IT3405 – User Interface Design

Section 1. Human Computer Interaction (HCI)

1. Interaction
2. Human User

Section 2. Evolution of HCI

3. Evolving Technologies for Rich Interaction

Section 3. Modeling (Analysis) HCI

4. PACT Analysis
5. Task Analysis

Section 4. Design HCI

6. User-Centered Design (UCD)
7. Design Models
8. Prototyping

Section 5. Features of Good HCI

9. Usability / Accessibility / Acceptability
10. User Support

Section 1. Human User Interaction (HCI)

1. **Interaction**
2. **Human User**

In every time, when you use any type of computing devices, there will be some kind of interaction in between you and devices. Today, using these devices are very easy, technologies are very close to us. Even we don't know that we are using them. But, think, it is very difficult to build up such an interaction. As a IT practitioners and students, it is not enough to use these technologies. Then, furthermore, you are able to understand the deepest levels of such an interaction, how they work, how to make up new interactions and many more. Ok, then, let's start.

HCI (human-computer interaction) is the study of how people interact with computers and to what extent computers are developed for successful interaction with humans. Historically and with some exceptions, computer system developers have not paid much attention to computer ease-of-use. Many computer users today would argue that computer makers are still not paying enough attention to making their products "user-friendly." However, computer system developers might argue that computers are extremely complex products to design and make and that the demand for the services that computers can provide has always outdriven the demand for ease-of-use.

1. Interaction

In this lesson, you'll learn about:

- *Component of HCI*
- *Interactive system*
- *About interaction*
- *About interface*
- *Key peoples of HCI*
- *Short history if HCI*
- *Past HCI vs Present HCI*

Component of HCI

Now you know, we are about to discuss on HCI. That means Human Computer Interaction. As the term implies, there are three components of HCI model.

- Human
- Computer
- Interaction

2019 – 2

2) Which of the following is a/are basic component/s of the HCI Model?

(a) Human User	(b) Modality	(c) Interaction
(d) Usability	(e) Computer	

MP 1(a)

1) (a) List main components of interaction model. Describe how these components communicate with each other. (Marks 10)

ANSWER IN THIS BOX

User, Computer and interaction. User is communicating his requirements through the interface to obtain the service of the computer. After the processing, the computer communicates the feedback/results through the interface in a format understandable to user. This process of communication is described as the interaction.

However, mainly, there are two types of groups are involved in HCI, developers and users. They have different perspectives on HCI.

User definition: HCI, also known as man-machine interaction, is a discipline that organizes interaction between man and computing devices to make it more successful.

Developer Definition: Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them.

HCI is a subject of multidisciplinary.

- HCI is a subject which is directed to many disciplines of other study streams and HCI is a sub-field of computer studies
- HCI consultants should have good knowledge or understanding of those disciplines

Other related area of HCI

- Psychology and cognitive science
- Ergonomics
- Sociology
- Computer Science and Engineering
- Business/Management
- Arts
- Writing

Ok then, I'll ask question from you. Is HCI a Science or a Craft?

✓ HCI is required to be both a craft and a science in order to be successful

(Beautiful and/or novel interfaces are artistically pleasing and motivate fulfilling the tasks required | Scientific view/reasoning: why certain things are successful whilst others are not? Then allow creative nature to feed off this information)

HCI takes advantage of our everyday knowledge of the world to make software and devices more understandable and usable for everyone.

2017 – 3

3) Which of the following **is/are** true with respect to the Human Computer Interaction?

(a) A discipline that organizes interaction between man and computing devices
(b) A discipline that relates only to Computer Science
(c) A multidisciplinary subject
(d) Fills the gap between user and computing devices
(e) One of the main components of HCI model is interaction

Interactive systems

Designing interactive systems is concerned with many different types of product. It is about designing whole environments in which phones, PDAs, laptop computers, digital projectors and other devices communicate with one another and through which people interact with one another. It is about designing interactive systems, products and services for the home, for work or to support communities. Here are some examples of recent interactive products and systems.

Example 1: iPhone

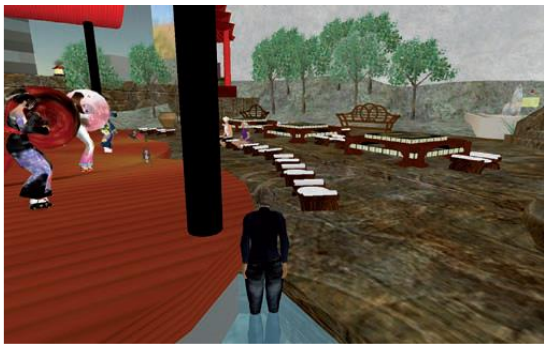
In 2007 Apple Inc. changed the face of mobile technologies when they introduced the iPhone. The iPhone had a carefully crafted, purpose-designed interface to make use of the finger as the input device. It had a revolutionary touch-sensitive screen that allowed for multi-touch input. They introduced 3D touch also commonly known as force touch with iPhone 6s and 6s Plus in 2015.

Example 2: Wii

Also, in 2007 Nintendo introduced the Wii. The Wii was a revolutionary new games concept that used infra-red sensors attached to a TV or other display device to track a wand that transmitted infra-red signals. The new system could, therefore, register different gestures such as a 'bowling' action, a 'tennis shot' action or a host of other movements. The notion of computer games changed radically, from a young person shooting at imaginary monsters, or driving imaginary cars, to a family-wide entertainment. When the 'Wii fit' was introduced it appealed to a new audience of people wanting to keep fit at home.

Example 3: Second Life

Second Life is a huge on-line community populated by animated virtual people (called avatars). It consists of thousands of simulated buildings, parks, sea sides, factories, universities and everything else one could find in the real world (and much else besides). People create avatars to represent themselves in this virtual world. They can determine their size, shape, gender and what they want to wear. They are controlled by their creators using the Internet, interacting with other avatars, and visiting virtual places.



Learn on: Artificial life

Artificial life (often abbreviated to 'Alife') is a branch of artificial intelligence (AI), the discipline that looks at whether intelligent software systems can be built and at the nature of intelligence itself. The tradition in AI has been to represent knowledge and behaviors through rules and rigid structures. Alife tries instead to represent higher-level features of the things in an environment, such as the goals that a creature has and the needs that it must satisfy. The actual behavior of the artificial creatures is then more unpredictable and evolves in the environment. Increasingly, characters in computer games are using Alife techniques.

Example 4: i Robo-Q domestic toy robot

The i Robo-Q domestic toy robot is an example of the new children's toys that are increasingly available. Toys are using all manner of new technologies to enhance the experiences of children at play. They use robotics, voice input and output, and a variety of sensors to provide novel and engaging interactions.

Example 5: Facebook

Facebook is a highly popular website that allows people to keep in contact with their friends. Known as social networking sites, there are many similar systems around. Facebook is the most popular. It allows people to add applications in a similar way to the iPhone. People can store and share digital photos, write notes to each other and get regular updates about what their friends are doing.

About interaction

What is Interaction?

- A communication between a user and computer.

There are two types of interaction:

1. **Direct** - A dialog with feedback and control throughout the performance of the task and most of the time **human user is intervening** to the interaction (Online processing, do not use intelligent sensors) – **explicit communication**
   Ex: Changing fonts in a word processor

2. **Indirect** - Batch processing or intelligent sensors controlling the environment and most of the time **human user is not intervening** to the interaction – **implicit communication**.
   Ex: misspelled words are automatically corrected in a word processor

MP – 10

10) Direct interaction connects man and machine explicitly in several ways. Which of the following is/are such interaction?

(a) Clicking a button	(b) Highlighting spelling mistake in a word processor	(c) Changing a font in a word processor
(d) Recovering files in an abnormal shutdown	(e) Open a tab in a browser	

2015 – 10

10) Indirect interaction connects a user and a computer implicitly in several ways. Which of the following is/are such indirect interaction(s)?

(a) Clicking on a menu item.
(b) Highlighting spelling mistakes in a word processor.
(c) Changing a font of letters in a word processor.
(d) Saving files to recover in an abnormal shutdown.
(e) Opening a new window.

2017 – 18

18) Indirect interaction connects a user and a computer implicitly in several ways. Which of the following **is/are** such an indirect interaction(s)?

(a) Clicking on a menu item.
(b) A word processor highlighting grammatical errors.
(c) A spreadsheet application saving files to recover in an abnormal shutdown.
(d) Opening a new window.
(e) Changing a font of letters in a word processor.

2018 – 5

5) Direct interaction connects man and machine explicitly in several ways. Which of the following is/are such interaction(s) in a word processor?

(a) Clicking the Save button
(b) Highlighting spelling mistake
(c) Recovering documents due to a program error or an abnormal shutdown
(d) Changing the font
(e) Open an existing document

2016- 1(a)

1) (a) Explain Direct and Indirect interaction types when you use an application. Give one example for each interaction style considering a word processing software. (10 marks)

ANSWER IN THIS BOX

Direct: a dialog with feedback and control throughout the performance of the task. Ex: Changing fonts, font sizes, font colours in a word processor.

Indirect: Batch processing or intelligent sensors controlling the environment
Ex: Some misspelled words are automatically corrected, Grammar/ spelling mistakes are highlighted.

When you design an interaction, you have 2 ways to do it.

1. **User-centered design (UCD)** - In order to optimize the system functionality and resources, human user is considered main stakeholders to satisfy

2. **Task-centered design (TCD)** - "Tasks are what the user is carrying out in a way he/she wants.

When designing interaction, its goals should be:

allowed users to carry out tasks

- Safely
- Effectively
- Efficiently
- Enjoyably

What is **interface**?

If something helps you to access your digital data (images in your hard drive) from physical world, that thing is called as an interface. In this example, you can use mouse to access your images stored on storage device. Therefore, in here, mouse is the interface in between you and data. Interaction happens through the interface and interface facilitates the communication between the user and system.

Simply say, human and computer need to some kind of interface to communicate with each other. Another way interaction is initiated and maintained through an interface.

The interface needs to provide some mechanisms for

- People to provide instructions and enter data into the system: 'input'.
- The system to tell people what is happening: 'feedback'
- The system to display the content (i.e. information, pictures, movies, animations): 'output'.

MP – 1

1) Identify device(s) which ***directly*** *is/are used* in the human-computer interaction

(a) Speakers	(b) UPS	(c) USB
(d) Multi-touch surface	(e) Printer	

2015-1

1) Identify a device(s) which is/are not part of user interface of a personal computer.

(a) Microphone	(b) UPS	(c) CPU
(d) Keyboard	(e) LCD	

2016-1

1) Identify a device/s which is/are **not** part of user interface of a personal computer.

(a) Microphone	(b) Speakers	(c) CPU
(d) Keyboard	(e) LCD	

The interface to an interactive system is all those parts of the system with which people come into contact,

- **Physically** (by pressing buttons or moving levers)
- **Perceptually** (by displaying things on a screen, or making noises)
- **Conceptually** (by providing messages and other displays)

2015 – 1(a)

1) (a) What fills the gap between the user and computer? Describe its significance for successful communication between two components. (10 marks)

ANSWER IN THIS BOX
Interface. Interface facilitates the communication between the user and system.
It translates users' requirement to a format understandable for computing devices as well
as messages from computing devices to a format understandable for human users.

You can use various techniques to make interface more facilitative (interface extend technique).

1. **Multiple ways** - The device can be handled in different ways to do the same
2. **Simplify the interface** - Use the devices to increase the productivity (simplify the interface)
3. **Multitasking** - Single device to multiple tasks
4. **Customization** - Change the device to use it easily to do the task
5. **Personalization** - Some people like to do in a specific way

2017 – 4

4) The following two groups A and B are about user interaction. Select the **correct matching** between items in group A with appropriate ones in group B.

Group A	**Group B**
A1. Direct Interaction	B1. Handling a single device for many tasks
A2. Indirect Interaction	B2. A component which connects the interaction
A3. Interaction	B3. A dialog with feedback and control throughout the performance of the task
A4. Multitasking	B4. Occurs when intelligent sensors control the environment
A5. User	B5. The communication between the user and the machine

(a) A1→B1, A2→B2, A3→B3, A4→B4, A5→B5
(b) A1→B5, A2→B4, A3→B3, A4→B2, A5→B1
(c) A1→B3, A2→B4, A3→B5, A4→B1, A5→B2
(d) A1→B4, A2→B1, A3→B5, A4→B3, A5→B2
(e) A1→B2, A2→B3, A3→B1, A4→B4, A5→B5

2018 – 17

17) The following two groups A and B are related to novel interface design. Select the **correct matching** between items in group A with appropriate ones in group B.

Group A	**Group B**
A1. Multitasking	B1. Modify the device to facilitate a user to perform tasks easily.
A2. Multiple ways	B2. Some people like to do tasks in a specific way
A3. Simplify the interface	B3. Single device to perform multiple tasks
A4. Customization	B4. The device can be handled in different ways to do the same task
A5. Personalization	B5. A device can be used to increase the productivity

(a) A1→B3, A2→B4, A3→B5, A4→B1, A5→B2

(b) A1→B1, A2→B2, A3→B3, A4→B4, A5→B5

(c) A1→B5, A2→B4, A3→B3, A4→B2, A5→B1

(d) A1→B4, A2→B1, A3→B5, A4→B3, A5→B2

(e) A1→B2, A2→B3, A3→B1, A4→B4, A5→B5

2017 – 6

6) Which of the following is/are **false** with respect to novel interface design?

(a) In a multitasking environment, a single device can be handled in different ways to do the same thing.
(b) Productivity can be increased by simplifying the interface.
(c) Personalization will decrease the user satisfaction.
(d) Customization provides facilities to change the interface according to individual requirements.
(e) A single device can be used to do multiple tasks.

MP – 1(b)

(b) Name **three ways** to extend the interface of a device. Describe briefly the possible reasons to extend a particular interface? (Marks 10)

ANSWER IN THIS BOX

Simplification, Customization, Personalization, Multiple ways,
The given interface may have been designed considering all users of the system. However, we can observer different user groups as well as different requirements with respect to individuals or work task. These ways will help to identify them.

2015-1(b)

(b) Simplification is a method to extend the user interface. How does the simplification affect the user? How do you implement it using the keyboard? (10 Marks)

ANSWER IN THIS BOX
It increases the productivity of the user. Short cut keys are the common ways to increase
productivity. Caps lock and Shift key also facilitate the simplification as well as
productivity. Function keys bundle several actions together or map to a longer task by
just one touch. Numeric keypad could also be considered as a way to simplify the process of
entering numeric data. Backspace or DEL keys simplify the interaction of deleting a
character.

2016 – 1(b)

(b) Customization is a method to extend a user interface. How does the customization affect the user? Give an example for customization in office applications. (10 Marks)

ANSWER IN THIS BOX
Customization gives the user the ability to change certain aspects of a system according to one of a pre-defined set of profiles in the system.
The interface of a system will be more flexible to user needs or is user friendly compared to a one without customization. This situation will affect the
users to perform better.
Users could select different tools from tool bar/ribbon according to his/her preferences and requirements in an office application. These toolbars contain different icons according to default design in the system. Users could easily customize these toolbars by adding or removing icons using facilities in the menu of office application.

Risk of poor user interface

Poor user interfaces

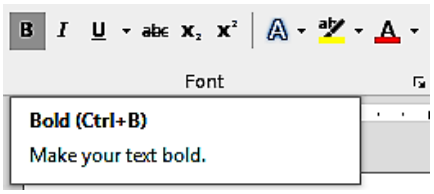
- Can cripple a system that is outstanding in all other respects
- Can be very irritating for the user
- Can be hard to learn or remember
- Can lose productivity
- Could literally become a life or death situation

Features of good user interface

1. Good user interface needs to be:
    - Clear / Concise / Familiar / Responsive / Consistent / Attractive / Efficient / Forgiving

Clear

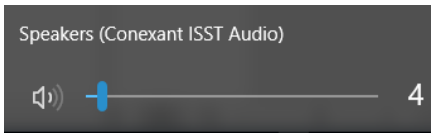
the whole purpose of user interface design is to enable people to interact with your system by communicating meaning and function. If people can't figure out how your application works or where to go on your website, they'll get confused and frustrated.



What does that do? Hover over buttons in Word (2016) and a tooltip will pop up explaining their functions

Concise

When you can explain a feature in one sentence instead of three, do it. When you can label an item with one word instead of two, do it. Save the valuable time of your users by keeping things concise. Keeping things clear and concise at the same time isn't easy and takes time and effort to achieve, but the rewards are great.



The volume controls in win 10 use little icons to show each side of the scale from low to high

Familiar

Familiar is just that: something which appears like something else you've encountered before. When you're familiar with something, you know how it behaves, you know what to expect. Identify things that are familiar to your users and integrate them into your user interface.

Responsive

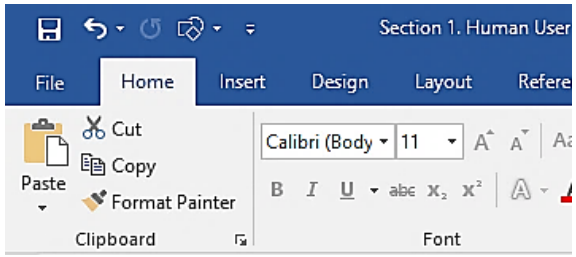
In one hand, means the interface provides some form of feedback. The interface should talk back to the user to inform them about what's happening.
responsive means fast. The interface, if not the software behind it, should work fast. Waiting for things to load and using leggy and slow interfaces is frustrating.

Outlook shows a progress bar when you first go to your inbox. This allows for the whole page to be shown instantly once everything is ready.

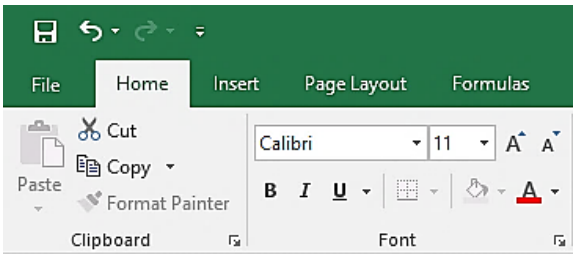
Consistent

Consistent interfaces allow users to develop usage patterns they'll learn what the different buttons, tabs, icons and other interface elements look like and will recognize them and realize what they do in different contexts. They'll also learn how certain things work, and will be able to work out how to operate new features quicker, extrapolating from those previous experiences.

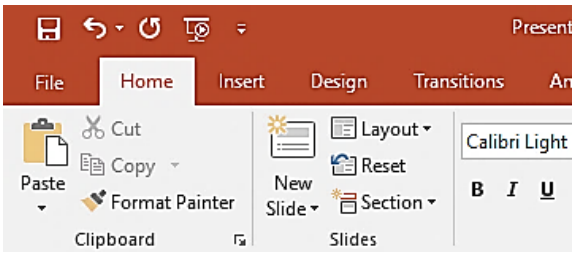
Microsoft Word



Microsoft Excel



Microsoft PowerPoint



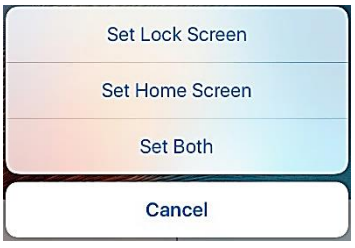
The Microsoft Office (2016) user interface is consistent for a reason.

Attractive

Attractive in a sense that it makes the use of that interface enjoyable. Interface should be colorful (according to the rules in UID) and gorgeous.

Efficient

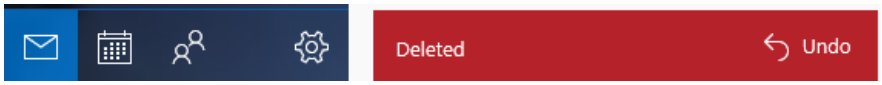
There are number of different functions of the software application or website. A good interface should allow you to perform those functions faster and with less effort.



Apple has identified three key things people want to do with wall paper image on their iPhone, and provides buttons to accomplish each of them in the wall paper controls

Forgiving

People are bound to make mistakes when using your software or website. How well you can handle those mistakes will be an important indicator of your software's quality. Don't punish the user build a forgiving interface to remedy issues that come up. A forgiving interface is one that can save your users from costly mistakes. For example, if someone deletes an important piece of information, they will be easily able to retrieve it or undo this action.



Trashed the wrong email by mistake? Windows mail program lets you quickly undo your last action.

2. Suitable for the task
3. Easy to use (appropriate, adaptable to the user's knowledge and experience)
4. Display information to useful for the user
5. Confirms to the "Principles of Software Ergonomics" (Color using, object size)

Developing the interaction

When developing interactions in a system, the designer should

- Understand the human capacities of the user
- Understand the consequences of using information technology as a tool for solving work related tasks
- Develop and evaluate the system by putting the user at the center of the design process (UCD).

Computing devices are used for specific tasks by users (People) and Interfaces should be designed to support these tasks by designers (People).

- User = Designer → trivial job
- User != Designer → not so difficult

Interface is not the last thing to do:

- Should be developed integrally with the rest of the system
- Iterative work that goes with evaluation

Key peoples in HCI

1. Vannevar Bush

   Postulated Memex device
   - Can store all records/articles/communications
   - Large memory
   - Items retrieved by indexing, keywords, cross references
   - Can make a trail of links through material, etc…

   Read "As we may think" at
   http://www.theatlantic.com/magazine/archive/1945/07/as-we-may-think/303881/

Vannevar Bush established the U.S. military / university research partnership that later developed the *ARPANET (The First Internet)*, and wrote the first visionary description of the potential use for information technology, inspiring many of the *Internet*'s creators.

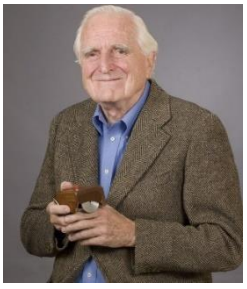
2. J.R. Licklider

- 1960 - Postulated “man-computer symbiosis”
- Couple human brains and computing machines tightly to revolutionize information handling

3. Ivan Sutherland

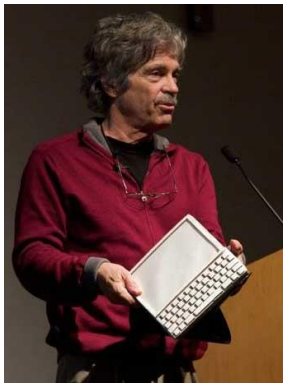
- SketchPad - ‘63 PhD thesis at MIT
- It is a computer program for animation, drawing, drafting, CAD
    - Hierarchy - pictures & subpictures
    - Master picture with instances (ie, OOP)
    - Constraints
    - Icons
    - Copying
    - Light pen as input device
    - Recursive operations

4. Douglas Engelbart



- He is the inventor of the **mouse**
- Also, famous for hierarchical hypertext, multimedia, mouse, high-res, display, windows, shared files, electronic messaging, CSCW, teleconferencing, ...

5. Alan Kay



- Inventor of Dynabook - Notebook sized computer loaded with multimedia and can store everything
- Outlines the requirements for a conceptual portable educational device
- Offer similar functionality to that now supplied via a laptop computer or a tablet or slate computer with the exception of the requirement for any Dynabook device offering near eternal battery life

6. Tim Berners-Lee

- Father of World Wide Web
- A system of globally unique identifiers for resources (URL/URI)
- The publishing language Hyper Text Markup Language (HTML);
- The Hypertext Transfer Protocol (HTTP).

MP – 3

3) Who is the inventor of mouse?

(a) Douglas Engelbart	(b) Alan Kay	(c) Tim Berners Lee
(d) Vannevar Bush	(e) J.R. Licklider	

2015-3

3) Hypertext and its protocol had a direct impact on the user interface design. Who was the key architect of this technology?

(a)Douglas Engelbart	(b) Alan Kay	(c) Tim Berners Lee
(d) Vannevar Bush	(e) J.R. Licklider	

2016-3

3) Which individual proposed the idea of "man-computer symbiosis" which can be explained as the coupling of human brains and computing machines tightly to revolutionize information handling?

(a)Douglas Engelbart	(b) Alan Kay	(c) Tim Berners Lee
(d) Vannevar Bush	(e) J.R. Licklider	

2017-10

10) Which individual proposed the Memex device?

(a) Douglas Engelbart	(b) Alan Kay	(c) Tim Berners Lee
(d) Vannevar Bush	(e) J.R. Licklider	

2018-19

19) Which individual proposed the idea of "man-computer symbiosis"?

(a) Douglas Engelbart	(b) J.R. Licklider	(c) Alan Kay
(d) Tim Berners Lee	(e) Vannevar Bush	

2019-10

10) Which individual invented the mouse?

(a) Douglas Engelbart	(b) J.R. Licklider	(c) Alan Kay
(d) Tim Berners Lee	(e) Vannevar Bush	

MP-1(c)

(c) Write a short composition about the inventor of the mouse. (Marks 10)

ANSWER IN THIS BOX

2015-1(c)

(c) Write a brief description about the device proposed by the father of Human-Computer Interaction. (10 Marks)

ANSWER IN THIS BOX
Vanner Bush is considered to be the father of human-computer interaction. This was based on his visionary article published in 1945, "As we may think". This article is based on a device he proposed, called "Memex". It is a device where an individual stores all his books, records, and communications and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to one's memory.

2016-1(c)

(c) Explain how the work of Mr. Tim Berners Lee affected the human-computer interaction. (10 Marks)

ANSWER IN THIS BOX
He is the Father of the world wide web (WWW). It is based on the Hyper Text Markup Language (HTML) and the Hypertext Transfer Protocol (HTTP). This mechanism created a different metaphor to access information.

Short history of HCI

- Mid 1960's computers too expensive for individuals and those were timesharing
  - Increased accessibility
  - Interactive systems, not jobs
  - Text processing, editing
  - Email, shared file system
  - Land mark developments affected HCI was VDU
  - More suitable medium than paper
  - Sutherland's Sketchpad as landmark system
  - Computers used for visualizing and manipulating data
  - Early days – CRT | Nowadays – LCD, LED, Touch Screen

Xerox PARC

- Personal computing and GUI development
  - Text and command-based
  - Xerox PARC - mid 1970's
    - ✓ local processor, bitmap display, mouse
    - ✓ Precursor to modern GUI, windows, menus, scrollbars
    - ✓ LAN – Ethernet

- Apple Inc. reinvented more user-friendly devices with graphic interface
  - Apple Lisa -1983
  - Apple Macintosh -1984

Apple Lisa

2000 to Present

- XBOX 360 – Video Game Console- 2005
- Nintendo Wii – 7th generation Console
- Android – Linux based phone OS -2007
- iPhone – Apple's smartphone- 2007
- Windows 8 – Popular Microsoft's OS - 2012
- HMZ-T1- Sony HD and 3D viewer 2012
- Surface – Microsoft's hybrid tablet – 2012
- Windows 10 – Popular Microsoft's OS – 2015
- Surface Hub – Next generation of "surface" – 2015
- Surface Book – Microsoft's 2-in-1 PC – 2015
- Surface Studio – Microsoft's all-in-one PC – 2016
- iPhone 7 – Current generation of Apple's smartphone- 2016

Apple Macintosh 128k

Nintendo Wii

XBOX 360

HMZ-T1

Main characteristics of HCI (Past vs Present)

Past	Present
Function/Process centered	User centered
Not much use of graphics	More use of graphics
Early PC and mouse	Newer PCs and intelligent censors
High learning curve	Low learning curve
	OS development
	New technologies aimed at • Natural feel • Motion capture • Touch screen • Multi-touch / Force touch (3D touch)

****

2. Human User

In this lesson, you'll learn about:

- *Understanding human user*
- *Visual and human eye*
- *Reading*
- *Hearing and ear*
- *Touch, movement and Fitts Law in Visual Design*
- *Human memory*
- *Human thinking and problem solving*
- *Human Errors*

Understanding the human user

The user is interacting with the computer in order to accomplish something (he/she has a goal!). Human user may be an individual, a group of users working together or a sequence of users in an organization (each dealing with some parts of task). Humans are limited in their capacity to process information. This has important implications for design. Human users can be classified according to various kind of aspects.

- Physical abilities
- Personality differences
- Skill differences
- Cultural diversity
- Motivation
- Special needs

There are 3 types of users

1. **Primary user** - Those who actually use the product
2. **Secondary user** - Those who will occasionally use the product or those who use it through an intermediary
3. **Tertiary user** - Those who will be affected by the use of the product or make decisions about its purchase

Humans are differing from each other with

- **Long term differences** like gender, physical and intellectual abilities
- **Short term differences** like effect of stress or fatigue
- **Changing differences** like age

A Human can be viewed as an information processing system.

- Information received and responses given via input-output channels
  - visual, auditory, haptic, movement
- Information stored in memory
  - sensory, short- term, long –term
- Information processed and applied in various ways
  - reasoning, problem solving, skill, error

Input channel of human

- Visual (sight)
- Auditory (hearing)
- Haptic (touch)
- Taste
- Smell

} Rarely used for HCI

Output channel of human

- Auditory (speaking)
- Body (movement, appearance)

Input in the human occurs mainly through the senses and output through the motor control of the effectors. There are five major senses: **sight**, **hearing**, **touch**, taste and smell and the first three are the most important to HCI.
Taste and smell do not currently play a significant role in interface design. (It is possible future applications may exploit these senses). Speaking, Body movement, Facial expressions, etc. are used to output the status of human process

2016-18

18) Which of the following is/are rarely used in human computer interaction?

(a) Body movement	(b) Smell
(c) Vision	(d) Touch (Haptic)
(e) Taste	

2018-15

15) Which of the following is/are not essential for accessibility?

(a) Taste	(b) Vision	(c) Haptic
(d) Audio	(e) Smell	

Different Channels in computers and human users || Input Vs. Output

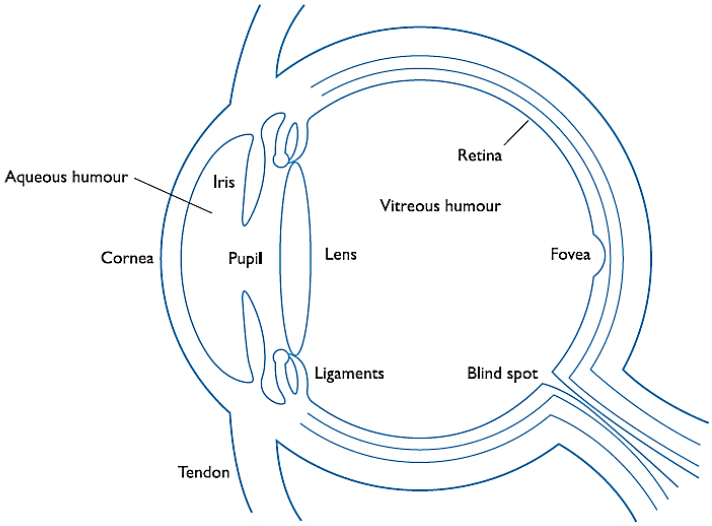
- Entering data/information into computers
  - Keyboard – Character processing - Text data
  - Speakers – Voice Recognition – Audio data
  - Camera – Image Recognition (Computer Vision) – Image data
  - Mouse – Spatial processing - point of location

- Entering data/information into human user
  - Eyes
  - Ears
  - Body

- Output data/information
  - The most common method is by viewing information expressed as text, an image or video displayed on a screen.
  - Auditory data may take the form of music, recorded of speech, text-to-speech or alert sounds

Visual and human eye

Capabilities of humans in receiving information may vary from one to another although all humans have same eye structure (individual differences)



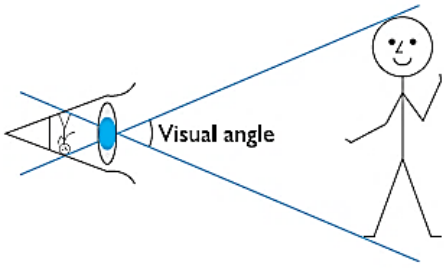
Interpreting the visual signal

Size and depth

- Visual angle indicates how much of view object occupies (relates to size and distance from eye)

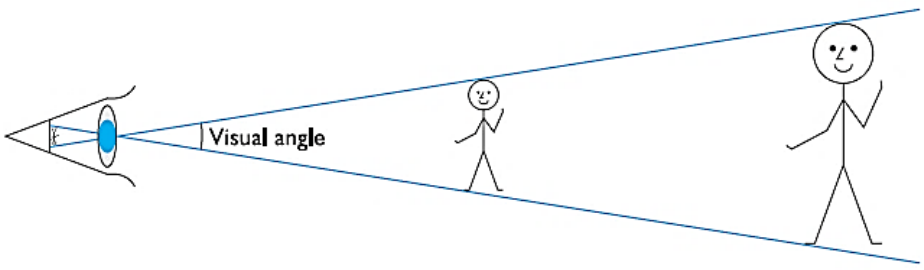
Perceiving size and depth

Imagine you are standing on a hilltop. Beside you on the summit you can see rocks, sheep and a small tree. On the hillside is a farmhouse with outbuildings and farm vehicles. Someone is on the track, walking toward the summit. Below in the valley is a small market town. Even in describing such a scene the notions
of size and distance predominate. Our visual system is easily able to interpret the images which it receives to take account of these things. We can identify similar objects regardless of the fact that they appear to us to be of vastly different sizes. In fact, we can use this information to judge distances.



Objects of the same size at different distances have different visual angles

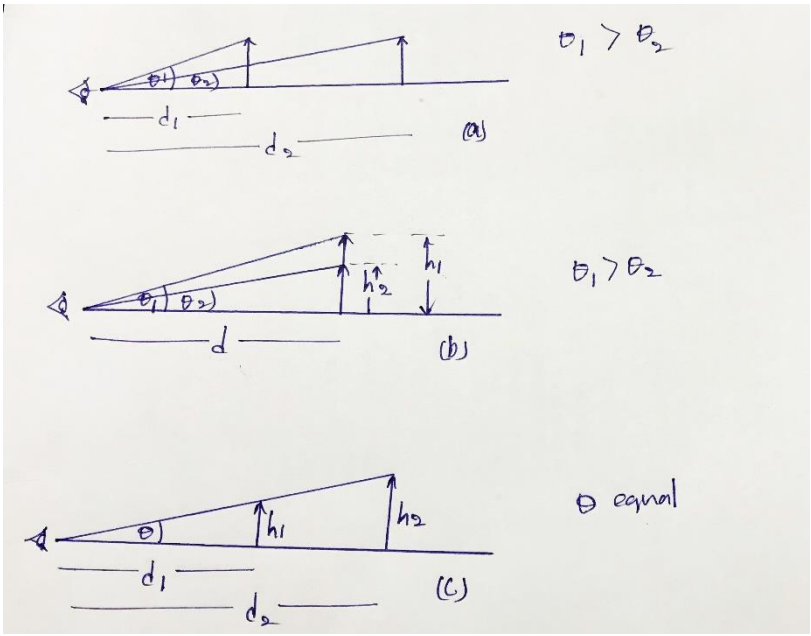
Objects of different sizes and different distances may have the same visual angle



Interpreting the signal to identify objects

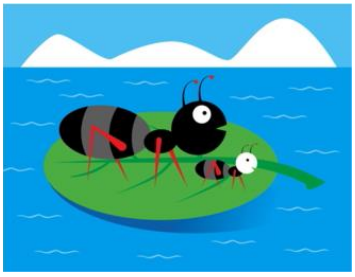
So how does the eye perceive size, depth and relative distances? To understand this, we must consider how the image appears on the retina. As we noted in the previous slide, reflected light from the object forms an upside-down image on the retina

The size of that image is specified as a visual angle. If we were to draw a line from the top of the object to a central point on the front of the eye and a second line from the bottom of the object to the same point, the visual angle of the object is the angle between these two lines.



Identifying the larger objects

Visual angle is affected by both the size of the object and its distance from the eye. Therefore, if two objects are at the same distance, the larger one will have the larger visual angle.



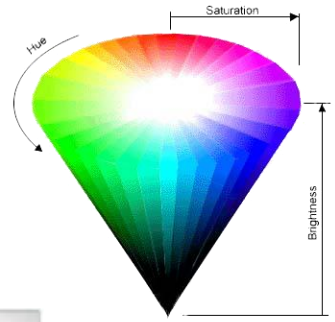
Visual Acuity

The extensive knowledge about the human visual system can be brought to bear in practical design. For example, our ability to read or distinguish falls off inversely as the distance from our point of focus increases. This is due to the fact that the cones are packed more densely towards the center of our visual field. You can see this in the following image. Fixate on the dot in the center. The letters on the left should all be equally readable, those on the right all equally harder.

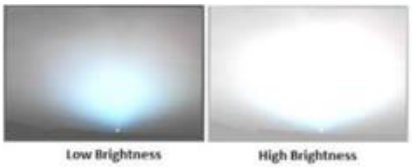
This loss of discrimination sets limits on the amount that can be seen or read without moving one's eyes. A user concentrating on the middle of the screen cannot be expected to read help text on the bottom line.

However, although our ability to discriminate static text diminishes, the rods, which are concentrated more in the outer parts of our visual field, are very sensitive to changes; hence we see movement well at the edge of our vision. So, if you want a user to see an error message at the bottom of the screen it had better be flashing! On the other hand, clever moving icons, however impressive they are, will be distracting even when the user is not looking directly at them.

Brightness

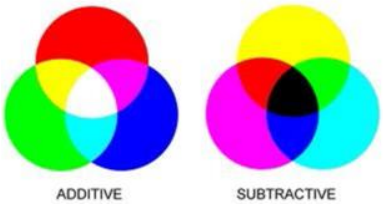


- Subjective reaction to levels of light
- Affected by luminance of object
- Measured by just noticeable difference
- Visual acuity increases with luminance as does flicker



Colour

- Made up of hue, intensity, saturation
- Cones sensitive to colour wavelengths
- Blue acuity is lowest
- 8% males and 1% females colour blind



Movement and Luminance

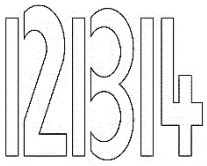
- The visual system compensates for:
  - Movement
  - Changes in luminance
- You can read the name board of moving bus.

Context is used to resolve ambiguity

This ability to interpret and exploit our expectations can be used to resolve ambiguity. For example, consider the image shown in following figure.

Is this 13 or B?

ABC

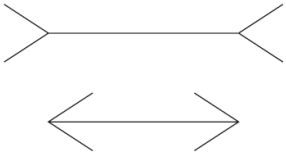


121314

Optical Illusions

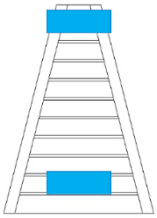
- Optical illusions sometimes occur due to over compensation.
- An optical illusion (also called a visual illusion) is characterized by visually perceived images that differ from objective reality. The information gathered by the eye is processed and the brain to give a percept that does not tally with a physical measurement of the stimulus source.

Which line is longer?

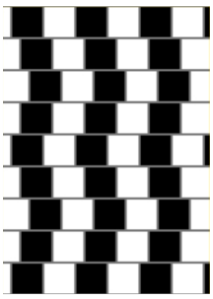


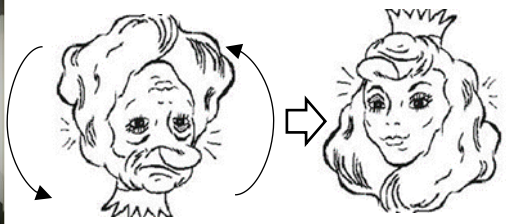
The Muller–Lyer illusion

Are these the same size?



The Ponzo illusion





(PP) 2016-5

5) Which of the following is/are true with respect to the human visual system?

(a) The movement and changes in luminance may not affect recognition.

(b) Overcompensation could result in optical illusions.
(c) Context always creates ambiguity.
(d) Optical illusions can occur due to ambiguity.
(e) Visual acuity is a kind of ability to perceive detail.

Reading

Read the following passage.

> I cnduo't bvleiee taht I culod aulaclty uesdtannrd waht I was rdnaieg. Unisg the icndeblire pweor of the hmuan mnid, aocdcrnig to rseecrah at Cmabrigde Uinervtisy, it dseno't mttaer in waht oderr the lterets in a wrod are, the olny irpoamtnt tihng is taht the frsit and lsat ltteer be in the rhgit pclae. The rset can be a taotl mses and you can sitll raed it whoutit a pboerlm. Tihs is bucseae the huamn mnid deos not raed ervey ltteer by istlef, but the wrod as a wlohe. Aaznmig, huh? Yaeh and I awlyas tghhuot slelinpg was ipmorantt! See if yuor fdreins can raed tihs too.

When we read, we are passing several stages.

1. Visual pattern perceived
2. Decoded using internal representation of language
3. Interpreted using knowledge of syntax, semantics, pragmatics

Reading involves saccades and fixations Perception occurs during fixations Word shape is important to recognition Negative contrast (**dark characters on a light screen**) improves reading from computer screen. (black letters on white space)

Hearing and ear

Hearing Provides information about environment: you recognize **distances**, **directions**, **objects** with the sound.

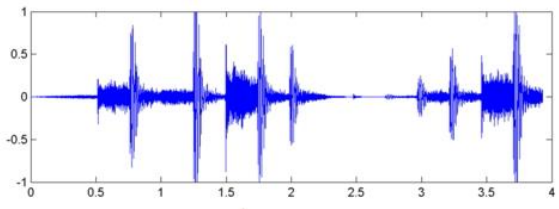
Part of ears

1. **Outer ear** – protects inner and amplifies sound
2. **Middle ear** – transmits sound waves as vibrations to inner ear
3. **Inner ear** – chemical transmitters are released and cause impulses in auditory nerve

Sound

- Sound have three important characteristics.
    - **Pitch** – sound frequency
    - **Loudness** – amplitude
    - **Timbre** – type or quality

- Humans can hear frequencies from **20Hz** to **15kHz** and **less accurate distinguishing high frequencies than low**.
- Auditory system filters sound. you can attend to sounds over background noise. As an example, the cocktail party phenomenon.



Hear this: https://www.youtube.com/watch?v=qNf9nzvnd1k

MP-4

4) What is/are frequency ranges that human could hear?

(a) 20 Hz to 30 kHz	(b) 20 Hz to 15 kHz	(c) 50 Hz to 15 kHz
(d) 10 Hz to 15Hz	(e) 10 Hz to 15kHz	

MP-5

5) Which of the following is/are true with respect to human hearing?

(a). Humans can hear frequencies from 20Hz to 15Hz

(b). Humans can attend sounds over background noise

(c). Less accurate distinguishing of low frequencies than high

(d). Middle ear transmits sound waves as vibrations to inner ear

(e). Hearing perception is faster than visual perception

2015-5

5) Which of the following is/are true with respect to human user capabilities for interaction?

(a) Humans can hear frequencies from 25Hz to 15KHz.

(b) Human attention is not disturbed due to jerks in the background sounds.

(c) Middle ear transmits sound waves as vibrations to outer ear.

(d) Auditory reaction time is more than visual time.

(e) Sensitivity in fingers is not important for touch typing speed.

We are using **non-speech sounds** for various purposes such as

- **Attention** – to attract the user's attention to a critical situation or to the end of a process.
- **Status information** – continuous background sounds can be used to convey status information. For example, monitoring the progress of a process (without the need for visual attention).
- **Confirmation** – a sound associated with an action to confirm that the action has been carried out. For example, associating a sound with deleting a file.
- **Navigation** – using changing sound to indicate where the user is in a system. For example, what about sound to support navigation in hypertext?

Touch, movement and **Fitts Law in Visual Design**

Touch

Touch may be key sense for someone who is visually impaired. Stimulus received via receptors in the skin:

- **Thermoreceptors** – Heat and cold
- **Nociceptors** – Pain
- **Mechanoreceptors** – Pressure
  (some instant, some continuous)

Awareness of body position generally known as **Kinethesis** affects comfort and performance of the user.

Movement

- Time taken to respond to stimulus = reaction time + movement time
- Movement time dependent on age, fitness etc. (User dependent variable)
- Reaction time - dependent on stimulus type:
  - **Auditory ~ 150ms**
  - **Visual ~ 200ms**
  - **Pain ~ 700ms**
- Increasing reaction time decreases accuracy in the unskilled operator but not in the skilled operator.

> *Hint for Design:*
> *If you want to inform something quickly, you have to use audio-based interaction. It is faster than visual interaction.*

Fitts Law in Visual Design

Fitts' Law describes the time taken to hit a screen target:

$$\mathbf{Mt = a + b \log_2 (D/S + 1)}$$

Mt	= Movement time
a and b	= Determined constants
D	= Distance
S	= Size of target

This affects the type of target we design. Since users will find it more difficult to manipulate small objects, targets should generally be as large as possible and the distance to be moved as small as possible. This has led to suggestions that pie chart- shaped menus are preferable to lists since all options are equidistant.

However, the trade-off is increased use of screen estate, so the choice may not be so simple. If lists are used, the most frequently used options can be placed closest to the user's start point (for example, at the top of the menu).

> *Hint for Design:*
> *When you design, an interface builds targets as large as possible and keep distances as small as possible in between targets.*

2019-8

8) What is the correct statement to complete the blank space in the following sentence?

_____ predicts that the time to point at an object using a device is a function of the distance from the target object and the target object's size

(a) Fitt's Law
(b) GOMS models
(c) KLM methods
(d) 2 Gulfs in Interaction
(e) SPARK

MP-2(a)

2) (a) What is FITTS Law? Explain its applicability in the screen design. (Marks 10)

ANSWER IN THIS BOX

Mt = a + b log2 (D/S +1)
where: a and b are empirically determined constants

Mt = movement time, D = Distance, S = Size of target

It is hard to hit smaller objects irrespective of distance. It is easier to hit larger objects and only distance from the mouse point (starting location) affects the movement time. Therefore it is better to design targets as large as possible and distance as small as possible.

2015-2(a)

2) (a) Explain how the FITTS law could be used to justify time taken to hit a target on the screen. (10 Marks)

ANSWER IN THIS BOX

FITTS law is

Mt = a + b log2(D/S + 1)

where: a and b are empirically determined constants

Mt = movement time, D = Distance, S = Size of target

It is hard to hit smaller objects irrespective of distance based on the above formula. It is easier to hit larger objects and only distance from the mouse point (starting location) affects the movement time. Therefore it is better to design targets as large as possible and distances as short as possible.

2019-1(a)

1) (a) As a UI Designer, you have been asked to improve the usability of a horizontal toolbar in a word processing application. The toolbar consists of a single row of twelve 16x16-pixel icons. Write down two (2) techniques that can be used to make the toolbar faster and easier to use. Justify your answer using Fitts' Law.

[8 Marks]

ANSWER IN THIS BOX

(1) Making the individual icons bigger in the toolbar

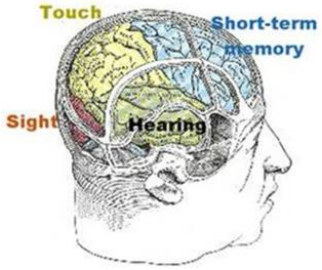
Because Fitts' Law predicts that larger items take less time to hit.

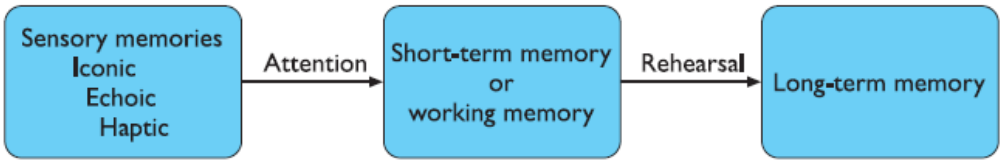
(2) Placing the toolbar closer to where users' pointing cursors are most likely to be

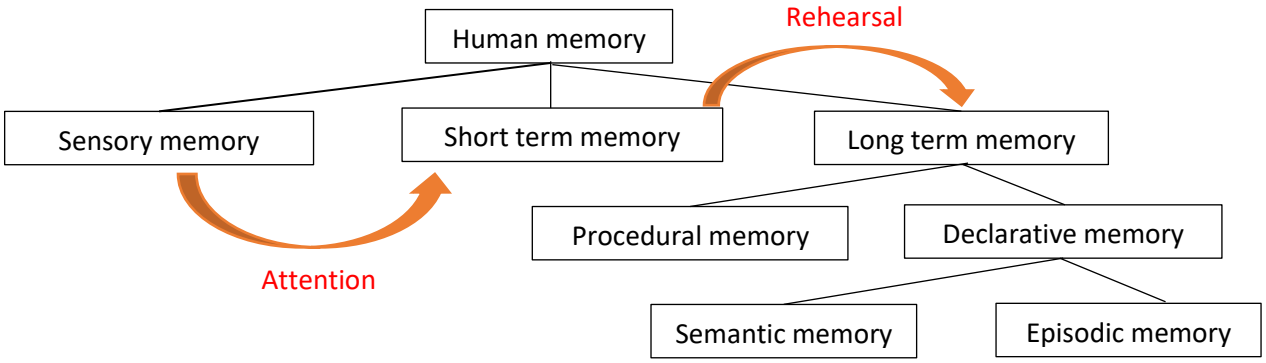
Because Fitts' Law predicts that shorter movements take less time to complete.

Human memory

Have you ever played the memory game? The idea is that each player has to recount a list of objects and add one more to the end. There are many variations but the objects are all loosely related. Indeed, much of our everyday activity relies on memory. As well as storing all our factual knowledge, our memory contains our knowledge of actions or procedures. By understanding following figure, you will be able to get simple idea about a model of the structure of memory.







2018-23

23) Which of the following is/are (a) level(s) of the human memory?

(a) Short-Term Memory
(b) Sensory Memory
(c) Echoic Memory
(d) Long-Term Memory
(e) Haptic memory

2019-15

15) Which of the following is a/are memory propagation technique/s in human memory?

(a) Semantics	(b) Attention	(c) Deduction
(d) Rehearsal	(e) Inclusion	

2019-1(b)

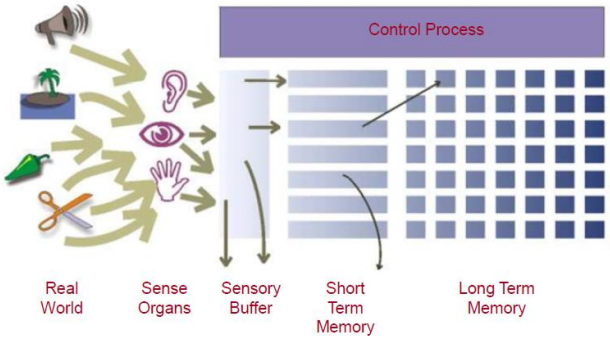
(b) What role does attention play in human memory?

[4 Marks]

ANSWER IN THIS BOX

Attention is what is required for information to move from our sensory memory stores (image, iconic & haptic) into working memory (Short-term memory).

Memory Propagation



Sensory Memory

The sensory memories act as buffers for stimuli received through the senses. A sensory memory exists for each sensory channel:

- **Iconic** memory for **visual** stimuli
- **Echoic** memory for **aural** stimuli
- **Haptic** memory for **tactile** stimuli

These memories are **constantly overwritten** by new information coming in on these channels.

2017-19

19) What kind of a stimuli is retained in Haptic Memory?

(a) Visual	(b) Aural	(c) Tactile
(d) Episodic	(e) Semantic	

Short Term Memory (STM)

Short-term memory or working memory acts as a **'scratch-pad' for temporary recall** of information. It is used to store information which is only required fleetingly.

- Short-term memory can be accessed rapidly – 70 ms
- As well as decays, rapidly – 200 ms
- Short-term memory also has a limited capacity
- Average person can remember 7 ± 2 digits

Look at the following number sequence:

265397620853

Now write down as much of the sequence as you can remember.
Did you get it all, right? If not, how many digits could you remember? If you remembered between five and nine digits your digit span is average. Now try the following sequence:

44 113 245 8920

Did you recall that more easily? Here the digits are grouped or chunked. A generalization of the 7 ± 2 rule is that we can remember 7 ± 2 chunks of information.

***Patterns can be useful as aids** to memory. For example, most people would have difficulty remembering the following sequence of chunks*

ETH ECA TRA NU PTH ETRE

Try to remember this pattern.

However, if you notice that by moving the last character to the first position, you get the statement 'the cat ran up the tree', the sequence is easy to recall.

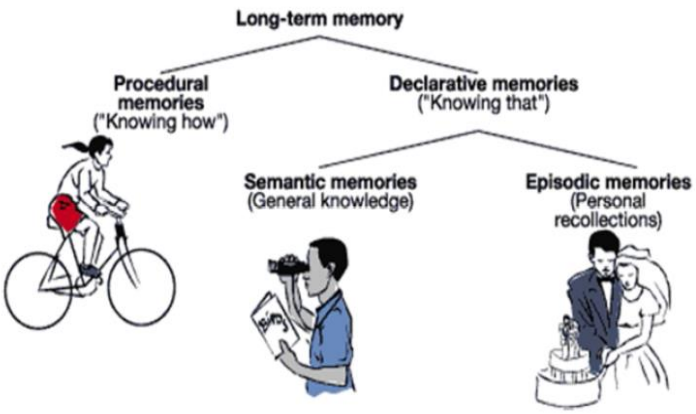
Long Term Memory (LTM)

Long – term memory is our main resource. Here we store factual information, experiential knowledge, procedural rules of behavior – in fact, everything that we 'know'. It differs from short-term memory in a number of significant ways.

- Slow access ~ 1/10 second
- Slow decay
- Huge or unlimited capacity

Here, problem is retrieval, not storage and have types including

- **Procedural memory**
- **Declarative memory**



Declarative memory

This type of memories can be further classified in to two sections including

- **Episodic** – serial memory of events
- **Semantic** – structured memory of facts, concepts, skills

The information in **semantic memory is derived from that in our episodic memory**, such that we can learn new facts or concepts from our experiences.

Semantic memory is structured in some way to allow access to information, representation of relationships between pieces of information, and inference

- Semantic network representation
- Frame based representation
- Script representation

2015-4

4) What is/are true with respect to processing in the human memory?

(a) Stimuli affect sensory memory.

(b) Rehearsal transfers things from long term to short term memory.

(c) The decay in LTM is fast.

(d) Episodic and Semantic description facilitate the retrieval actual content.

(e) Attention affects to store data in the STM.

2016-4

4) What is/are true with respect to Long Term Memory (LTM) of humans?

(a) It is not continuously overwritten.

(b) Finding patterns in data makes it easier to remember.

(c) The capacity of the LTM is severely limited.

(d) In LTM, it is always easy to retrieve.

(e) Rehearsal affects storing data in LTM.

2018-9

9) Which of the following is/are true regarding human memory?

(a) LTM is optimized by spreading learning over time

(b) Information moves from STM to LTM through rehearsal

(c) Retroactive interference can happen in STM

(d) Proactive inhibition can happen in LTM

(e) "Sparkler" trail is an evidence that shows humans have STM

2016-1(d)

(d) Compare and contrast **Short Term Memory (STM)** and **Long Term Memory (LTM)**. (10 Marks)

ANSWER IN THIS BOX

STM is the Scratch-pad for temporary recall where LTM could hold things for a long period

In STM:
Information is retained automatically and is kept in place by a rehearsal
Rapid access which is around 70ms, is faster than LTM
Therefore, things are always and easily retrieved
However, the rapid decay which is around 200ms, affects badly.

Therefore, information in STM is quickly and easily lost, unless processed continuously compared to LTM.

Continued…

Information capacity is a severely limited at a time, it is arc ems' (denoted as 7± 2 chunks at a time)

In LTM:

It is the memory of past, and facilitate someone one to access for a longer period.

It could be considered as the repository of all our knowledge
The main issue is slow access which is around 1/10 second
However, the decay of information is slower than STM
Capacity is considered to be huge or unlimited.
However, the Problem is retrieval, not really the storage.

2018-2(a)

2) (a) Write down four (4) differences between short-term and long-term memory. [12 Marks]

ANSWER IN THIS BOX

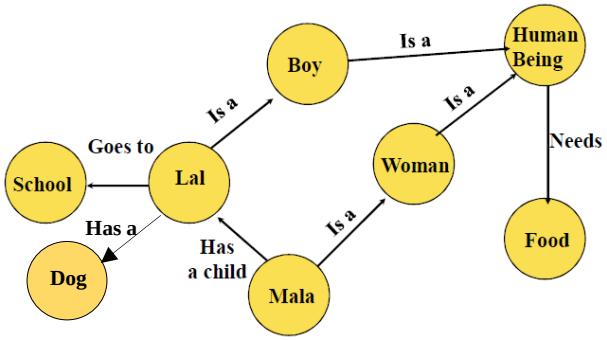
Possible answers (Any 4 answers out of them)

- **Short-term memory, as the name suggests, is capable of storing information for shorter periods of time whereas long-term memory is capable of storing information for longer periods.**
- **Short-term memory also has a more limited capacity than long-term memory.**
- **Long-term memory is often characterized by the ease of recall. It is highly associative and persistent. In contrast, in short-term memory, particular items can be recalled but often only with conscious effort.**

- Items may gradually be acquired by long-term memory through repeated rehearsal in short-term memory.
- Short-term memory is also more vulnerable to interference effects compared to long-term memory
- Short-term memory can also be thought of as the working memory. Therefore, any processing of information in long-term memory can also be vulnerable to the problems that affect short-term memory.
- *(Some solutions may refer to the 7 + or - 2 heuristic for non-associative capacity of short term memory.)*

Semantic network representation

One model for the way in which semantic memory is structured is as a network. Items are associated to each other in classes, and **may inherit attributes from parent** classes. This model is known as a **semantic network**.



Inheritance: Mala is a woman, woman is a human being, human beings need food. Therefore, Mala needs food.

Frame based representation

However, semantic network representation does not allow us to model the representation of more complex objects or events, which are perhaps composed of a number of items or activities. You can recollect that Lal has a dog. But specification related with dog can't remember.

Procedural memory

Information production rule

A final type of knowledge representation which we hold in memory is the representation of procedural knowledge, our knowledge of how to do something. A common model for this is the **production system**. **Condition–action rules are stored in LTM**.

Information coming into short-term memory can match a condition in one of these rules and result in the action being executed. For example, a pair of production rules might be

IF dog is wagging tail
THEN pat dog
IF dog is growling
THEN run away

Long-term memory processes

There are three main activities related to long-term memory:

- Storage or remembering of information
- Forgetting
- Information retrieval

Storage or remembering of information

- Information from short-term memory is stored in long-term memory by **rehearsal**.
- You discovered that the amount learned was directly proportional to the amount of time spent learning (amount retained proportional to rehearsal time). This is known as the **total time hypothesis**.
- If information is stored under good structure, meaningful and familiar, then information easier to remember

Forgetting information in LTM

- There are two main theories of forgetting:
  - Decay
  - Interference

Decay

- ✓ Decay suggests that the information held in long-term memory may eventually be forgotten

Interference

- ✓ If we acquire new information it causes the loss of old information. This is termed **retroactive interference**. (A common example of this is the fact that if you change telephone numbers, learning your new number makes it more difficult to remember your old number.)
- ✓ Sometimes, the old memory trace breaks through and interferes with new information. This is called **proactive inhibition**. (An example of this is when you find yourself driving to your old house rather than your new one.)

- Forgetting is also affected by **emotional factors**. We tend to remember positive information rather than negative. (so, may not forget at all memory is selective)

Information retrieval from LTM

- You use two techniques to retrieve information from LTM
  - Recall
  - Recognition

Recall

- ✓ information reproduced from memory can be assisted by cues, e.g. categories, imagery

Recognition

- ✓ information gives knowledge that it has been seen before
- ✓ less complex than recall - information is cue

2018-24

24) Which of the following interface design principle(s) reduce(s) the user's memory load?

(a) Define intuitive shortcuts
(b) Disclose information in a progressive fashion
(c) Establish meaningful defaults
(d) Provide an online tutorial
(e) Provide visual cues

Human thinking and problem solving

Thinking / Reasoning and problem solving can be considered as main things which humans do.

MP-6

6) What is/are the way(s) used to process information in the mind?

(a) Watching	(b) Reading	(c) Reasoning
(d) Problem solving	(e) Error correcting	

Reasoning

There are 3 types of reasoning

- **Deduction** - Derive logically necessary conclusion from given premises

  Ex: If it is Friday then she will go to work
  It is Friday
  Therefore, she will go to work.

  But remember, logical conclusion not necessarily true:

  Ex: If it is raining then the ground is dry
  It is raining
  Therefore, the ground is dry

- **Induction** - Generalize from cases seen to cases unseen

  Ex: All elephants we have seen have trunks
  Therefore, all elephants have trunks.

  This also not always true.

  Ex: Dumbo has big ears like feathers. It can fly
  All elephants have big ears. Therefore, all elephants can fly.
  But humans are better at using positive than negative evidence.

- **Abduction** - Reasoning from event to cause

Ex: Sam drives fast when drunk.
If I see Sam driving fast, assume drunk.
Unreliable and can lead to false explanations

2015-6

6) What is a/are correct method(s) of reasoning in the problem solving process?

(a) Deduction	(b) Induction	(c) Conduction
(d) Reduction	(e) Inclusion	

2017-20

20) What **is/are** a method(s) humans use to reason?

(a) Abduction	(b) Deduction	(c) Abstraction
(d) Induction	(e) Adoption	

2018-25

25) Which of the following is/are true regarding human reasoning?

(a) Abductive reasoning is reasoning from event to cause
(b) Deductive reasoning is based on generalizations
(c) Abductive reasoning can lead to false explanations
(d) Inductive and abductive reasoning can both be unreliable
(e) Deductive reasoning always results in true logical conclusions

Problem solving

Process of finding solution to unfamiliar task using knowledge is known as problem solving. Humans uses two theories to do this.

- Gestalt
- Problem space theory
- Analogy approach

Gestalt

Gestalt psychologists were answering the claim, made by behaviorists, that problem solving is a matter of reproducing known responses or trial and error. problem solving is both **productive** and **reproductive**. **Reproductive problem-solving draws on previous experience** as the behaviorists claimed, but **productive problem solving involves insight and restructuring of the problem**.

Problem space theory

The problem space comprises **problem states**, and problem solving involves generating these states using **legal state transition operators**. The problem has an initial state and a goal state and people use the operators to move from the former to the latter. Such problem spaces may be huge, and so heuristics are employed to select appropriate operators to reach the goal.

*Ex: One such heuristic is **means–ends analysis**. In means–ends analysis the initial state is compared with the goal state and an operator chosen to reduce the difference between the two. For example, imagine you are reorganizing your office and you want to move your desk from the north wall of the room to the window. Your initial state is that the desk is at the north wall. The goal state is that the desk is by the window. The main difference between these two is the location of your desk. You have a number of operators which you can apply to moving things: you can carry them or push them or drag them, etc.*

Human Errors

- There are 2 types of human errors
    - Slips
    - Mistakes

Mental model

People build their own theories to understand the causal behavior of systems. These have been termed mental models. Simply understanding or knowledge about anything.

Slips

- ✓ Understand system and goal
- ✓ Correct formulation of action
- ✓ But, incorrect action
- ✓ Errors done by experienced users and cause may be carelessness
    - Solution: **Provide better interface design**

Mistakes

- ✓ May not even have right goal!
- ✓ Errors done by inexperienced users and cause may be lack of knowledge
    - Solution: **Make a better mental model**

MP-11

11) "You typed the user name and password of an online system and pressed the Enter key instead of pressing login button. After 10 seconds, there were no changes in the screen and you then pressed the login button. You then successfully logged into the system". How do you describe this situation?

(a) There was a slip due to user action
(b) There was a mistake due to user error
(c) It was due to a consistency issue in the interaction
(d) It was due to a visibility issue in the interaction
(e) It was nothing to do with user action

2015-11

11) Assume that "You typed user name and password of an online system and pressed the Enter key instead of the login button. After 10 seconds, there were no changes in the screen and you observed a spelling mistake in the user name. You corrected it and then pressed the login button. You successfully logged into the system". How do you describe this situation?

(a) There was a slip due to user error.
(b) There was a mistake due to user error.
(c) It was due to a consistency issue in the interaction.
(d) It was due to a visibility issue in the interaction.
(e) It was nothing to do with user action.

2016-10

10) Which of the following statement/s is/are true with regard to human errors?

(a) Slips can be minimized by better interface design.
(b) Mistakes can be avoided by giving feedback to the user.
(c) Providing many ways of input can reduce human errors.
(d) Increasing visibility can also increase human error.
(e) Making mistakes is unavoidable.

2018-2

2) Complete the blank spaces of the following sentence.

_____ occur through conscious deliberation while _____are unintentional.

(a) Slips, mistakes (b) Errors, slips (c) Mistakes, errors
(d) Mistakes, slips (e) Slips, Errors

2019-7

7) Which of the following is a/are slip/s in human error?

(a) Press the Cancel button when planning to Save
(b) Manual addition in a spreadsheet
(c) Typing mistakes
(d) Format using blank spaces
(e) Forgetting to save a document when shutting down the computer

2019-16

16) What is the difference between slips and mistakes?

(a) They are interchangeable terms that both mean "human error."
(b) Slips refer to human errors, and mistakes refer to software-system errors.
(c) Slips occur due to novice behavior whereas mistakes occur due to Unconscious behavior.
(d) Mistakes occur when the user intends to perform one action but instead ends up doing another (similar action). Slips occur when users have goals that are inappropriate for their tasks.
(e) Slips occur when the user intends to perform one action but instead ends up doing another (similar action). Mistakes occur when users have goals that are inappropriate for their tasks.

MP-2(c)

(c) What is a "slip" that occurs when a person interacts with a computer? (Marks 5)

ANSWER IN THIS BOX

It is due to unconscious behavior that happens when we interact with things while attending several things and/or thinking something else.

2015-2(c)

(c) Briefly state how a mistake could occur as a human error during the interaction. (5 Marks)

ANSWER IN THIS BOX

It is due to incorrect reasoning about how to do something. It occurs when the user has a wrong intention and wrong mental model.

2017-1(b)

(b) Read the following scenario and identify if this type of human error is a mistake or a slip. Justify your answer.

[6 marks]

A typical Windows user is exposed to a Linux environment for the first time. He has to type a document on Emacs as opposed to his favourite Windows text editor. The user inadvertently makes a typo and without hesitating he presses the Control and the Z buttons since these are the keys he always uses as a keyboard shortcut for the UNDO command. The user gets frustrated as the Emacs editor completely disappears from the screen and he gets back to the Linux prompt with no single notification message.

ANSWER IN THIS BOX

This is a mistake.

The user made a mistake in this case because he has a wrong conceptual model about the UNDO command in the Linux environment. The fact that the user has been working on Windows builds a mental model for the UNDO command in almost all windows programs and associates this model with the action of pressing CTRL + Z, not knowing that these actions will cause a completely different action in Linux environment. As a result, Emacs is running as a background process and the only way to bring the Emacs to foreground to interact with it is to type "fg" at the Linux prompt.

****