



FALMOUTH
UNIVERSITY

COMP210: Interfaces & Interaction

1: Human-Centred Design for AR/VR

Virtual and Augmented Reality Overview:

Learning Outcomes:

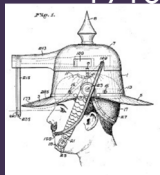
- ▶ **explain** the importance of placing the user at the centre of the design process
- ▶ **briefly** describe and compare different user-centred design techniques
- ▶ **demonstrate** a knowledge of the principles of user-centred design.

A Word of Warning

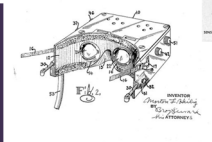
AR/VR are both emerging technologies and thus, they borrow language from other similar disciplines such as game development, film studies and 3D design. This appropriation of lexicons can be confusing and there will be some overlap in relation to key terms and definitions.

History of AR/VR

1916



1960



1960



1988



Figure: Left to Right - Pratt's head-mounted targeting interface, Heilig's Stereoscope TV Apparatus & Sensorama, NASA's VIEW System

Forms of Reality

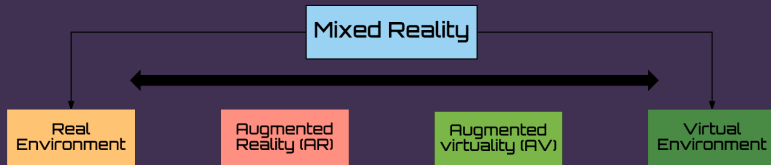


Figure: The Virtuality Continuum - Milgram & Kishino

Reality Systems - Hardware

Display Types:

- ▶ Head-Mounted Displays
- ▶ World-Fixed Displays
- ▶ Hand-held Displays

Audio: Spatialised Audio is preferred

- ▶ Headphones - more immersive.
- ▶ surround sound speakers.

Head-Mounted Displays (HMD)



World-Fixed Display

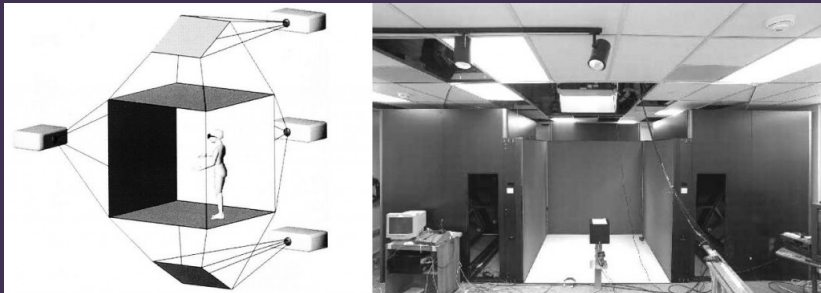


Figure: Cave VR environment: A lifelike visual display is created by projectors positioned outside the CAVE and controlled by physical movements from a user inside the CAVE.

Haptics

Haptics are the artificial forces between virtual objects and the user.

Passive - real-world physical objects that match the shapes of a virtual objects. (Doors, ledges, pillars...)

Active - Haptics can be dynamically controlled by the computer to provide a feeling of a wide range of simulated virtual objects.



Figure: University of North Carolina - Pit Experiment

Tactile Haptics

- ▶ Vibrotactile - vibration passed directly or indirectly to the skin
- ▶ Electrotactile - electrodes passing current through the skin
- ▶ Proprioceptive force - provides a sense of limb movement and muscular resistance

Self-Grounded vs. World-Grounded Haptics

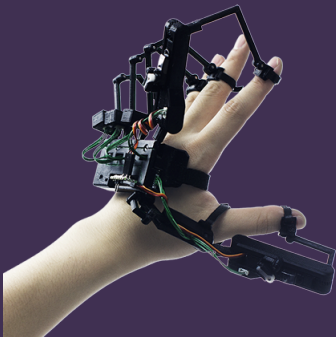


Figure: DexmoF2 & Sensable's Phantom Haptic System

Motion Platforms

A motion platform is a hardware device that moves the entire body resulting in a sense of physical motion and gravity.

These systems can convey a sense of orientation, vibration, acceleration and jerking.

(Examples)





Human-Centred Design:

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- ▶ **briefly** describe and compare different user-centred design techniques
- ▶ **demonstrate** a knowledge of the principles of user-centred design.
- ▶ **acknowledge** that sophisticated/eloquent solutions are less important than great user experiences.

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- ▶ Failures are an inevitable outcome of creativity and innovation.

Iteration

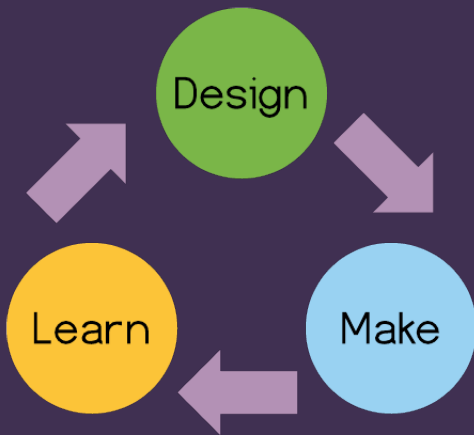


Figure: The Iteration Cycle

Design/Define Stage

This stage attempts to answer the question, 'what do we want to make?' and includes everything from the high-level vision to listing requirements. All parts of the define stage should be described from the users point of view and easily understood by all.

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- ▶ Vision
- ▶ Objectives
- ▶ Key Players
- ▶ Time & Costs
- ▶ Risks
- ▶ Assumptions
- ▶ Constraints
- ▶ Personas
- ▶ User Stories
- ▶ Story Boards

ASK QUESTIONS

- ▶ Feedback is crucial at the define stage.
- ▶ Ask lots of questions.
- ▶ Do not trust assumptions.
- ▶ Common misconception.

Analysis Paralysis

Make Stage

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- ▶ Use Cases
- ▶ Block Diagrams
- ▶ Sketches
- ▶ Prototypes
- ▶ Class Definitions
- ▶ Hardware and Software implementation

Prototypes

A prototype is a simplistic implementation of what is trying to be accomplished without being overly concerned with aesthetics or perfection.

Types of prototype:

- ▶ Real-world Prototype
- ▶ Wizard of Oz Prototype
- ▶ Programmer Prototype
- ▶ Team Prototype
- ▶ Stake Holder Prototype
- ▶ Representative Prototype
- ▶ Marketing Prototype

Each stage in the list represents a higher level of fidelity in the development of the end product.