increases the lifetime

With no air gaps to degrade optics and is solid state with no moving parts, it has high reliability and durability

With no internal reflections & minimum light absorption text & graphics displayed on underlying screen are crisp & clear.

Ushering In New Design Considerations

The major design aspects and the main advantages while using a capacitive sensor interface are, User interface (UI) can now be entirely constructed in software. To optimize user's interaction with the sensor two methods are adopted. Static design includes control discoverability, layout, and tactile definition. Dynamic control processing includes button activation methods, hysteresis in gestures, and consistency in UI processing.

Static Design

Static design features include,

- A display can be designed for a sensor that corresponds to some device action.
- Proper spacing & sizing of UI elements.
- Drawn element size need not match activation size.
- Buttons can be made of different size depending on their location and function.
- Tactile definition includes Braille bumps, bezel, and change in surface texture.

Dynamic Control Processing

Dynamic design features include,

- Button activation methods include taps and presses
- Hysteresis is necessary for scrolling & other movement based UI elements. It relaxes active boundaries to accommodate inaccuracies in finger movement
- Consistency implies that button processing, scroll bar functionality etc should behave similarly as control layout changes from one application to another

Optimum Performance

Optimum performance characteristics are achieved due to the following reasons,

- Design is precisely tuned to its supporting proprietary mixed signal VLSI IC
- Programmers receive clean and filtered data
- Electrostatic discharge protection is high, with ESD rating extending beyond ±15 kilovolts (KV)
- Power consumption is highly reduced by operating in the different modes including active, doze, sleep and deep sleep

Mobile Communication Technology

Every one is familiar with mobile phones. It has become one of the most inevitable electronic gadgets for almost anyone in these days. Having used these mobile phones for this long, how many of us have ever tried to understand how they work? Let us give a glimpse on how these mobile phones work.

To start with, one of the most interesting things about a cell phone is that it is actually a radio - an extremely sophisticated radio, but a radio nevertheless. The telephone was invented by Alexander Graham Bell in 1876, and wireless communication can trace its roots to the invention of the radio by Nikolai Tesla in the 1880s (formally presented in 1894 by a young Italian named Guglielmo Marconi). It was only natural that these two great technologies would eventually be combined.

In the days before cell phones, people who really needed mobile-communications ability installed radio telephones in their cars. In the radio-telephone system, there was one central antenna tower per city, and perhaps 25 channels available on that tower. This central antenna meant that the phone in your car needed a powerful transmitter - big enough to transmit 40 or 50 miles (about 70 km). It also meant that not many people could use radio telephones - there just were not enough channels.

The genius of the cellular system is the division of a city into small cells. This allows extensive frequency reuse across a city, so that millions of people can use cell phones simultaneously.

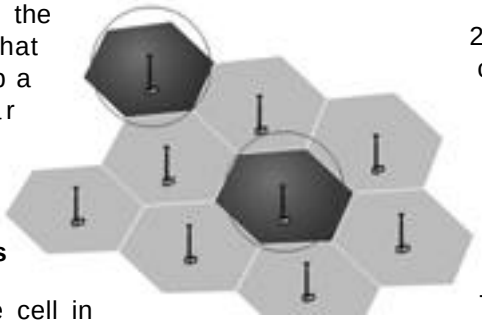
A good way to understand the sophistication of a cell phone is to compare it to a CB radio or a walkie-talkie.

Full-duplex vs. half-duplex - Both walkie-talkies and CB radios are half-duplex devices. That is, two people communicating on a CB radio use the same frequency, so only one person can talk at a time. A cell phone is a full-duplex device. That means that you use one frequency for talking and a second, separate frequency for listening. Both people on the call can talk at once.

Channels - A walkie-talkie typically has one channel, and a CB radio has 40 channels. A typical cell phone can communicate on 1,664 channels or more!

Range - A walkie-talkie can transmit about 1 mile (1.6 km) using a 0.25-watt transmitter. A CB radio, because it has much higher power, can transmit about 5 miles (8 km) using a 5-watt transmitter. Cell phones operate within cells, and they can switch cells as they move around. Cells give cell phones incredible range. Someone using a cell phone can drive hundreds of miles and maintain a conversation the entire time because of the cellular approach.

In a typical analog cell-phone system in the United States, the cell-phone carrier receives about 800 frequencies to use across the city. The carrier chops up the city into cells. Each cell is typically sized at about 10 square miles (26 square kilometers). Cells are normally thought of as hexagons on a big hexagonal grid. Each cell has a base station that consists of a tower and a small building containing the radio equipment. We'll get into base stations later. First, let's examine the "cells" that make up a cellular system.



Cell-phone Channels

A single cell in an analog cell-phone system uses one-seventh of the available duplex voice channels. That is, each cell (of the seven on a hexagonal grid) is using one-seventh of the available channels so it has a unique set of frequencies and there are no collisions:

A cell-phone carrier typically gets 832 radio frequencies to use in a city.

Each cell phone uses two frequencies per call - a duplex channel - so there are typically 395 voice channels per carrier. (The other 42 frequencies are used for control channels - more on this later.)

Therefore, each cell has about 56 voice channels available. In other words, in any cell, 56 people can be talking on their cell phone at one time. Analog cellular systems are considered first-generation mobile technology, or **1G**. With digital Analog cellular systems are considered first-generation mobile technology, or 1G. With digital transmission methods (2G), the number of available channels increases. For example, a TDMA-based digital system (more on TDMA later) can carry three times as many calls as an analog system, so each cell has about 168 channels available.

Cell phones have low-power transmitters in them. Many cell phones have two signal strengths: 0.6 watts and 3 watts (for comparison, most CB radios transmit at 4 watts). The base station is also transmitting at low power. Low-power transmitters have two advantages:

1. The transmissions of a base station and the phones within its cell do not make it very far outside that cell. Therefore, in the figure above, both of the purple cells can reuse the same 56 frequencies. The same frequencies can be reused extensively across the city.

2. The power consumption of the cell phone, which is normally battery-operated, is relatively low. Low power means small batteries, and this is what has made handheld cellular phones possible.

The cellular approach requires a large number of base stations in a city of any size. A typical large city can have hundreds of towers. But because so many people are using cell phones, costs remain low per user. Each carrier in each city also runs one central office called the Mobile Telephone Switching Office (MTSO). This office handles all of the phone connections to the normal land-based phone system, and controls all of the base stations in the region.

Let's say you have a cell phone, you turn it on and someone tries to call you. Here is what happens to the call:

- When you first power up the phone, it listens for an SID on the control channel. The control channel is a special frequency that the phone and base station use to talk to one another about things like call set-up and channel changing. If the phone cannot find any control channels to listen to, it knows it is out of range and displays a "no service" message.

Cell Phone Codes

- **Electronic Serial Number** (ESN) - a unique 32-bit number programmed into the phone when it is manufactured
- **Mobile Identification Number** (MIN) - a 10-digit number derived from your phone's number
- **System Identification Code** (SID) - a unique 5-digit number that is assigned to each carrier by the FCC

While the ESN is considered a permanent part of the phone, both the MIN and SID codes are programmed into the phone when you purchase a service plan and have the phone activated.

All cell phones have special codes associated with them. These codes are used to identify the phone, the phone's owner and the service provider.

- When it receives the SID, the phone compares it to the SID programmed into the phone. If the SIDs match, the phone knows that the cell it is communicating with is part of its home system.
- Along with the SID, the phone also transmits a registration request, and the MTSO keeps track of your phone's location in a database - this way, the MTSO knows which cell you are in when it wants to ring your phone.
- The MTSO gets the call, and it tries to find you. It looks in its database to see which cell you are in.
- The MTSO picks a frequency pair that your phone will use in that cell to take the call.
- The MTSO communicates with your phone over the control channel to tell it which frequencies to use, and once your phone and the tower switch on those frequencies, the call is connected. Now, you are talking by two-way radio to a friend.
- As you move toward the edge of your cell, your cell's base station notes that your signal strength is diminishing. Meanwhile, the base station in the cell you are moving toward (which is listening and measuring signal strength on all frequencies, not just its own one-seventh) sees your phone's signal strength increasing. The two base stations coordinate with each other through the MTSO, and at some point, your phone gets a signal on a control channel telling it to change frequencies. This hand off switches your phone to the new cell.

Let's say you're on the phone and you move from one cell to another - but the cell you move into is covered by another service provider, not yours. Instead of dropping the call, it'll actually be handed off to the other service provider.

If the SID on the control channel does not match the SID programmed into your phone, then the phone knows it is roaming. The MTSO of the cell that you are roaming in contacts the MTSO of your home system, which then checks its database to confirm that the SID of the phone you are using is valid. Your home system verifies your phone to the local MTSO, which then tracks your phone as you move through its cells. And the amazing thing is that all of this happens within seconds.

Note that if you want to roam internationally, you'll need a phone that will work both at home and abroad. Different countries use different cellular access technologies. More on those technologies later. First, let's get some background on analog cell-phone technology so we can understand how the industry has developed.

Analog Cell Phones

In 1983, the analog cell-phone standard called AMPS (Advanced Mobile Phone System) was approved by the FCC and first used in Chicago. AMP uses a range of frequencies between 824 MHz and 894 MHz for analog cell phones. In order to encourage competition and keep prices low, the U. S. government required the presence of two carriers in every market, known as A and B carriers. One of the carriers was normally the local-exchange carrier (LEC), a fancy way of saying the local phone company.

Carriers A and B are each assigned 832 frequencies: 790 for voice and 42 for data. A pair of frequencies (one for transmit and one for receive) is used to create one channel. The frequencies used in analog voice channels are typically 30 kHz wide - 30 kHz was chosen as the standard size because it gives you voice quality comparable to a wired telephone.

The transmit and receive frequencies of each voice channel are separated by 45 MHz to keep them from interfering with each other. Each carrier has 395 voice channels, as well as 21 data channels to use for housekeeping activities like registration and paging.

A version of AMPS known as Narrowband Advanced Mobile Phone Service (NAMPS) incorporates some digital technology to allow the system to carry about three times as many calls as the original version. Even though it uses digital technology, it is still considered analog. AMPS and NAMPS only operate in the 800-MHz band and do not offer many of the features common in digital cellular service, such as e-mail and Web browsing.

Along Comes Digital

Digital cell phones are the second generation (2G) of cellular technology. They use the same radio technology as analog phones, but they use it in a different way. Analog systems do not fully utilize the signal between the phone and the cellular network — analog signals cannot be compressed and manipulated as easily as a true digital signal. This is the reason why many cable companies are switching to digital — so they can fit more channels within a given bandwidth. It is amazing how much more efficient digital systems can be.

Digital phones convert your voice into binary information (1s and 0s) and then compress it. This compression allows between three and 10 digital cell-phone calls to occupy the space of a single analog call.

Many digital cellular systems rely on frequency-shift keying (FSK) to send data back and forth over AMPS. FSK uses two frequencies, one for 1s and the other for 0s, alternating rapidly between the two to send digital information between the cell tower and the phone. Clever modulation and encoding schemes are required to convert the analog information to digital, compress it and convert it back again while maintaining an acceptable level of voice quality. All of this means that digital cell phones have to contain a lot of processing power.

Inside a Digital Cell Phone

On a "complexity per cubic inch" scale, cell phones are some of the most complex devices people use on a daily basis. Modern digital cell phones can process millions of calculations per second in order to compress and decompress the voice stream.

The parts of a cell phone

If you take a basic digital cell phone apart, you find that it contains just a few individual parts:

• An amazing circuit board containing the brains of the phone
•An antenna
• A liquid crystal display (LCD)
• A keyboard (not unlike the one you find in a TV remote control)
• A microphone
• A speaker
• A battery

The circuit board is the heart of the system. Here is one from a typical Nokia digital phone:

Let's talk about what some of the individual chips do. The analog-to-digital and digital-to-analog conversion chips translate the outgoing audio signal from analog to digital and the incoming signal from digital back to analog. The digital signal processor (DSP) is a highly customized processor designed to perform signal-manipulation calculations at high speed.

The microprocessor handles all of the housekeeping chores for the keyboard and display, deals with command and control signaling with the base station and also coordinates the rest of the functions on the board.

The ROM and Flash memory chips provide storage for the phone's operating system and customizable features, such as the phone directory. The radio frequency (RF) and power section handles power management and recharging, and also deals with the hundreds of FM channels. Finally, the RF amplifiers handle signals travelling to and from the antenna.

The display has grown considerably in size as the number of features in cell phones has increased. Most current phones offer built-in phone directories, calculators and games. And many of the phones incorporate some type of PDA or Web browser.

Some phones store certain information, such as the SID and MIN codes, in internal Flash memory, while others use external cards that are similar to Smart Media cards.

Cell phones have such tiny speakers and microphones that it is incredible how well most of them reproduce sound.

What is amazing is that all of that functionality - which only 30 years ago would have filled an entire floor of an office building - now fits into a package that sits comfortably in the palm of your hand!

Cell-phone Network Technologies: 2G

There are three common technologies used by 2G cell-phone networks for transmitting information

· **Frequency division multiple access** (FDMA)
· **Time division multiple access** (TDMA)
· **Code division multiple access** (CDMA)

Although these technologies sound very intimidating, you can get a good sense of how they work just by breaking down the title of each one.

The first word tells you what the access method is. The second word, division, lets you know that it splits calls based on that access method.

· FDMA puts each call on a separate frequency.
· TDMA assigns each call a certain portion of time on a designated frequency.
· CDMA gives a unique code to each call and spreads it over the available frequencies.

The last part of each name is multiple access. This simply means that more than one user can utilize each cell.

FDMA: It separates the spectrum into distinct voice channels by splitting it into uniform chunks of bandwidth. To better understand FDMA, think of radio stations: Each station sends its signal at a different frequency within the available band. FDMA is used mainly for analog transmission. While it is certainly capable of carrying digital information, FDMA is not considered to be an efficient method for digital transmission.

TDMA: Using TDMA, a narrow band that is 30 kHz wide and 6.7 milliseconds long is split time-wise into three time slots. Narrow band means "channels" in the traditional sense. Each conversation gets the radio for one-third of the time. This is possible because voice data that has been converted to digital information is compressed so that it takes up significantly less transmission space. Therefore, TDMA has three times the capacity of an analog system using the same number of channels. TDMA systems operate in either the 800-MHz (IS-54) or 1900-MHz (IS-136) frequency bands.

GSM

TDMA is also used as the access technology for Global System for Mobile communications (GSM). However, GSM implements TDMA in a somewhat different and incompatible way from IS-136. Think of GSM and IS-136 as two different operating systems that work on the same processor, like Windows and Linux both working on an Intel Pentium. GSM systems use encryption to make phone calls more secure. GSM operates in the 900-MHz and 1800-MHz bands in Europe and Asia and in the 850-MHz and 1900-MHz (sometimes referred to as 1.9-GHz) band in the United States. It is used in digital cellular and PCS-based systems. GSM is also the basis for Integrated Digital Enhanced Network (IDEN), a popular system introduced by Motorola and used by Nextel.

GSM is the international standard in Europe, Australia and much of Asia and Africa. In covered areas, cell-phone users can buy one phone that will work anywhere where the standard is supported. To connect to the specific service providers in these different

countries, GSM users simply switch **subscriber identification module** (**SIM**) cards. SIM cards are small removable disks that slip in and out of GSM cell phones. They store all the connection data and identification numbers you need to access a particular wireless service provider.
Unfortunately, the 850MHz/1900-MHz GSM phones used in the United States are **not compatible** with the international system. If you live in the United States and need to have cell-phone access when you're overseas, you can either buy a tri-band or quad-band GSM phone and use it both at home and when traveling or just buy a GSM 900MHz/1800MHz cell phone for travelling.

CDMA: It takes an entirely different approach from TDMA. CDMA, after digitizing data, spreads it out over the entire available bandwidth. Multiple calls are overlaid on each other on the channel, with each assigned a unique sequence code. CDMA is a form of spread spectrum, which simply means that data is sent in small pieces over a number of the discrete frequencies available for use at any time in the specified range.
All of the users transmit in the same wide-band chunk of spectrum. Each user's signal is spread over the entire bandwidth by a unique spreading code. At the receiver, that same unique code is used to recover the signal. Because CDMA systems need to put an accurate time-stamp on each piece of a signal, it references the GPS system for this information. Between eight and 10 separate calls can be carried in the same channel space as one analog AMPS call. CDMA technology is the basis for Interim Standard 95 (IS-95) and operates in both the 800-MHz and 1900-MHz frequency bands.
Ideally, TDMA and CDMA are transparent to each other. In practice, high-power CDMA signals raise the noise floor for TDMA receivers, and high-power TDMA signals can cause overloading and jamming of CDMA receivers.

Cell-phone Network Technologies: 3G

3G technology is the latest in mobile communications. 3G stands for "third generation" — this makes use of analog cellular technologies generation one and cellular technology generation one and digital/PCS generation two. 3G technology is intended for the true multimedia cell phone - typically called smartphones - and features increased bandwidth and transfer rates to accommodate Web-based applications and phone-based audio and video files.
3G comprises several cellular access technologies. The three most common ones as of 2005 are:

- CDMA2000 - based on 2G Code Division Multiple Access
- WCDMA (UMTS) - Wideband Code Division Multiple Access
- TD-SCDMA - Time-division Synchronous Code-division Multiple Access

3G networks have potential transfer speeds of up to 3 Mbps (about 15 seconds to download a 3-minute MP3 song). For comparison, the fastest 2G phones can achieve up to 144Kbps (about 8 minutes to download a 3-minute song). 3G's high data rates are ideal for downloading information from the Internet and sending and receiving large, multimedia files. 3G phones are like mini-laptops and can accommodate broadband applications like video conferencing, receiving streaming video from the Web, sending and receiving faxes and instantly downloading e-mail messages with attachments.

Of course, none of this would be possible without those soaring towers that carry cell-phone signals from phone to phone.

Unlocking Your GSM Phone

Any GSM phone can work with any SIM card, but some service providers "lock" the phone so that it will only work with their service. If your phone is locked, you can't use it with any other service provider, whether locally or overseas. You can unlock the phone using a special code — but it's unlikely your service provider will give it to you. There are Web sites that will give you the unlock code, some for a small fee, some for free.

REPORT ON WORKSHOP ON THE RECENT TRENDS IN MICROWAVE COMMUNICATION

A two day workshop on the recent trends in microwave communication was conducted by the Department of Electronics and Communication Engineering of Model Engineering College on the 27th and 28th of July 2007.The event, sponsored by TEQIP, was coordinated by Smt.Aparna Devi, Lecturer, Department of Electronics, MEC and was attended by faculty from engineering institutes all over Kerala. There were 14 internal staff, 23 students and a total of 9 external participants.The main highlights of the workshop were:

1 A talk on '**Microwaves'** by Dr. S. Mridula from SOE,CUSAT- This session included an overview of microwaves and the various types of antennas used for microwave communication. Methods for the analysis of antenna networks using network analyzers, anechoic chambers were also discussed.

2 Seminar on '**EM theory made simple**' by Prof. Dr. P. Mohanan, Dept. of electronics, CUSAT- The basic concepts of electromagnetic theory were analyzed from a layman's point of view using physical examples and interpretations in this session.

3 A lecture on '**Microwave communication- An antenna perspective**' by Ms. Deepthi Das Krishna, Research Scholar, CUSAT- This was an extended version of the first talk wherein many types of antennas (horn, microstrip, dielectric resonator antennas etc.) and their applications were introduced.

4 Seminar on '**Microwave communication- Current Scenario**' by Gopi Krishnan, Research Scholar, CUSAT- The inability of technologies like Wi-Fi, Bluetooth, Wi-Max etc. to handle high data rates led to the development of UWB technology. The different band schemes used in UWB, the devices working on UWB and its current scenario were discussed at length in this session.

5. An overview of **Electromagnetic Simulation and Optimisation Packages**' by Ms. Suma, Research Scholar, CUSAT- This session included a brief description of the various computer based simulation packages available for antenna design like 1E3D, FDTD based simulation etc.

Project on Highlight - Voice Controlled Car

The one feature that distinguishes man from machine is his ability to think, rationalize and execute. This ability of man has led him to a number scientific innovations and breakthrough. It started out with the discovery of fire and then led to the invention of wheel and after that there was no looking back.

The ingenuity of mathematics combined with the flexibility and power of electronics has made possible a number of things which were deemed impossible, a couple of decades back. One such innovation is **Speech Recognition** and this technology has been incorporated in our project which is called **"VOICE CONTROLLED CAR"**

Speech recognition has always been a subject of interest with many people. In this project we control a battery operated vehicle with one's voice. i.e. the car will have the ability to move around in any direction by just giving a voice command. This can help people to send the vehicle in areas inaccessible to man and can also be a boon for physically impaired people.

The car is controlled using voice commands. Voice commands are recognized using a speech recognition IC HM2007. When the command corresponding to left/right movement of the vehicle is given, the vehicle turns to that direction until the stop command is given. So stop command in conjunction with the direction command enables the user to turn the vehicle to any angle.

The main component of the speech recognizer is the speech recognizing chip called **Hm2007**. HM2007 is a single chip CMOS voice recognition LSI circuit with on-chip analog front end, voice analysis, recognition process and system control function. It is a 48 pin PDIP IC. A maximum of 40 words can be recognized and maximum word length is 1.92 secs. The chip has two operational modes; manual mode and CPU mode. The CPU mode is designed to allow the chip to work under a host computer. HM2007 chips can be cascaded to provide a larger word recognition library.

The car consists of 3 blocks

1. **Speech Recognizer**

It consists of the speech recognizing IC Hm2007 and an 8k*8 SRAM and other components for recognition purpose. For training purpose, a keypad and a 7 segment display board is externally connected.

2. **Microcontroller**

The microcontroller we use is PIC16f628. The purpose of the microcontroller is to recognize the binary output coming from the speech recognizing circuit and to give corresponding output to the motor driver

3. **Motor Driver & motors**

The output coming from the microcontroller is used to control the motors using a motor driver-L293D.The motor driver controls two 6V motors of the vehicle.

This project was done by a group of four students (Roshan, Sachin, Ashok & Ajish) for their mini project. This project has also been recognized by the IEEE and was one among the 4 projects in India invited to be presented at the All India Students Project Contest organized by the IEEE Hyderabad section and the AES society and won the 2nd prize.

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Cypress Facts

Founded : 1982,USA
Headquarters: San Jose,California
Industry : Semiconductor manufacturing
Founder : T.J. Rodgers
Revenue : $900 million
Employees : 5400 (approx)