CACS101: Computer Fundamentals and Applications

Unit 7 – Contemporary Technologies

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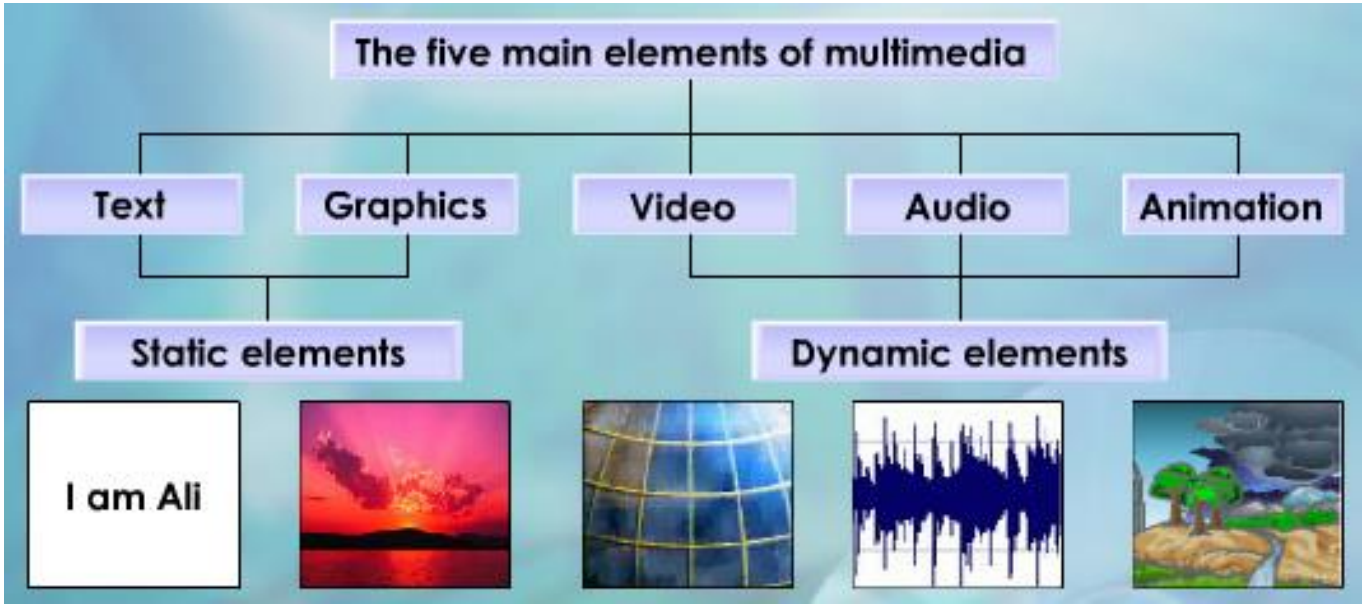
Multimedia

- Multimedia means that computer information can be represented through audio, video, and animation in addition to traditional media (i.e., text, graphics/drawings, images).
- 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 media that uses multiple form of information content and information processing.

Characteristics of Multimedia

- Multimedia systems must be computer controlled.
- Multimedia systems are integrated.
- The information they handle must be represented digitally.
- The interface to the final presentation of media is usually interactive.

Elements of Multimedia



Text

- Text is the basic element of multimedia. It involves the use of text types, sizes, colors and background colors.
- In multimedia, text is mostly use for titles, headlines, menu, paragraph, list etc.
- In a multimedia application, other media or screen can be linked with text. This is what you call Hypertext.
- The most used software for viewing text files are Microsoft Word, Notepad, Word pad etc. Mostly the text files are formatted with , DOC, TXT etc. extension.

Graphics

- It is a digital representation of non-text information, such as a drawing, chart, or photograph.
- Graphics make the multimedia application attractive. They help to illustrate ideas through still pictures.
- There are two types of graphics used: bitmaps (paint graphics) and vectors (draw graphics).
- Bitmaps graphics also called raster graphics. A bitmap represents the images as an array of dots called pixels. Bitmap graphics are resolution-dependent and generate large file sizes.
- Vectors graphics are images drawn on the computer with software that uses geometrical formulas to represent images and only require a small amount of memory.

Video

- Video is the technology of electronically capturing, recording, processing, storing, transmitting, and reconstructing a sequence of still images representing scenes in motion.
- Photographic images that are played back at speeds of 15 to 30 frames a second and the provide the appearance of full motion.

Audio

- In multimedia audio means related with recording, playing etc.
- Audio is an important components of multimedia because this component increase the understandability and improves the clarity of the concept.
- Audio includes speech, music or any other sound.

Animation

- Animation is the rapid display of a sequence of images of 2-D artwork or model positions in order to create an illusion of movement.
- It is an optical illusion of motion due to the phenomenon of persistence of vision and can be created and demonstrated in several ways.
- Entertainment multimedia titles in general, and children's titles specifically, rely heavily on animation.

Advantages of Multimedia

- It is very user-friendly. It doesn't take much energy out of the user, in the sense that you can sit and watch the presentation, you can read the text and hear the audio.
- It is multi sensorial. It uses a lot of the user's senses while making use of multimedia, for example hearing, seeing and talking.
- It is integrated and interactive. All the different mediums are integrated through the digitization process. Interactivity is heightened by the possibility of easy feedback.
- It is flexible. Being digital, this media can easily be changed to fit different situations and audiences.
- It can be used for a wide variety of audiences, ranging from one person to a whole group.

Disadvantages of Multimedia

- Information overload. Because it is so easy to use, it can contain too much information at once.
- It takes time to compile. Even though it is flexible, it takes time to put the original draft together.
- It can be expensive. Multimedia makes use of a wide range of resources, which can cost you a large amount of money.

Application Areas of Multimedia

- Video Games
- Special Effects in Film
- Animated Advertisement
- Internet and Interactive Web Pages

E-commerce

- E-commerce (Electronic Commerce) is the buying and selling of goods and services, or the transmitting of funds or data, over the internet.
- E-commerce is a methodology of modern business which addresses the need of business organizations, vendors and customers to reduce cost and improve the quality of goods and services while increasing the speed of delivery.
- E-commerce refers to paperless exchange of business information using EDI, E-mail, electronic fund transfer etc.
- E-commerce web sites are like on-line marketplaces where you can sell and buy items, and facilitate it by advertising your product, establishing newsgroups and blogs, posting job-oriented resumes etc.

Types of e-Commerce models

1. Business-to-Consumer (B2C)
2. Business-to-Business (B2B)
3. Consumer-to-Business (C2B)
4. Consumer-to-Consumer (C2C)

Business-to-Consumer (B2C)

- The B2C model involves transaction between business organization and customer. The business organization sells its products directly to a consumer.
- Customer can view the products shown on the website. The customer can choose a product and order the same. The website will then send a notification to the business organization via email and the organization will dispatch the product/goods to the customer.

Business-to-Business (B2B)

- The B2B model involves the transaction between companies/businesses, such as between a manufactures and a wholesaler or between wholesaler and a retailer.
- The business/company sells its products to an intermediate buyer who then sells the product to the final customer.

Consumer-to-Business (C2B)

- The C2B model involves a transaction between a consumer and business organization.
- It is similar to B2C model; however the difference is that in this case the consumer is the seller and business organization is the buyer. In this kind of transaction, the consumer decide the price of a particular product, which business accept or decline.

Consumer-to-Consumer (C2C)

- The C2C model involves transaction between consumers. Here, a consumer sells directly to another consumer. A well-known example is eBay.

Advantages of e-Commerce

- It makes buying selling procedure faster, as well as easy to find products.
- It makes buying/selling possible 24/7.
- There are no theoretical geographical limitations hence more reach to customers.
- It reduces operational costs and provides better quality of services.
- It does not require physical company set ups.

Disadvantages of e-Commerce

- Bad sites eat up customer's money.
- There is no guarantee of product quality.
- Mechanical failures can cause unpredictable effects on the total processes.
- There are many hackers who look for opportunities and thus an ecommerce site, service payment gateways all are always prone attack.
- The start-up costs of the e-commerce portal are very high. The setup of the hardware and the software, the training cost of employees, the constant maintenance and upkeep are all quite expensive.

e-Learning

- E-learning is the use of electronic media and information and communication technology (ICT) in education. E-learning includes numerous types of media that deliver text, audio, images, animation and streaming video, and includes technology applications and processes such as audio or video tape, satellite TV, CD-ROM and computer-based learning and, as well as local intranet/extranet and web-based learning.
- E-learning system is defined as an entire technological management system that facilitates learning and teaching for students and learners through electronic form such as internet, CDs and DVDs, TVs etc. The main concept of the E-learning is that which acts as the student-centered learning area.
- E-learning forms an essential way of teaching and learning to improve skills and knowledge. Delivery of digital content is the main characteristic of e-learning.

Advantages of e-Learning

- Class work can be scheduled around work and family.
- Students can study anywhere they have access to a computer and internet connection.
- There is no any geographical limitation for learning.
- It is quite favorable for learner as it can happen at any time and anywhere.
- It reduces or eliminates travel costs to attend learning events.
- It reduces or eliminates need for classroom/instructor infrastructure.

Disadvantages of e-Learning

- Technology dependent
- Can limit or prevent access by some student groups (for example, cost of equipment, online access and printing)
- E-learners need to be highly self-motivated.
- Student with visual impairments may be disadvantaged.
- Slow Internet connections or older computers may make accessing course materials frustrating.
- Managing computer files and online learning software can sometimes seem complex for students with beginner-level computer skills.
- Hands-on or lab work is difficult to simulate in a virtual classroom.

e-Governance

- E-governance is the application of information and communication technology (ICT) for delivering government services, exchange of information communication transactions, integration of various stand-alone systems and services between government-to-customer (G2C), government-to-business (G2B), government-to-government (G2G) as well as back-office processes and interactions within the entire government framework.
- Through e-governance, government services will be made available to citizens in a convenient, efficient and transparent manner. The three main target groups that can be distinguished in governance concepts are government, citizens and businesses/interest groups. In e-governance there are no distinct boundaries.

Benefits of e-Governance

- Improve delivery of services to citizens.
- Empower citizen through access to knowledge and information.
- Make the working of government more efficient and effective.
- More transparency.
- Greater convenience.
- Smoother flow of information.
- Less Corruption.
- Revenue growth and cost reduction.
- On-line access to information.
- Availabilities of government 24/7.
- On-line application submission and processing.

e-Governance barriers

- Resistant to change
- Lack of public awareness
- Public fear and skepticism
- Telecommunication services
- Internet services
- Unskilled IT staff and department
- Additional Hardware and Software cost
- Lack of privacy and security

e-Banking

- E-banking is defined as the automated delivery of new and traditional banking products and services directly to customers through electronic, interactive communication channels.
- E-banking includes the system that enable financial institution customers, individuals or businesses, to access accounts, transact business, or obtain information on financial products and services through public or private network, including the internet.
- Customers access e-banking services using an intelligent electronic device, such as a personal computer (PC), personal digital assistant (PDA), automated teller machine (ATM) etc.

Various Forms of E-Banking

1. Internet Banking
2. Automated Teller Machine (ATM)
3. Tele Banking
4. Debit Card
5. E-Cheque

Benefits of e-Banking

- Anytime banking, and anywhere banking
- Low-cost banking service
- Ease of monitoring
- Ease of transaction
- Convenience
- Quality service
- Transfer service

Drawbacks of e-Banking

- High start-up cost
- Security concerns
- Training and maintenance
- Transaction problems

Hypermedia

- Hypermedia is a collection of text, graphics, video, and sound linked and accessible in a hypertext format.
- Hypermedia allows links to be embedded in multimedia elements like images and videos to navigate to the same or other types of media.
- Although the Internet is the best example of the use of hypermedia, there is a lot of software that makes use of both hypermedia and hypertext.
- A lot of word processing, spreadsheet and presentation software like Microsoft Office allow hypermedia and hypertext to be embedded into the documents created.
- For example, in Microsoft Word, users can add hyperlinks to any word and even add links to pictures. Microsoft PowerPoint has the same feature for hypermedia.

Geographic Information System

- Geographic Information System (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present geographic data.
- The 4 main ideas of Geographic Information Systems (GIS) are:
  - Create geographic data.
  - Manage it in a database.
  - Analyze and find patterns.
  - Visualize it on a map
- GIS integrates many types of data. It analyzes geographic location and organizes layers of information into visualizations using maps and 3D scenes.

Geographic Information System

- Geographic Information Systems (GIS) have various industrial applications, and technological advancements have significantly enhanced GIS data, specifically how it can be used and what can be achieved as a result.
- Geographic Information Systems are powerful decision-making tools for any business or industry since it allows the analyzation of environmental, demographic, and topographic data.
- Data intelligence compiled from GIS applications help companies and various industries, and consumers, make informed decisions.

Scopes of GIS

- Land registration system
- Utilities such as Water supply, Electricity, Telephone, Irrigation networks
- Topographical database
- Forestry planning management
- Transportation networks
- Land use and land cover planning
- Urban planning
- Natural resource planning
- Disaster management and mitigation
- Environment impact studies

Components of GIS

- Hardware
- Software
- Data
- People
- Procedures

Virtual Reality

- Virtual Reality is a term used to describe a 3-Dimensional computer-generated environment which can be explored and interacted with by a person.
- It involves high end user interface that involves real time simulation and interactions through multiple sensorial channels.
- Virtual Reality is **believable, interactive, compute-generated, explorable, and immersive.**

Applications of Virtual Reality

- Military
- Sport
- Mental Health
- Medical Training
- Education

Augmented Reality

- Augmented reality (AR) is an interactive experience of a real-world environment where the objects that reside in the real-world are “augmented” by computer-generated perceptual information.
- The primary value of augmented reality is that it brings components of the digital world into a person’s perception of the real world and does so not as s simple display of data, but through the integration of immersive sensations that are perceived as natural path of an environment.
- AR is used to describe a combination of technologies that enable real-time mixing of computer-generated content with live video display.
- AR is based on techniques developed in VR and interacts not only with a virtual world but has a degree of interdependence with the real world.

Advantages of AR

- Medical Training
- Retail
- Repair & Maintenance
- Design & Modeling
- Business Logistics
- Tourism Industry
- Classroom Education
- Field Service
- Entertainment
- Public Safety

Artificial Intelligence

- Artificial Intelligence (AI) refers to the science and engineering of creating computer systems that simulate human thought and behavior.
- Some researchers are working to create computers that can think like humans, most are focused on developing software that can automate specific tasks that require a subset of human intelligence.
- The overall purpose of artificial intelligence applications is to help individuals and organizations achieve their goals.
- ***Bellman (1978)-*** *"The automation of activities that we associate with human thinking, activities such as decision-making, problem-solving, learning."*
- ***Lager and Stubblefield (1993)-*** *"The branch of computer science that is concerned with the automation of intelligent behavior."*

Categories of AI

- Thinking Humanly
- Acting Humanly
- Thinking Rationally
- Acting Rationally

Domain Areas of AI

- Game Playing
- Speech Recognition
- Understanding Natural Language
- Computer Vision
- Expert Systems
- Heuristic Classification
- Neural Networks
- Robotics

Application of AI

- Robotics
- Computer Vision
- Natural Language Processing
- Handwriting Recognition
- Face Recognition
- Intelligent Agents
- Neural Network

Ambient Intelligence

- Ambient Intelligence (AmI) refers to electronic environments that are sensitive and responsive to the presence of people.
- In an ambient intelligence world, devices work to support people in carrying out their everyday life activities, tasks and rituals in an easy, natural way using information and intelligence that is hidden in the network connecting these devices.
- The ambient intelligence paradigm is characterized by systems and technologies that are **embedded, context aware, personalized, adaptive, and anticipatory.**

Robotics

- A robot is a machine capable of carrying out a complex series of actions automatically. Robots can be guided by an external control device, or the control may be embedded within.
- Robotics is that branch which involves with the study and applications of Robots. It is the branch of technology which deals with the design, construction, operation, and application of robots, as well as computer systems for their control, sensory feedback, and information processing.

Laws of Robotics

- **Law 0:** *"A robot may not harm humanity, or, by inaction, allow humanity to come to harm."*
- **Law 1:** *"A robot may not injure a human being or, through inaction, allow a human being to come to harm."*
- **Law 2:** "A robot must obey the orders given to it by human beings, except where such orders would conflict with the First Law."
- **Law 3:** *"A robot must protect its own existence as long as such protection does not conflict with the First or Second Law."*

Components of Robot

- Controller
- Arm
- Drive
- End-Effector
- Sensor

Components of Robot

- Controller
- Arm
- Drive
- End-Effector
- Sensor

Bit Coin

- Bitcoin is a decentralized cryptocurrency, a form of payment that uses cryptography to control its creation and management, without need of any central authorities such as bank.
- It is an open-source software based online payment system.
- It is also known as electronic cash system based on peer-to-peer virtual data.
- It is world's first decentralized currency.
- Bitcoins can be transferred through a computer or smartphone without an intermediate financial institution.
- The processing of Bitcoin transactions is secured by servers called Bitcoin "miners". These servers communicate over an internet-based network and confirm transactions by adding them to a ledger which is updated and archived periodically using peer-to-peer filesharing technology, also known as the "blockchain".
- Bitcoin miners keep the blockchain consistent, complete and unalterable by continuously and repeatedly verifying and collecting newly broadcast transactions into a new group of transactions called 'Block'.

Features of Bitcoin

- Bitcoin is simple to setup
- It is decentralized
- It is anonymous
- It is transparent
- It is quick
- It is non-repudiable