# Human Computer Interface(HCI)

# Introduction

Human

- The end-user
- The members of an organization

Computer

- Hardware
- Software

Interface

- A point where two objects meet.
- A point where the human can tell the computer what to do.
- A point where the computer displays the requested information.

# What is HCI?

- A process of information transfer
  - User to Machine
  - Machine to User
- HCI is also referred to as Man Machine Interaction.
- HCI is what the user sees and includes:
  - The physical controls
  - What the system looks like?
  - How the system accepts input from the user?
  - How the system responds to user input?
  - How the system outputs the results of processing?

# Types of Interfaces

- **Command Line Interface (CLI)**

  A CLI displays a prompt, the user types a command on the keyboard, the computer executes the command and provides textual output.

- **Menu Driven Interface**

The user has a list of items to choose from, and can make selections by highlighting one.

- **Graphical User Interface (GUI)**

Uses windows, icons, menus and pointers (WIMP) which can be manipulated by a mouse (and often to an extent by a keyboard as well).

- **Natural Language Interface**

Can range from simple command systems to voice activated text processing. Commands are spoken in “normal” language.

# Existing Technologies

- The existing interfaces differ in the degree of complexity both because of degree of functionality or usability.
- The user activity has three different levels:
  - Physical
  - Cognitive
  - Affective
- The existing physical technologies for HCI basically can be categorized by human senses.
- These devices are basically relying on three human senses: vision, audio, and touch.

# Audio Based HCI

- It deals with information acquired by different audio signals.
- The information gathered from audio signals can be more trustable, helpful and in some cases unique providers of information.
- Key components:


  - Microphone
  - ASR(automated speech recognition) and NLU(natural language understanding) software
- The main research areas of Audio based HCI are divided into:
  - Speech Recognition
  - Speaker Recognition
  - Auditory Emotion Analysis
  - Human-Made Noise/Sign Detections
  - Musical Interaction

# Sensor Based HCI

- It has the wide range of applications in our day-to-day life.
- The common feature in every application is that at least one physical sensor is used between machine and human to provide interaction.
- Some of the sensors range from being very sophisticated to primitive :
  - Pen-Based Interaction
  - Motion Tracking Sensors/Digitizers
  - Haptic Sensors
  - Pressure Sensors
  - Keyboard, Mouse, Joysticks

# Visual Based HCI

- It is also called as machine vision which is the observation of an environment using cameras.
- In this, different aspects of human responses can be recognised visual signals.
- Detection, identification and tracking of a real life entity and its translation into meaningful machine/computer input.
- The main research areas of visual based HCI are:
  - Facial Expression Analysis
  - Body Movement tracking and Gesture recognition
  - Gaze Detection
- Sixth Sense is one of the Visual based HCI technologies which is a wearable “Gesture Based” device.

# Applications

- Intelligent Homes/Offices
- Driver Monitoring
- Intelligent Games
- E-Commerce
- Helping People with Disabilities

# Command Line Interface

- **Advantages**
  - Very flexible with the use of “switches” (options)
  - Good for “expert” users - can quickly access commands
  - Uses the fewest system resources

- **Disadvantages**
  - Requires the user to learn “complex” commands or language
  - “Hidden” features i.e. if the command is unknown we cannot make use of that feature
  - Not very good for novice users

# Menu Driven Interface

- **Advantages**
  - No need to learn complex commands/language
  - Easier for a novice to learn/use
  - Ideal when there are a limited number of options (efficient)

- **Disadvantages**
  - Can be frustrating for experienced users i.e. the command they want to use is buried 5 levels deep.
  - User interface may be limited by screen space and number of options available.

# Graphical User Interface

- **Advantages**
  - Most suitable interface for inexperienced or novice users
  - Many generic packages for a GUI will share common features
- **Disadvantages**
  - GUIs use more system resources than other types of interface