UNIT - 5

Telemedicine

Telemedicine is the exchange of medical information from one location to another using electronic communication, which improves patient health status. ... The ATA has traditionally considered telehealth and telemedicine to be interchangeable terms, which includes wide definitions of remote healthcare.

There are three main types of telemedicine, which include store-and-forward, remote monitoring and real-time interactive services. Each of these has a beneficial role to play in overall health care and, when utilized properly, can offer tangible benefits for both healthcare workers and patients.

The digital transmission of medical imaging, remote medical diagnosis and evaluations, and video consultations with specialists are all examples of telemedicine.

There are three main categories of telemedicine; teleconsultation, telementoring, and telemonitoring

Although WHO has given importance to telemedicine, there is no legislation in India concerning telemedicine and virtual consultation. Hence, it is governed by a combination of the practice of medicine and information technology with their associated rules, regulations or laws.

Telemedicine Today

Today the telemedicine field is changing faster than ever before. As technology advances at exponential levels, so does the widespread affordability and accessibility to basic telemedicine tools. For example, not only do we now have the technology for live video telemedicine, but much of the U.S. population has experience using online video chat apps (like Skype or Face time), and access to a computer or mobile device to use them.

Telemedicine was originally created as a way to treat patients who were located in remote places, far away from local health facilities or in areas of with shortages of medical professionals. While telemedicine is still used today to address these problems, it's increasingly becoming a tool for convenient medical care. Today's connected patient wants to waste less time in the waiting room at the doctor, and get immediate care for minor but urgent conditions when they need it.

This expectation for more convenient care, combined with the unavailability of many overburdened medical professionals (especially primary care providers) have led to the rise of telemedicine companies. Many offer patients 24/7 access to medical care with an on-call doctor

contracted by that company. Others offer hospitals and larger health centers access to extra clinical staff and specialists, for outsourcing of special cases (common model among teleradiology companies). Still others provide a <u>telemedicine platform</u> for physicians to use to offer virtual visits with their own patients. Increasingly, telemedicine is becoming a way to give medical practices an edge in a competitive healthcare landscape where it's difficult to stay independent or maintain a healthy bottom line.

Also impacting the rise of telemedicine today is the growing mobile health field. With the wide variety of mobile health apps and new mobile medical devices that are consumer-friendly, patients are starting to use technology to monitor and track their health. Simple home-use medical devices that can take vitals and diagnose ear infections, monitor glucose levels, or measure blood pressure let patients gather needed medical information for a doctor's diagnosis, without going into the doctor's office. And again, as more patients get proactive about using technology to manage their health, they also will be more open to alternative ways to get care – through telemedicine!

Services can be provided by telemedicine

Telemedicine can be used for a wide variety of health services. Here's a short list of common conditions a primary care doctor may treat via telemedicine:

Allergies

Arthritic Pain

Asthma

Bronchitis

Colds and Flu

Diarrhea

Infections

Insect Bites

Pharyngitis

Conjunctivitis

Rashes

Respiratory Infections

Sinusitis

Skin Inflammations

Cellulitis

Sore Throats

Sprains & Strains

Bladder Infections

UTIs

Sports Injuries

Vomiting

Telemedicine services can range widely by specialty. A surgeon might use telemedicine to do post-operation check-ins with patients, to make sure their wound is not infected. A gynecologist might use a live telemedicine solution to provide birth control counseling. An endocrinologist may do live videochats with patients to discuss recent lab results and answer questions.

Multimedia is the field concerned with the computer-controlled integration of text, graphics, drawings, still and moving images (Video), animation, audio, and any other media where every type of information can be represented, stored, transmitted and processed digitally.

Multimedia is a combination of some or all forms such as data,text, photographs,images, animation, video and audio, which are converted from different formats into a single platform . In other words we can say that Multimedia is designing pertaining to a form of artist ,educational or commercial communication.

Text, image, audio, video, and animation are the five multimedia elements. The first multimedia element is text. Text is the most common multimedia element. Text expresses the information the developer is trying to get across to their viewers.

Multimedia is a technology which stores data as text, photo, animation, music, video, etc. and gives the method to collect and modify the data as required. Multimedia System : It is a system which has capability to integrate two or more types of media such as text, graphics, audio, video and animation.

Literal Meaning of Multimedia

 In this section, we will understand the literal meaning of multimedia.

- **Multi** − it means more than one

- **Medium** − it is singular and it means intermediary or mean

- **Media** − it is plural and it means conveying the information

Likewise, Multimedia is the field of Computer Science that integrates different forms of information and represents in the form of audio, video, and animation along with the traditional media, i.e., text, graphics/drawings, images, etc.

Multimedia Computer System

Multimedia computer system has high capacity to integrate different media including text, image, graphics, audio, and video.

The multimedia computer system stores, represents, processes, manipulates, and makes available to users.

Significant Features of Multimedia Computer System

Following are the major features multimedia computer system −

- Its Central Processing Unit (CPU) is very fast, as it needs to process large amount of data.

- It has huge storage capacity.

- It has huge memory power that helps in running heavy data programs.

- It has high capacity graphic card that helps in displaying graphics, animation, video, etc.

- The sound system makes it easy to listen to audio.

- With all these features (discussed above), a computer system is known as high end multimedia computer system.

- However, all the features listed above are not essentially required for every multimedia computer system, but rather the features of a multimedia computer system are configured as per the need of respective user.

Multimedia Components

Following are the major components of a multimedia computer system −

Text

It contains alphanumeric and some other special characters. Keyboard is usually used for input of text; however, there are some internal (inbuilt) features to include such text.

Graphics

It is technology to generate, represent, process, manipulate, and display pictures. It is one of the most important components of multimedia application. The development of graphics is supported by a different software.

Animation

Computer animation is a modern technology, which helps in creating, developing, sequencing, and displaying a set of images (technically known as *'frames'*). Animation gives visual effects or motion very similar to that of a video file (see image given below).

Audio

This technology records, synthesizes, and plays audio (sound). There are many learning courses and different instructions that can be delivered through this medium appropriately.

Video

This technology records, synthesizes, and displays images (known as frames) in such sequences (at a fixed speed) that makes the creation appear as moving; this is how we see a completely developed video. In order to watch a video without any interruption, video device must display 25 to 30 frames/second.

Multimedia Application

Let us now see the different fields where multimedia is applied. The fields are described in brief below −

Presentation

With the help of multimedia, presentation can be made effective.

E-books

Today, books are digitized and easily available on the Internet.

Digital Library

The need to be physically present at a library is no more necessary. Libraries can be accessed from the Internet also. Digitization has helped libraries to come to this level of development.

E-learning

Today, most of the institutions (public as well as private both) are using such technology to education people.

Movie making

Most of the special effects that we see in any movie, is only because of multimedia technology.

Video games

Video games are one of the most interesting creations of multimedia technology. Video games fascinate not only the children but adults too.

Animated films

Along with video games, animated film is another great source of entertainment for children.

Multimedia conferencing

People can arrange personal as well as business meetings online with the help of multimedia conferencing technology.

E-shopping

Multimedia technology has created a virtual arena for the e-commerce.

Digital Image Processing

Digital image processing deals with manipulation of digital images through a digital computer. It is a subfield of signals and systems but focus particularly on images. DIP focuses on developing a computer system that is able to perform processing on an image. The input of that system is a digital image and the system process that image using efficient algorithms, and gives an image as an output. The most common example is Adobe Photoshop. It is one of the widely used application for processing digital images.

Modern digital technology has made it possible to manipulate multi-dimensional signals with systems that range from simple digital circuits to advanced parallel computers. The goal of this manipulation can be divided into three categories: • Image Processing image in → image out • Image Analysis image in → measurements out • Image Understanding image in → high-level description out

Digital Image Processing
Digital Image Processing Tutorial provides basic and advanced concepts of Image Processing. Our Digital Image Processing Tutorial is designed for beginners and professionals both.

Digital Image Processing is used to manipulate the images by the use of algorithms. For processing digital images the most common software that used widely is Adobe Photoshop.

Our Digital Image Processing Tutorial includes all topics of Digital Image Processing such as introduction, computer graphics, signals, photography, camera mechanism, pixel, transaction, types of Images, etc.

What is Digital Image Processing (DIP)?

Digital Image Processing (DIP) is a software which is used to manipulate the digital images by the use of computer system. It is also used to enhance the images, to get some important information from it.

For example: Adobe Photoshop, MATLAB, etc.

It is also used in the conversion of signals from an image sensor into the digital images.

A certain number of algorithms are used in image processing.

Digital Image Processing

- o Digital Image Processing is a software which is used in image processing. For example: computer graphics, signals, photography, camera mechanism, pixels, etc.
- o Digital Image Processing provides a platform to perform various operations like image enhancing, processing of analog and digital signals, image signals, voice signals etc.
- o It provides images in different formats.

Digital Image Processing allows users the following tasks

- o **Image sharpening and restoration:** The common applications of Image sharpening and restoration are zooming, blurring, sharpening, grayscale conversion, edges detecting, Image recognition, and Image retrieval, etc.
- o **Medical field:** The common applications of medical field are Gamma-ray imaging, PET scan, X-Ray Imaging, Medical CT, UV imaging, etc.
- o **Remote sensing:** It is the process of scanning the earth by the use of satellite and acknowledges all activities of space.
- o **Machine/Robot vision:** It works on the vision of robots so that they can see things, identify them, etc.

Characteristics of Digital Image Processing

- o It uses software, and some are free of cost.
- o It provides clear images.
- o Digital Image Processing do image enhancement to recollect the data through images.
- o It is used widely everywhere in many fields.
- o It reduces the complexity of digital image processing.
- o It is used to support a better experience of life.

Advantages of Digital Image Processing

- Image reconstruction (CT, MRI, SPECT, PET)
- Image reformatting (Multi-plane, multi-view reconstructions)
- Fast image storage and retrieval
- Fast and high-quality image distribution.
- Controlled viewing (windowing, zooming)

Disadvantages of Digital Image Processing

- It is very much time-consuming.
- It is very much costly depending on the particular system.
- Qualified persons can be used.

Data Processing

Collection, manipulation, and processing collected data for the required use is known as data processing. It is a technique normally performed by a computer; the process includes retrieving, transforming, or classification of information.

However, the processing of data largely depends on the following −

- The volume of data that need to be processed
- The complexity of data processing operations
- Capacity and inbuilt technology of respective computer system
- Technical skills
- Time constraints

Methods of Data Processing

Let us now discuss the different methods of data processing.

- Single user programming
- Multiple programming
- Real-time processing
- On-line processing
- Time sharing processing
- Distributed processing

Single User Programming

It is usually done by a single person for his personal use. This technique is suitable even for small offices.

Multiple Programming

This technique provides facility to store and execute more than one program in the Central Processing Unit (CPU) simultaneously. Further, the multiple programming technique increases the overall working efficiency of the respective computer.

Real-time Processing

This technique facilitates the user to have direct contact with the computer system. This technique eases data processing. This technique is also known as the direct mode or the interactive mode technique and is developed exclusively to perform one task. It is a sort of online processing, which always remains under execution.

On-line Processing

This technique facilitates the entry and execution of data directly; so, it does not store or accumulate first and then process. The technique is developed in such a way that reduces the data entry errors, as it validates data at various points and also ensures that only corrected data is entered. This technique is widely used for online applications.

Time-sharing Processing

This is another form of online data processing that facilitates several users to share the resources of an online computer system. This technique is adopted when results are needed swiftly. Moreover, as the name suggests, this system is time based.

Following are some of the major advantages of time-sharing processing −

- Several users can be served simultaneously
- All the users have almost equal amount of processing time
- There is possibility of interaction with the running programs

Distributed Processing

This is a specialized data processing technique in which various computers (which are located remotely) remain interconnected with a single host computer making a network of computer.

All these computer systems remain interconnected with a high speed communication network. This facilitates in the communication between computers. However, the central computer system maintains the master data base and monitors accordingly.

HTML

HTML is the standard markup language for creating Web pages.

- HTML stands for Hyper Text Markup Language
- HTML describes the structure of a Web page
- HTML consists of a series of elements

- HTML elements tell the browser how to display the content
- HTML elements are represented by tags
- HTML tags label pieces of content such as "heading", "paragraph", "table", and so on
- Browsers do not display the HTML tags, but use them to render the content of the page

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A Simple HTML Document

<!DOCTYPE html>
<html>
<head>
<title>Page Title</title>
</head>
<body>

<h1>My First Heading</h1>
<p>My first paragraph.</p>

</body>
</html>

Example Explained

- The <!DOCTYPE html> declaration defines this document to be HTML5
- The <html> element is the root element of an HTML page
- The <head> element contains meta information about the document
- The <title> element specifies a title for the document
- The <body> element contains the visible page content
- The <h1> element defines a large heading
- The <p> element defines a paragraph

HTML Tags

HTML tags are element names surrounded by angle brackets:

<tagname>content goes here...</tagname>

- HTML tags normally come **in pairs** like <p> and </p>
- The first tag in a pair is the **start tag,** the second tag is the **end tag**

- The end tag is written like the start tag, but with a **forward slash** inserted before the tag name

Web Browsers

The purpose of a web browser (Chrome, Edge, Firefox, Safari) is to read HTML documents and display them.

The browser does not display the HTML tags, but uses them to determine how to display the document:
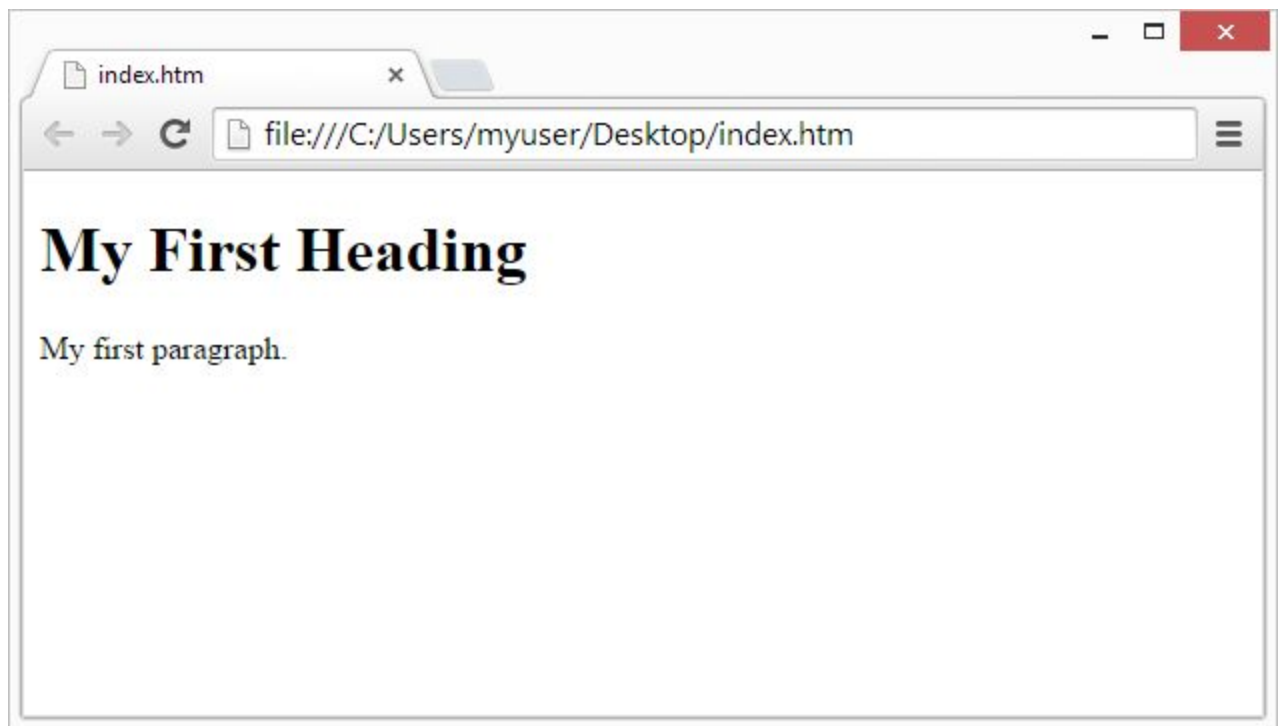
HTML Page Structure

Below is a visualization of an HTML page structure:

<html>

<head>

<title>Page title</title>

</head>

```
<body>

<h1>This is a heading</h1>

<p>This is a paragraph.</p>

<p>This is another paragraph.</p>

</body>

</html>
```

The <!DOCTYPE> Declaration

The <!DOCTYPE> declaration represents the document type, and helps browsers to display web pages correctly.

It must only appear once, at the top of the page (before any HTML tags).

The <!DOCTYPE> declaration is not case sensitive.

The <!DOCTYPE> declaration for HTML5 is:

<!DOCTYPE html>

The current trends in computer hardware platforms are:

- Mobile digital platforms.
- Bring your own devices.
- Quantum Computing.
- Virtualization.
- Cloud computing.
- Green computing.

Current trends in computer hardware platform

The Mobile Digital Platform

▪Based on new handheld hardware like cell phones and tablet computers oNanotechnology
▪Creating computer chips and other devices, thousands of times smaller through manipulating individual atoms, molecules grid Computing
▪Connects geographically remote computers into a single network to combine processing power and create virtual supercomputer
▪Provides cost savings, speed, and agility virtualization

▪Allows single physical resource to act as multiple resources (i.e. run multiple instances of OS)
▪Reduces hardware and power expenditures
▪Facilitates hardware centralization ▪→Type of software that allows a single computer (or clusters of connected computers) to function as if it were several different computers, each running its own operating system and software. Virtualization software underpins most cloud computing efforts and can make computing more efficient, cost-effective, and scalable oCloud Computing
▪A model of computing in which firms and individuals obtain computing resources over the internet
●Cloud infrastructure as a service

Applications: It's all On Demand

So far the applications segment of cloud computing is the only segment that has proven useful as a business model. The Cloud Wars: $100 Billion at Stake, Published by Merrill Lynch, May 7, 2008 By running business applications over the internet from centralized servers rather than from on-site servers, companies can cut some serious costs. Furthermore, while avoiding maintenance costs, licensing costs and the costs of the hardware required to run servers on-site, companies are able to run applications much more efficiently from a computing standpoint.

Offering On Demand Software – The companies below are already established in the On-Demand software or SaaS business. These companies charge their customers a subscription fee and in return host software on central servers that are accessed by the end user via the internet.

alesforce.com (CRM)

Google (GOOG)

NetSuite (N)

Cordys

Taleo (TLEO)

Concur Technologies (CNQR)

Traditional Software – The following companies have established themselves as traditional software providers. These companies sell licenses to their users, who then run the software from on premise servers.

SAP AG (SAP)

Oracle (ORCL)

Blackbaud (BLKB)

Lawson Software (LWSN)

Blackboard (BBBB)

Platforms:

Many of the companies that started out providing On Demand application services have developed platform services as well. The platform segment of cloud computing refers to products that are used to deploy internet. NetSuite, Amazon, Google, and Microsoft have also developed platforms that allow users to access applications from centralized servers.

In July 2008, HP, Yahoo! (YHOO), and Intel (INTC) announced a joint cloud computing research project called the Cloud Computing Test Bed. The companies are jointly designing and producing the internet based testing utilizing HP hardware and Intel processors.[3]

Active platforms – The following companies are some that have developed platforms that allow end users to access applications from centralized servers using the internet. Next to each company is the name of their platform.

Google (GOOG) – Apps Engine

Amazon.com (AMZN) – EC2

Microsoft (MSFT) – Windows Azure

SAVVIS (SVVS) – Symphony VPDC

Terremark Worldwide (TMRK) – The Enterprise Cloud

Salesforce.com (CRM) – Force.com

NetSuite (N) – Suiteflex

Rackspace Cloud – cloudservers, cloudsites, cloudfiles

Metrisoft – Metrisoft SaaS Platform

Infrastructure:

The final segment in cloud computing, known as the infrastructure, is very much the backbone of the entire concept. Infrastructure vendors environments (such as Google gears) that allow users to build applications. Cloud storage, such as Amazon's S3, is also considered to be part of the infrastructure segment.

Major Infrastructure Vendors – Below are companies that provide infrastructure services:

Google (GOOG) – Managed hosting, development environment

International Business Machines (IBM) – Managed hosting

SAVVIS (SVVS) – Managed hosting & cloud computing

Terremark Worldwide (TMRK) – Managed hosting

Amazon.com (AMZN) – Cloud storage

Rackspace Hosting (RAX) – Managed hosting & cloud computing

Businesses can benefit from autonomic computing, virtualization, and multicore processors.

Autonomic computing

Benefits of autonomic computing include systems that automatically do the following:

Configure themselves

Optimize and tune themselves

Heal themselves when broken

Protect themselves from outside intruders and self-destruction

Reduces maintenance costs

Reduces downtime from system crashes

Virtualization

Benefits of server virtualization include:

Run more than one operating system at the same time on a single machine.

Increase server utilization rates to 70 percent or higher.

Reduce hardware expenditures. Higher utilization rates translate into fewer computers required to process the same amount of work.

Mask server resources from server users.

Reduce power expenditures.

Run legacy applications on older versions of an operating system on the same server as newer applications.

Facilitates centralization of hardware administration.

Multicore processors

Benefits of multi-core processors:

Cost savings by reducing power requirements and hardware sprawl

Less costly to maintain as fewer systems need to be monitored.

Performance and productivity benefits beyond the capabilities of today's single-core processors.

Able to handle the exponential growth of digital data and the globalization of the Internet.

Able to meet the demands of sophisticated software applications under development.

Run applications more efficiently than single-core processors – giving users the ability to keep working even while running the most processor intensive task in the background.

Able to increase performance in areas such as data mining, mathematical analysis, and Web serving.

What are the current trends in software platforms?

Open-source software provides all computer users with free access to the program code so they can modify the code, fix errors in it, or to make improvements. Open-source software is not owned by any company or individual. A global network of programmers and users manage and modify the software. By definition, open-source software is not restricted to any specific operating system or hardware technology. Several large software companies are converting some of their commercial programs to open source.

Linux is the most well-known open-source software. It's a UNIX-like operating system that can be downloaded from the Internet, free of charge, or purchased for a small fee from companies

that provide additional tools for the software. It is reliable, compactly designed, and capable of running on many different hardware platforms, including servers, handheld computers, and consumer electronics. Linux has become popular during the past few years as a robust low-cost alternative to UNIX and the Windows operating system.