HMI - MODULE 1 - CHAPTER 1

Foundations of HMI

Human Machine Interaction

- HMI is the study, planning & design of how people & computers work together so that a person's needs are satisfied in the most effective way.

Human

- The user, is the one whom computer systems are designed to assist.
- Human interacts with various digital system with their senses.
  1) Vision
  2) Hearing
  3) Touch
  4) Movements

Machine

- Anything which reduces human efforts

Interaction

- Users can instruct the machine using its interface.

Example - Glucometer

History of the User Interface Designing

Generation 1

- Machines are designed to minimize Physical labour work
- Eg. - Hand Axe

Generation 2

- Machines with output (Display)
- Eg - Thermometer

Generation 3

- Machines with output & feedback
- Eg. AC User Interface

Generation 4

- Machines with computing ability
- Eg. Windows 10 User Interface

Generation 5

- Intelligent Machines
- Eg. Intelligent AC Interface

Future - Augmented Reality (AR)

Software & Hardware requirements

- Hardware is an essential part of any computing device.
- Generally selected as per user's requirement & can top it up with any software application
- Software helps developers to design UI for machine
- Eg. HMI system to record Biometric Attendance System

H/w requirements	S/w requirements
1) Sensor	1) Biometric Driver
2) Computer	2) File System
3) LAN Connection	

HMI Runtime Environment

- Supporting framework for hardware & software devices
- Eg - HMI system to record biometric attendance system

Runtime environment requirements

1) Sensor Device
2) Server System

Psychopathology

- Psycho - Mind state
- Pathos - disease
- logy - study

Seven stages of action

As per Norman, human actions will have 2 aspects

1) Execution
   - Task performed by human is referred as action
2) Evaluation
   - Once action is performed, it must be analyzed for improvement

Stages of action

- Stage 1 → Setting the goal of action

Execution

- Stage 2 → Set up a plan of action
- Stage 3 → Specifying an action to be performed.
- Stage 4 → Performing the action

Evaluation

- Stage 5 → Identify the state of the external world
- Stage 6 → Interpreting the state of the external world
- Stage 7 → Evaluation of action output by comparison with other actions

Three levels of processing

1) Visceral level
   - Initial level of processing available info
   - Refers to perceptible qualities of object & how they make user feel
   - External look & touch of product will dominate the user
2) Behavioural level
   - More detail level of product description
   - Refers to the emotions we feel as a result of either accomplishing / failing to complete our goals
   - Semantics & usability practices are addressed & help decide the behaviour & feedback of the product.
3) Reflective level
   - Final level of processing is analysis & reflection of all experiences is done in this level
   - Deals with past experiences & future goals

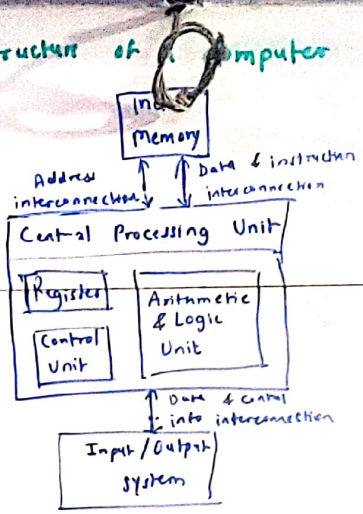
Norman's 7 principles

1) Use both knowledge in world & in head.
2) Simplify the structure of tasks
3) Make things visible - bridge the gulf of execution & evaluation
4) Get the mappings right
5) Exploit the power of constraints, both natural & artificial
6) Design for error
7) When all else fails, Standardise

Human - centered design

- Designers focus on system users human needs
- Design will consider all aspects of targeted users as per their interests, behaviours, skillset, experiences, challenges, etc. makes the products that are simple for the user to operate.
- Ex- Push Pull Part of door

Structure of Computer

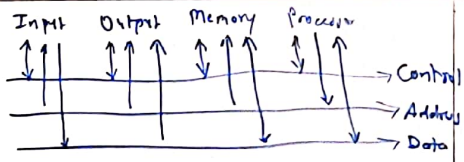


- Input Unit
- Output Unit
- Arithmetic & Logic Unit (ALU)
- Control Unit
- Memory Unit

Registers

- Accumulator (AC)
- Data Register (DR)
- Program Counter (PC)
- Instruction Register (IR)
- Memory Address Register (MAR)

Single bus structure



Ergonomics

- Designed for efficiency & comfort in working environment
- Studies of interfaces have focused almost exclusively on users perceptual, cognitive & motor skills

Paradigms of interactions

1) Time Sharing
2) Video Display Unit
3) Programming Toolkits
4) Personal Computing
5) Window system & WIMP interface
6) The Metaphor
7) Direct Manipulation