COMP210: Interfaces & Interaction

1: Human-Centred Design for AR/VR

Sign the Register

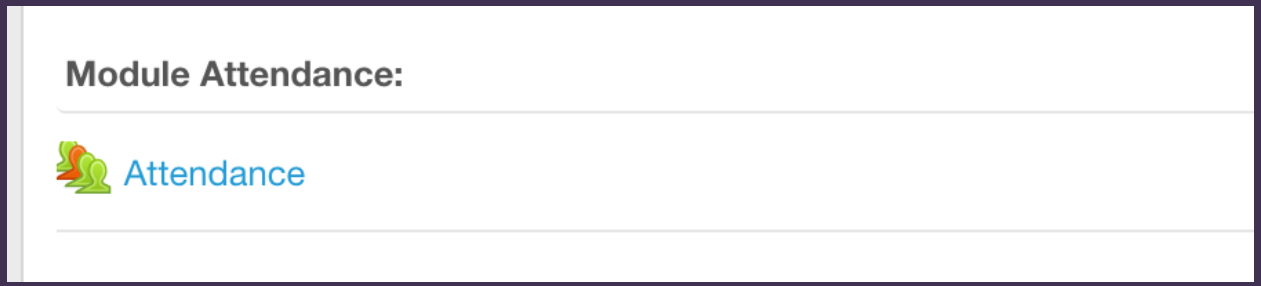
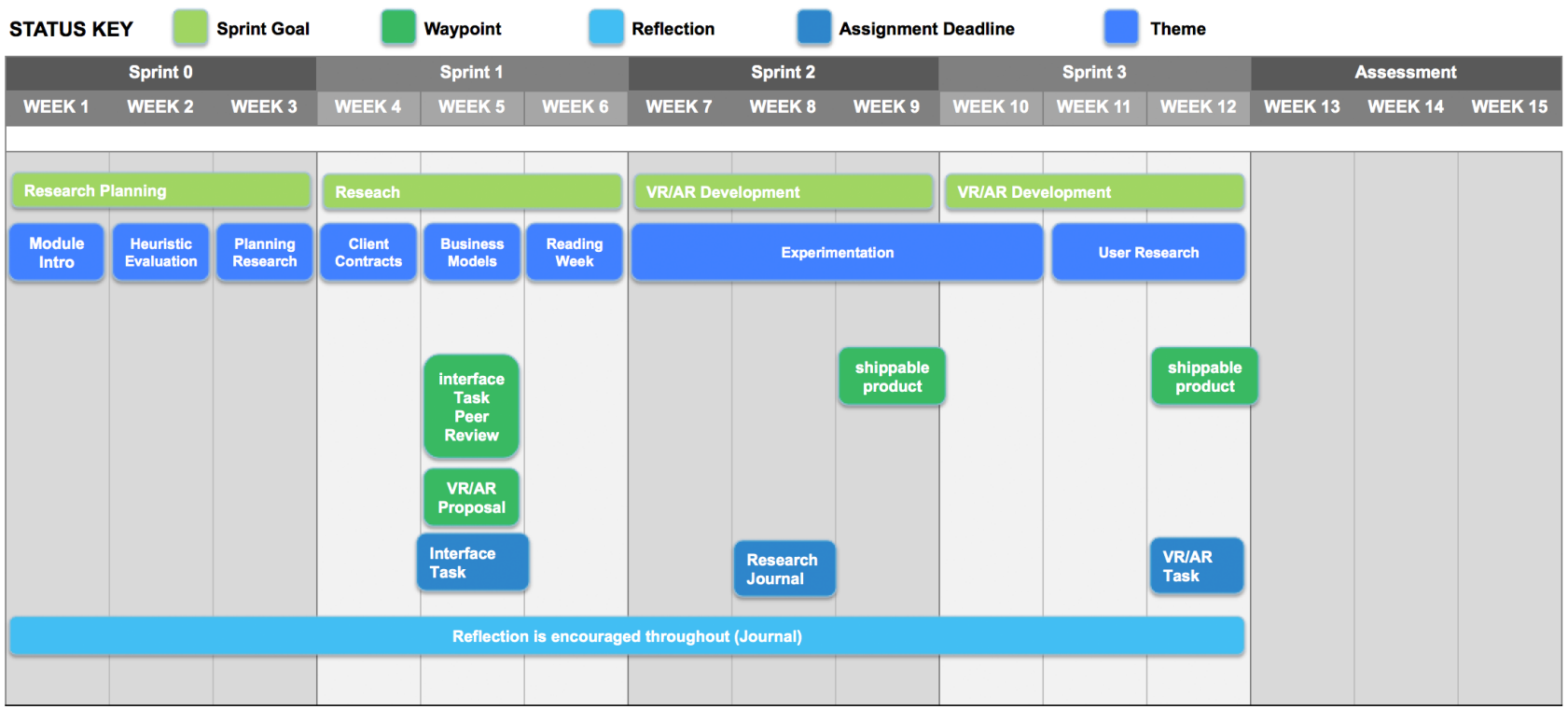


Figure: http://learningspace.falmouth.ac.uk/course/view.php?id=1254&section=1

Module Roadmap

COMP210 Interfaces & Interactions



Assignment Briefs

- **Evaluate** an existing screen-based game interface
- **Design** and **develop** an interface that incorporates either AR or VR
- **Produce** a journal detailing your research into virtual and augmented reality

Virtual and Augmented Reality Overview:

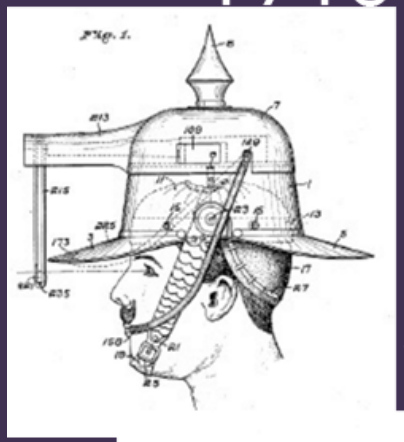
Learning Outcomes:

- **Explain** the difference between augmented & virtual reality.
- **Discuss** the various forms of haptic feedback.
- **List** and **describe** the key components that make up the hardware side of reality systems.

A Word of Warning

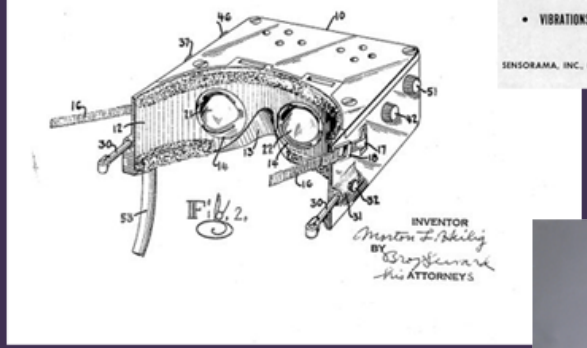
AR/VR are both emerging technologies and thus, they borrow language from other similar disciplines such as game development, film studies and 3D design. This appropriation of lexicons can be confusing and there will be some overlap in relation to key terms and definitions.

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

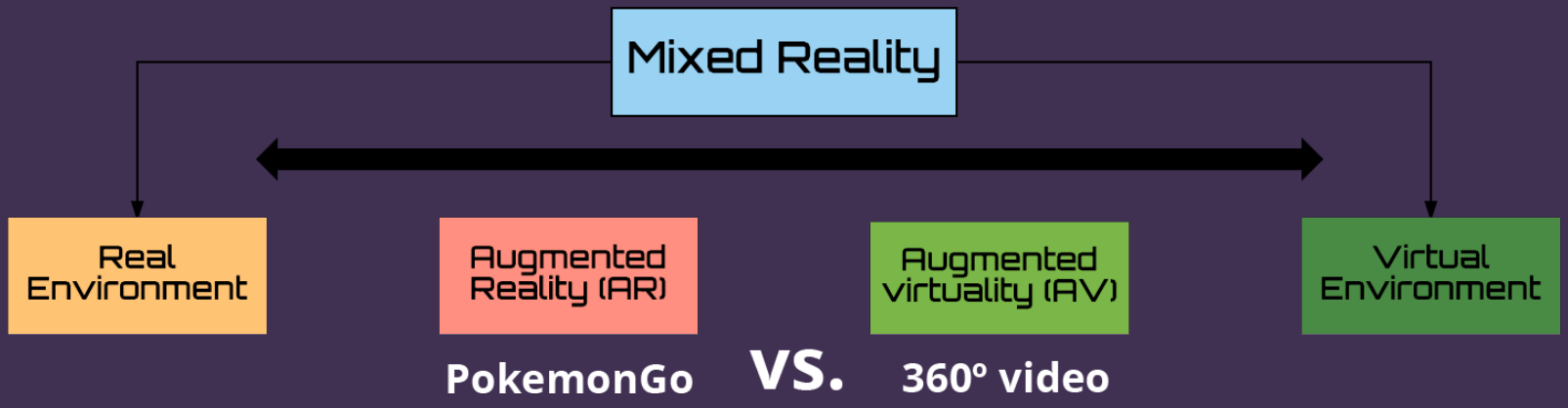


Figure: The Virtuality Continuum - Milgram & Kishino

The term `virtual reality' was coined by Jaron Lanier in 1987 during a period of intense research activity into this form of technology.

"As babies, each of us has an astonishing liquid infinity of imagination on the inside; that butts up against the stark reality of the physical world. That the baby's imagination cannot be realised is a fundamental indignity that we only learn to live with when we decide to call ourselves adults. With virtual reality you have a world with many of the qualities of the physical world, but it doesn't resist us. It release us from the taboo against infinite possibilities. That's the reason virtual reality electrifies people so much."

Reality Systems - Hardware

Display Types:

- Head-Mounted Displays
- World-Fixed Displays
- Hand-held Displays (tablets = floating, mobile = personal)

Audio: Spatialised Audio is preferred

- Headphones - more immersive.
- surround sound speakers.

Head-Mounted Displays (HMD)

World-Fixed Display

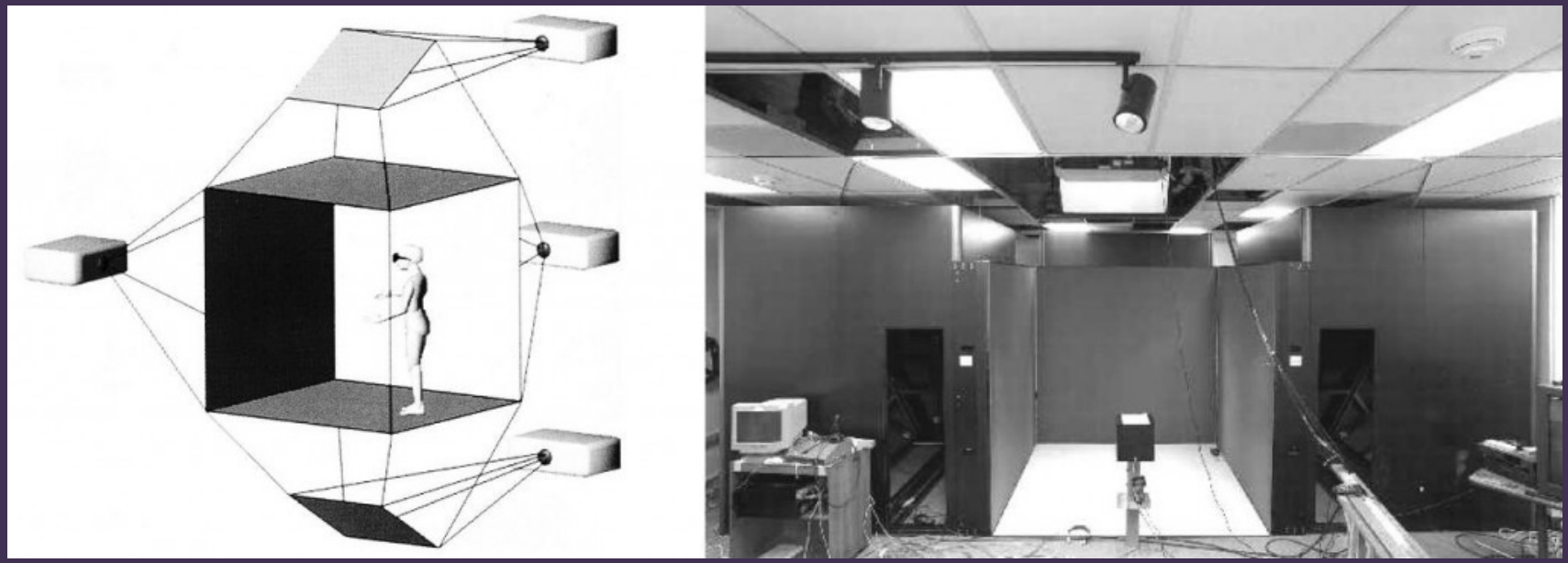


Figure: Cave VR environment: A lifelike visual display is created by projectors positioned outside the CAVE and controlled by physical movements from a user inside the CAVE.

Hand-held displays

Have a guess at the example I chosen?

Hand-held displays

Have a guess at the example I chosen?

Figure: Pokemon Go

Tracking

- Accelerator & Gyro embedded in displays
- Leap motion - Hand Tracking
- Eye Tribe (Foveated rendering)
- Fiducials Markers
- Kinect2 - Skeleton Tracking
- Valve's Lighthouse Tracking Sensors
- Vive Trackers (Link)

Tracking

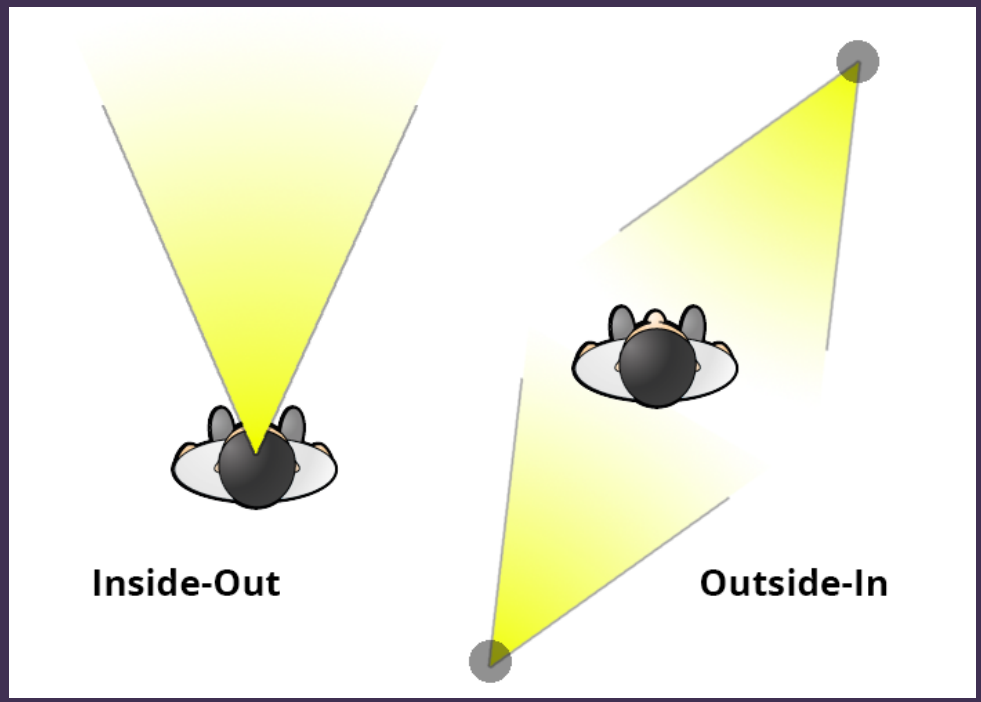


Figure: Pokemon Go

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

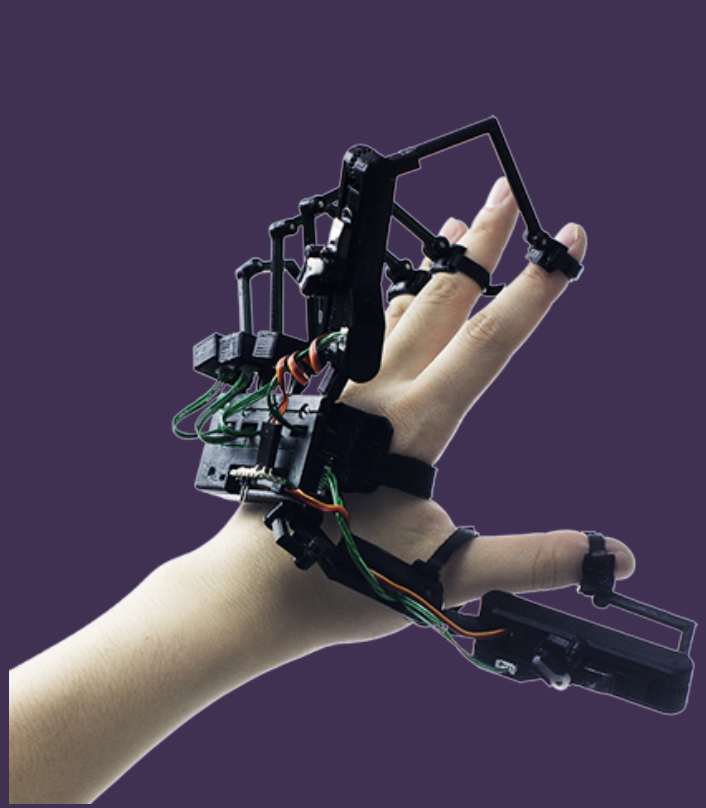


Figure: DexmoF2 & Sensable's Phantom Haptic System

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)


Omni
Omni


Birdly
SOMNIACS

Five Universal Tasks of 3D User Interfaces

- Navigation
- Selection
- Manipulation
- System Control
- Text & Voice Input

Human-Centred Design:

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.
- **acknowledge** that sophisticated/eloquent solutions are less important than great user experiences.

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- Waiting until the end of a build to find out that something doesn't work is unsustainable.
- Change is inevitable.
- Failures are an inevitable outcome of creativity and innovation.

Iteration

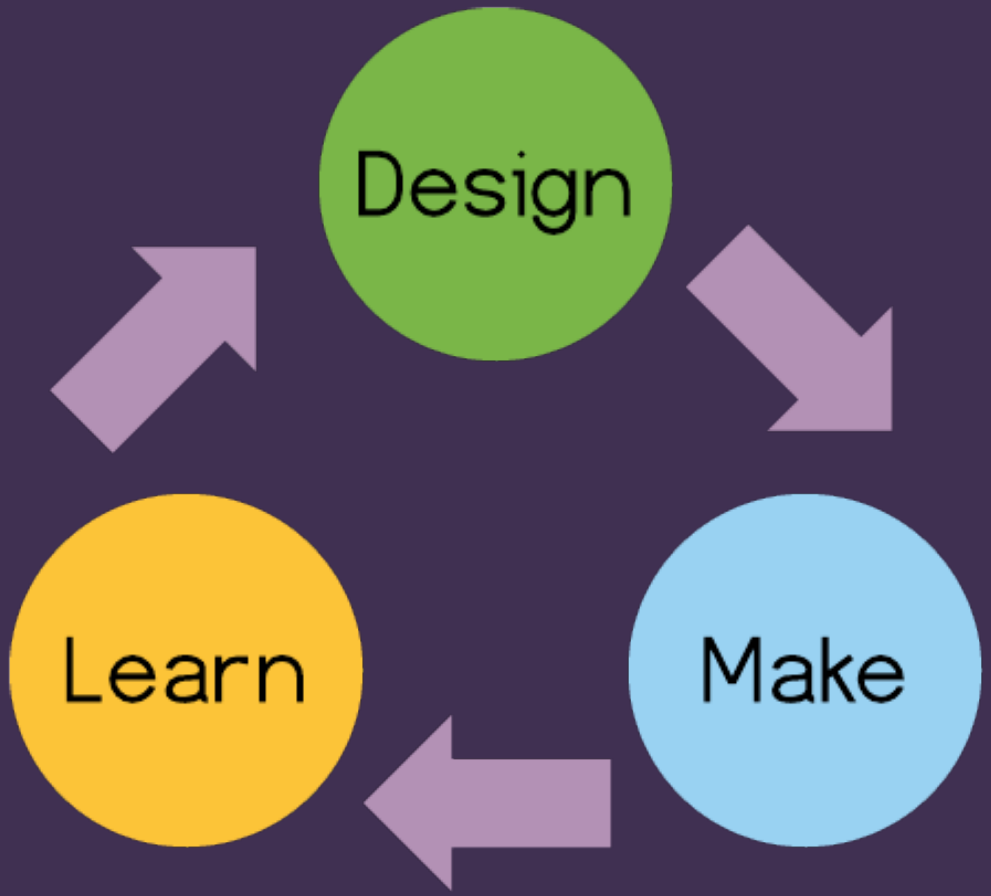

Figure: The Iteration Cycle

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. Design prototypes are defined by their level of fidelity, or resolved finish.

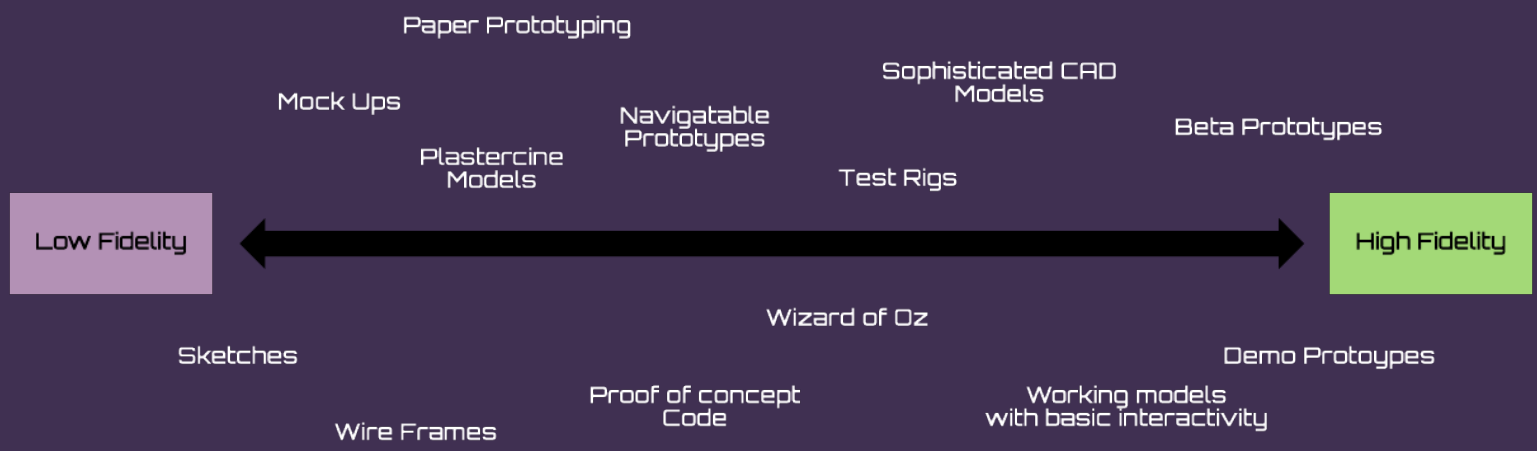

Figure: The Prototype Continuum

Learn Stage

Utilises VR experts, subject matter experts, experiment design experts, statisticians and the end-user to ensure that you are doing the right things to maximise learning.

This is the stage that we are mostly concerned with when approaching assignment COMP210 1.