Design of Interactive Systems (DIS)

Lecture 1: Designing interactive systems: a fusion of skills

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Key Information

- **Google classroom link:** https://classroom.google.com/c/Njg3NTA0ODQwNzMx
- **Class code:** udmi363
- **Instructor:** Dr. Kalpana Shankhwar
- **Email id:** kalpana@iiitd.ac.in
- **Office:** A-403 (R&D Block)
- **Office hours:** Friday 10:30 AM-12:30 PM
- **Class:** Wednesday 9:30 AM and Friday 11:00 AM
- **Course mailing group:** des519@iiitd.ac.in

About me

Kalpana Shankhwar

Education
- PhD in Mechanical Engineering, National Taiwan University (NTU)
- M.Tech in Mechanical Engineering, IIT Guwahati
- B.E. in Mechanical Engineering, SGSITS Indore

Work Experience
- Engineer at MAN Trucks India Pvt. Ltd.
- Assistant Professor at KIIT University, Bhubaneswar
- Assistant Professor at IIIT Delhi (From July 2023 – Present)

Lab
- Emerging Technology integrated Design & Manufacturing (https://etidm.iiitd.edu.in/)

Lab Information

The Emerging Technology Integrated Design & Manufacturing lab (ETiDM) at HCD focuses on exploring and investigating emerging technologies including Extended reality (XR)/ (AR, VR, MR), Artificial Intelligence (AI), Digital Twin, Internet Of Things (IoT) and Haptic Technology. The ongoing research projects employ emerging technologies to develop smart training, tutorial and evaluation systems in the context of Industry 4.0 and Education 4.0. The lab aims to explore emerging technologies and conduct interdisciplinary research to overcome existing challenges in diverse fields for example, education, healthcare, manufacturing, teleoperation, guidance for safety and so forth.

Extended Reality

Haptic Technology

Digital Twin

Artificial Intelligence

Finite Element Method

User Centered Design

Ongoing research

1. VR simulation of 3D path optimization in agriculture.
2. Interactive wall development using computer vision.
3. Gesture-based interactive game design using mixed reality (MR).
4. VR-based 3D modeling software development.
5. FEM results visualization of solid mechanics problems in MR using ML.
6. Haptic device for surgical training in MR.

Grading Policy

Type of Evaluation	**% Contribution in Grade**
Class Participation	5 [attendance and responses in class]
Paper Presentation	5 [group discussion and presentation]
Assignment	20 [4 assignments]
Mid-sem	15
End-sem	25
Project	30 [group of 3 students] [2 intermediate project reports and evaluation]

Resources

- Book by David Benyon
- Research Papers, *etc.*

Course schedule

Week	Lecture Topic
1	Essential of Designing Interactive Systems: Introduction
2	Essential of Designing Interactive Systems: Usability and Experience Design
3	Foundations of Designing Interactive Systems: Memory and Attention
4	Foundations of Designing Interactive Systems: Cognitive and Action
5	Techniques for Designing Interactive Systems: Evaluation and Task Analysis
6	Techniques for Designing Interactive Systems: Visual and Multimodal Interface Design
7	Context of Designing Interactive Systems: Web-based Systems and Social Media
8	Context of Designing Interactive Systems: Agents, Avatars, and Collaborative Environments
9	Project & Research Paper Discussion
10	Project & Research Paper Discussion
11	Project & Research Paper Discussion
12	Project & Research Paper Discussion
13	Project & Research Paper Discussion

Part 1: Essentials of designing interactive systems

- **Chapter 1**: Designing interactive systems: a fusion of skills
- **Chapter 2**: PACT: a framework for designing interactive systems
- **Chapter 3**: The process of human-centred interactive system design
- **Chapter 4**: Usability
- **Chapter 5**: Experience Design
- **Chapter 6**: The Home Information Centre (HIC): a case study in designing interactive systems

What is an interactive system?

- Interactive systems include components, devices, products and software systems concerned with processing information.
- They deal with transmission, display, storage or transformation of information that people can perceive.
- Who are the people involved?

  - User experience designers, information architects and interaction designers

Why do we need interactive systems?

- Do you use any interactive system?
  - Interactive television, mobile phone, website, Apps

Why do we need interactive systems?

- Do you use any interactive system?
  - Interactive television, mobile phone, website, Apps
- Applications/domains where interactive systems are useful?
  - Household appliances
  - Automobiles
  - Cash dispensing machine
  - Ticket machine

Design of Interactive Systems

"Aims to focus this emerging discipline
by *bringing together* the
best practice and experience from
HCI, **UX** and **ID**"

Human Computer Interaction (HCI)

"The strength and tradition of HCI has been in its **human-centredness** and **usability concerns.** HCI has evolved methods, guidelines, principles and standards to ensure that systems are easy to use and easy to learn."

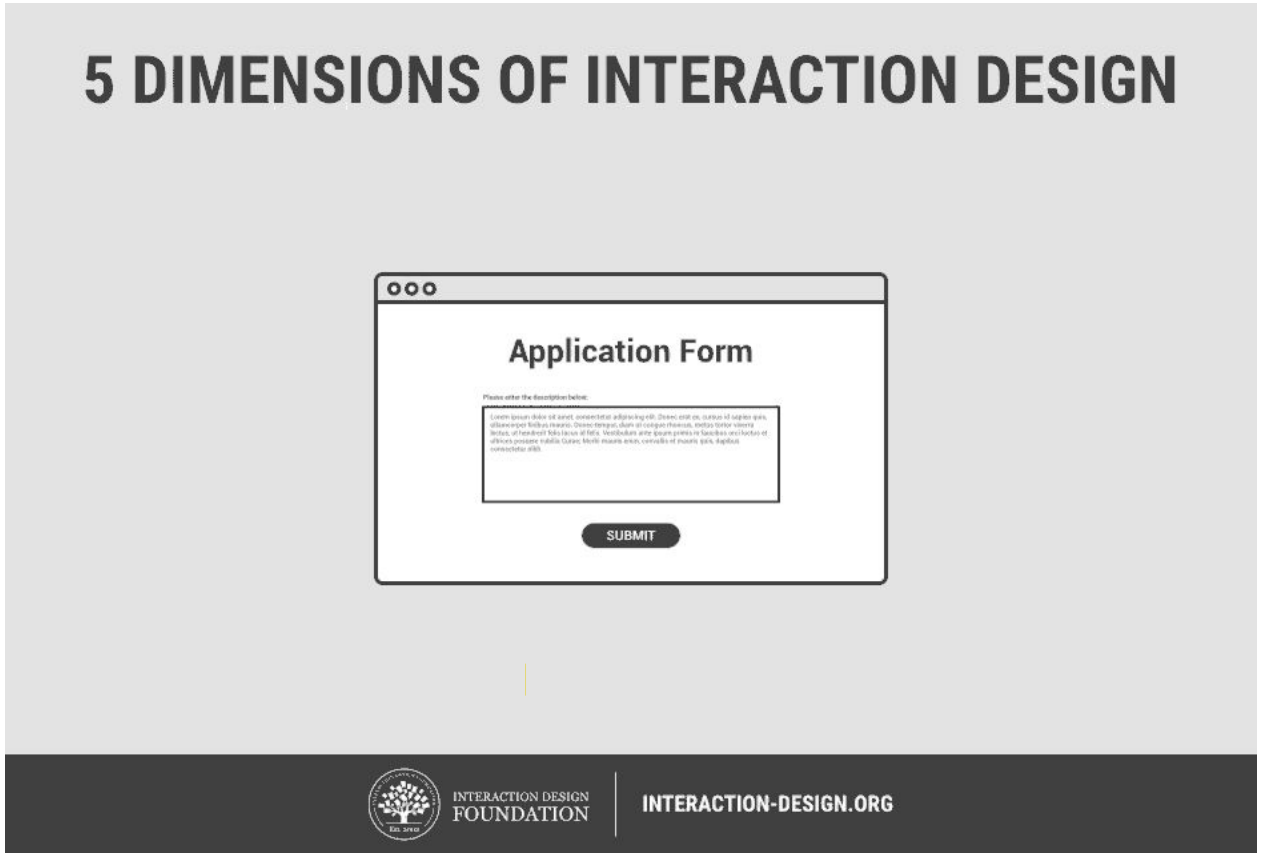
Interaction Design (ID)

- Interaction Design (ID) focuses on human-computer interaction, including animation, microinteraction, transition, search and other motion-based design.
- Aims to promote a seamless interaction between users and products.
- ID is specialized discipline within user experience (UX) design.

Interaction Design (ID)

5 dimensions of interaction design

- 1D: Words
- 2D: Visual representation
- 3D: Physical objects or space
- 4D: Time
- 5D: Behavior



User Interface (UI) Design

- It focuses on visual design, asthetics and overall feel using color, fronts, icons, layouts etc.
- Process of determining the appearance and functions of interactive systems.

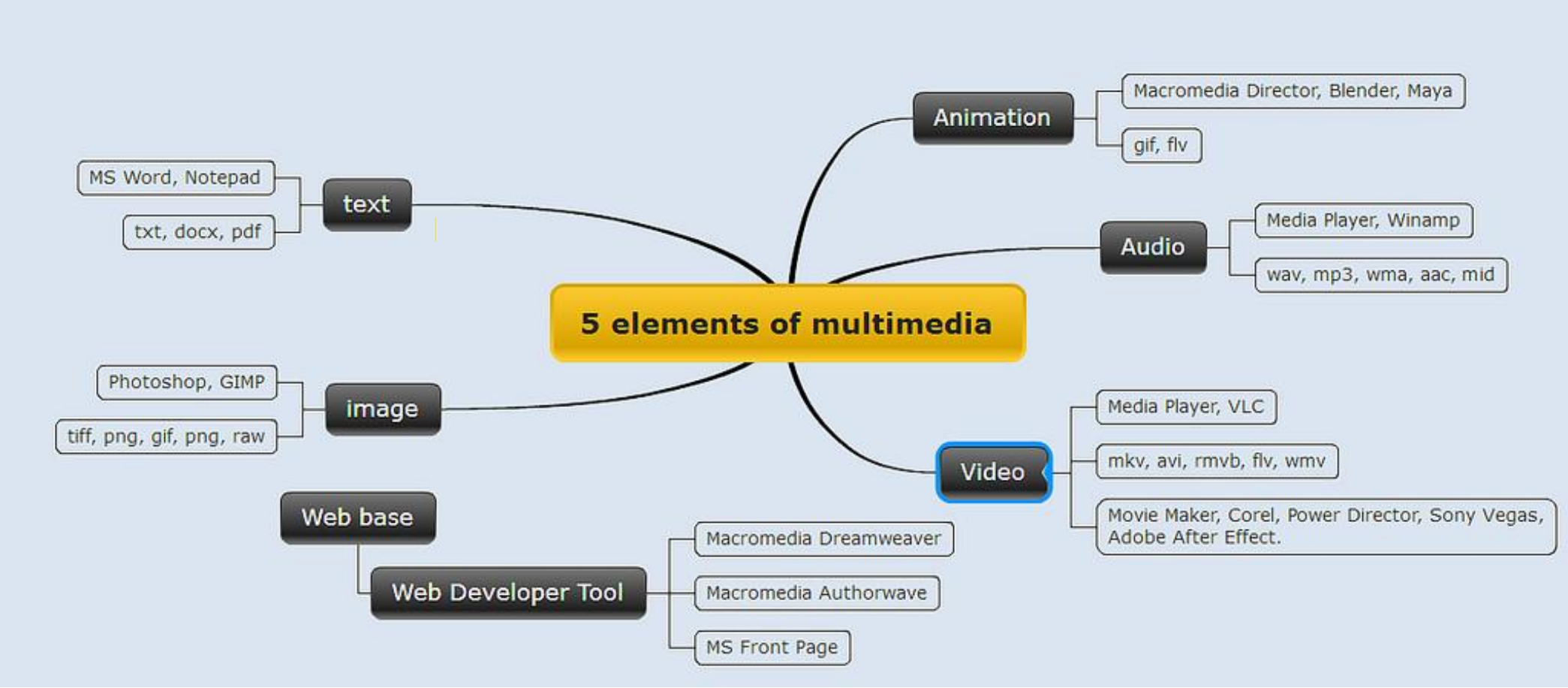
User Experience (UX) Design

- User experience (UX) design is the process design teams use to create products that provide meaningful and relevant experiences to users.
- UX design involves the design of the entire process of acquiring and integrating the product, including aspects of branding, design, usability and function.

HCI and Software Engineering

- **Software Engineering** is the study of designing, development and preservation of software. It comes in contact with HCI to make the man and machine interaction more vibrant and interactive.
- Software engineering and HCI group is a multi-perspective group focusing on a single problem: *how to help people develop software that is effective and accurate*.

Multimedia


5 elements of multimedia
Animation
Macromedia Director, Blender, Maya
gif, flv
Audio
Media Player, Winamp
wav, mp3, wma, aac, mid
Video
Media Player, VLC
mkv, avi, rmvb, flv, wmv
Movie Maker, Corel, Power Director, Sony Vegas, Adobe After Effect.
text
MS Word, Notepad
txt, docx, pdf
image
Photoshop, GIMP
tiff, png, gif, png, raw
Web base
Web Developer Tool
Macromedia Dreamweaver
Macromedia Authorwave
MS Front Page

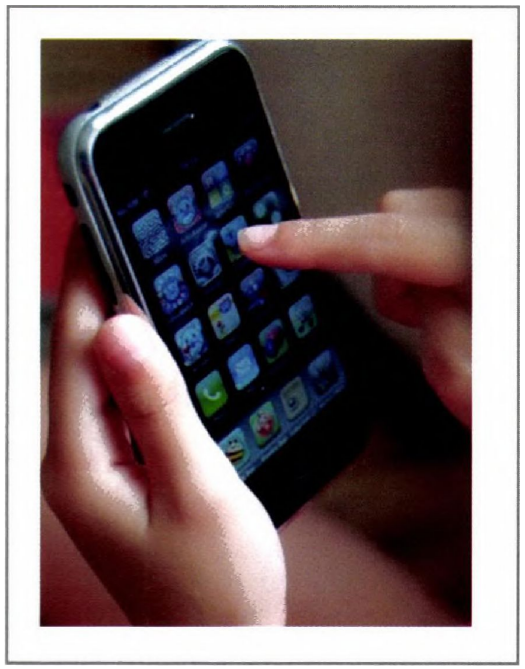
- Human perceptual system is composed of senses:
  - Visual: input
  - Acoustical: input/output
  - Haptic: input/output (touch, skin sensors, motor system)
  - Taste
  - Smell

- Brain is the processing, controlling and coordination center for the senses.
- Human senses are perfectly coordinated into a fully integrated system
- This system can receive and process multimodal information from the senses and produce multimedia output effortlessly

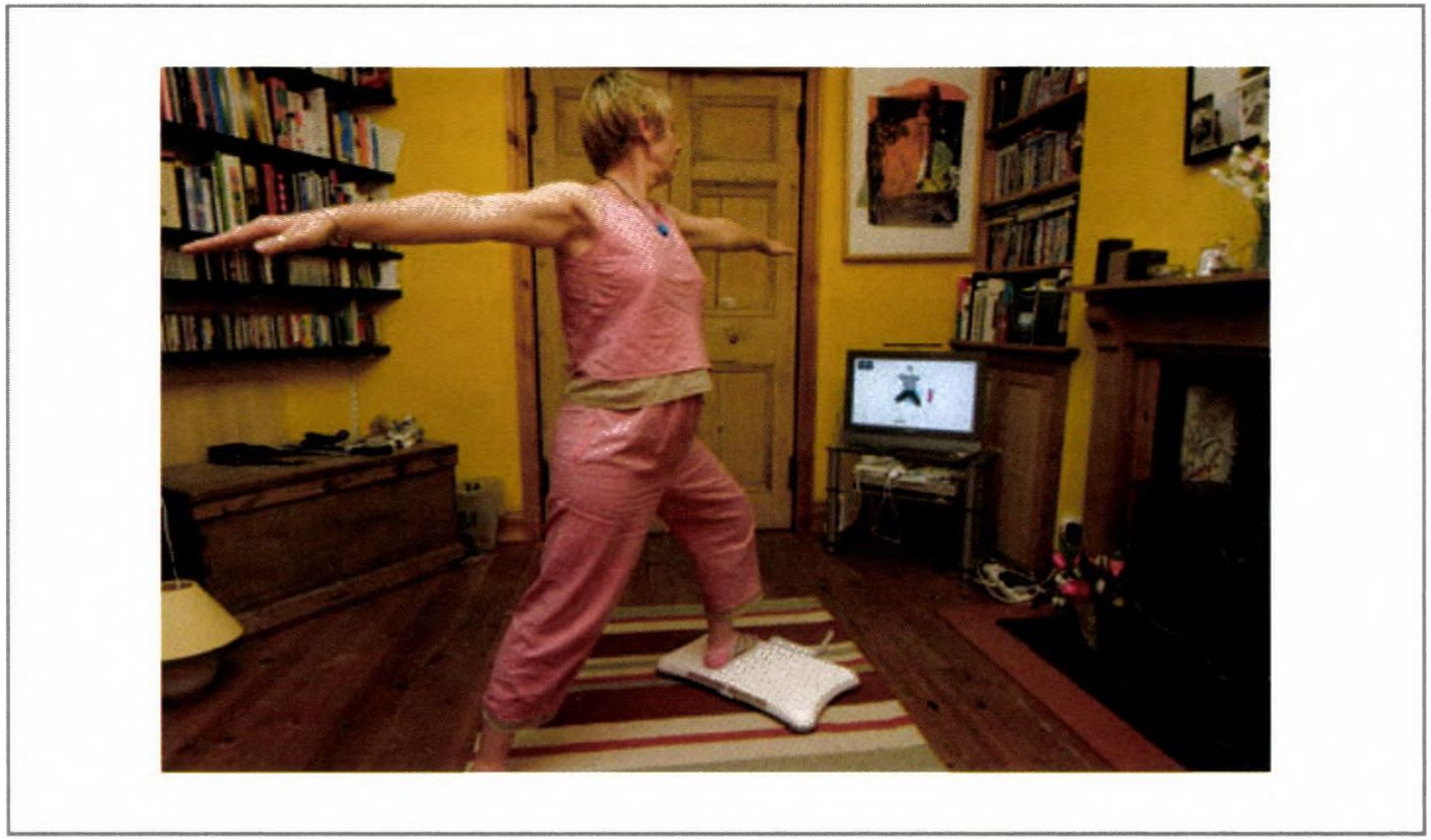
Design of Interactive Systems

- **Aim:**
  - Design interactive system that are **enjoyable to use**, that **do useful things** and enhance the lives of people who use them
  - That is, we want our interactive system to be **accessible**, **usable** and **engaging**
  - In order to achieve this, the design of such systems should be **human-centered**

Essential of DIS



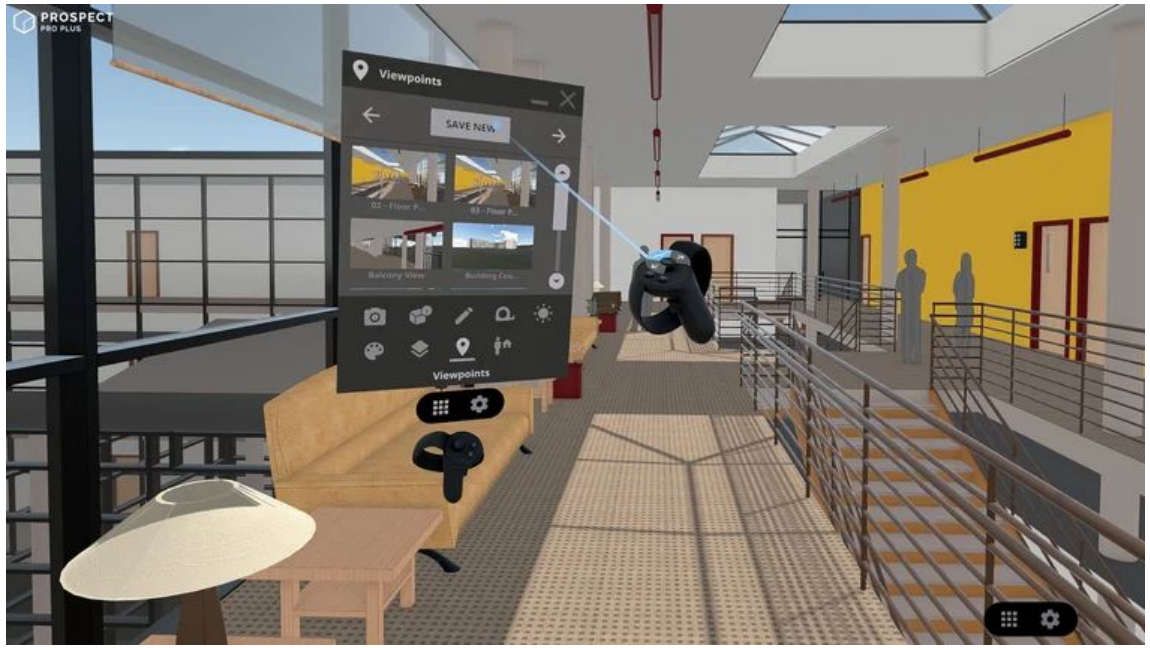
The iPhone

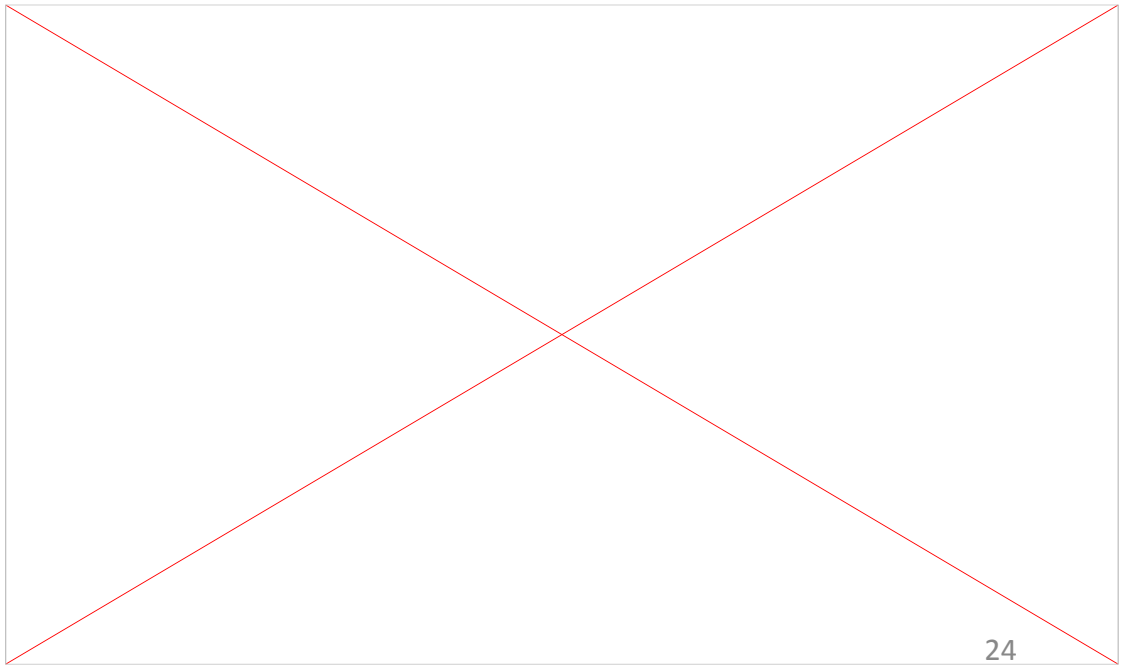


Wii Fit

Virtual reality (VR)

- VR is an artificial environment which is experienced through sensory stimuli (such as sights and sounds) provided by a computer and in which one's actions partially determine what happens in the environment
- Provide new kinds of experience, enabling users to interact with objects and navigate in 3D space
- Create highly-engaging user experiences





Key concerns of interactive system design

- ***Design***. What is design and how should you do it?
- ***Technologies***. These are the interactive systems, products, devices and components themselves.
- ***People*** who will use the systems and whose lives would we like to make better through our designs?
- ***Activities and contexts***. What do people want to do? What are the contexts within which those activities take place?

People and Technologies

- Interactive systems are things that deal with the transmission, display, storage or transformation of information that people can perceive.
- Excludes tables, chairs and doors
- Includes mobile phones, website, computer game controllers

Machine- and people-centred views

View	People are	Machines are
Machine-centred	Vague Disorganized Distractible Emotional Illogical	Precise Orderly Undistractible Unemotional Logical
People-centred	Creative Compliant Attentive to change Resourceful Able to make flexible decisions based on content	Dumb Rigid Insensitive to change Unimaginative Constrained to make consistent decisions

Source: Adapted from Norman (1993), p. 224

The interface

UI is all those parts of the system with which people come into contact,

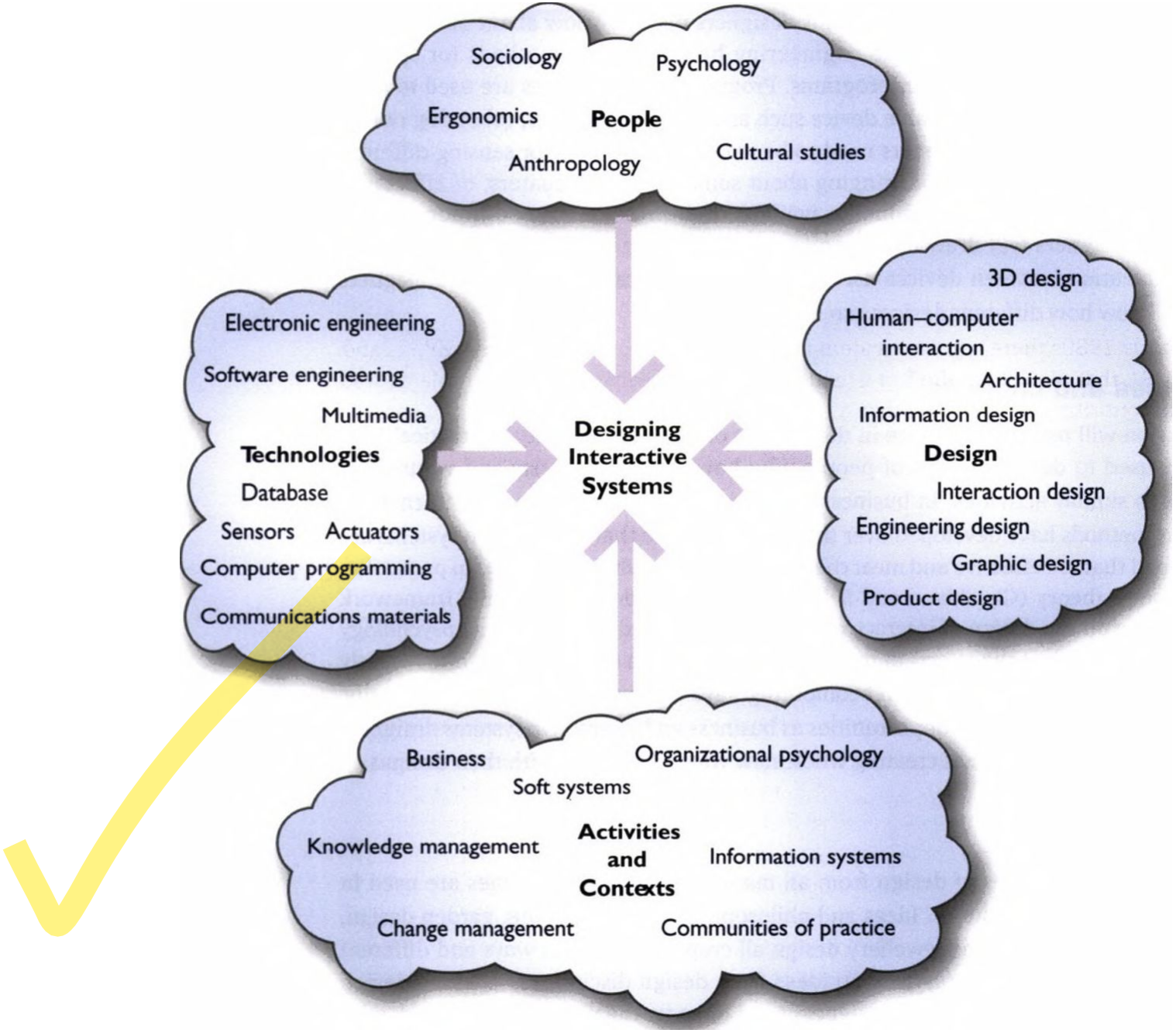
- Physically
- Perceptually
- Conceptually

Being Human-Centered

- Thinking about what people want to do rather than what the technology can do
- Designing new ways to connect people with people
- Involving people in the design process
- Designing for diversity

Being Digital

- We live in a digital age, when all manner of devices represent things using binary digits (bits). The significance of being digital is that bits are transformable, transmittable and storable using digital technologies.
- Digital alarm clock
- Heating adjustments in car, warning signs
- Ticket machine
- Coffee machine



Disciplines contributing to interactive systems deign

Why being human centered is important

- Return on investment
- Safety
- Ethics
- Sustainability

Projects

- Project should solve some problems of human/society
- Should involve interaction design (ID)
- Should involve user experience (UX)
- Should involve human computer interaction (HCI)
- Think of different departments the government has and what kind of problem they solve
  - Healthcare, Education, Women Security, Agriculture, Power, Housing, Industry, Transportation, Accessibility, Visualization, *etc.*
- Software, games, virtual reality and augmented reality applications, Apps, websites etc.

Project Planning

- Process
  - Propose the design of an interactive system
  - Completely understand it (requirement gathering)
  - Design the system
  - Collect data
  - Build the system
  - Do thorough testing and verify claims
  - Has to be of sufficient complexity
  - Simple implementations not acceptable
- Then submit project

- Check recent papers of Core A* Conference

Project Evaluation

- Criteria
  - 2 Intermediate reports/progress/Implementations
  - Final report
  - Code
  - Demo
  - Presentation
  - Testing and Evaluation
- Bonus
  - Novelty
  - Present in workshop/conference
  - Real-time systems

Class activity

- Find five interactive products you use in your daily life. Write down what you like about these products and what you do not like including the entire experience of using the product.

- What do the user interfaces of these interactive systems consist of?