Displays and Immersion

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What is Immersion?

Immersion is the sense of "being there."

Most work on immersion has been game-centric.

Quantifying immersion in virtual reality, Pausch and Proffitt and Williams, 1997

Stages of Immersion

- According to gamers, immersion is used to describe the degree of involvement with a game.
- This involvement moves along the path of time and is controlled by barriers.
- Some barriers can only be removed by human activity, such as concentration
- Others can only be opened by the game itself, such as the game construction.
- Each level of involvement is only possible if the barriers to the level are removed.
- Removing these barriers, however, only allows for the experience and does not guarantee it

A grounded investigation of game immersion, Brown and Cairns, 2004

Stages of Immersion

- Engagement

- Engrossment

- Total Immersion

A grounded investigation of game immersion, Brown and Cairns, 2004

Stages of Immersion: Engagement

- To lower the barriers to enter this level, the gamer needs to invest time, effort, and attention.
- Accordingly, an initial barrier for engagement is access. This refers first to the gamers' preference, if they do not like a certain style of game they will not even try to engage with it.
  - "I don't tend to play sport games, I don't see the point really."
- Secondly, access relates to game controls. The controls and feedback need to correspond in an appropriate manner so that the user can become expert, at least at the main controls.
  - "You just press anything just to try and kick, you don't really know what the controls are."

A grounded investigation of game immersion, Brown and Cairns, 2004

Stages of Immersion: Engrossment

- The barrier to engrossment is game construction.
- This is when game features combine in such a way that the gamers' emotions are directly affected by the game.
- Some game features mentioned by participants that form this quality were visuals, interesting tasks, and plot.
- The gamer is now less aware of their surrounding and less self aware than previously.

A grounded investigation of game immersion, Brown and Cairns, 2004

Stages of Immersion: Total Immersion

- Total immersion is presence.
- Participants described being cut off from reality and detachment to such an extent that the game was all that mattered.
    - "You just forget about the things around you and you're focused on what you're doing in the game"
    - "You feel like you're there"
- The barriers to presence are empathy and atmosphere.
- Empathy is the growth of attachment.
    - Empathy is distinct from attachment in that you feel attached to a main character or team but do not necessarily empathise with their situation. Gamers who did not feel total immersion talked of lack of empathy and the transfer of consciousness.
- Atmosphere: the development of game construction.
    - All but one game mentioned as totally immersive was a first person perspective game.

A grounded investigation of game immersion, Brown and Cairns, 2004

Types of Immersion

- In the game design community there has been work in categorizing immersion
- Staffan Bjoörk and Jussi Holopainen divide immersion into the following categories:
    - Tactical immersion
    - Strategic immersion
    - Narrative immersion
    - Spatial immersion

Patterns in game design (game development series), Bjork and Holopainen, 2004

Tactical Immersion

- Experienced when performing tactile operations that involve skill

- Players feel "in the zone" while perfecting actions that result in

  success

Patterns in game design (game development series), Bjork and Holopainen, 2004

Strategic Immersion

- More cerebral

- Associated with mental challenge

- Chess players experience strategic immersion when choosing a

  correct solution among a broad array of possibilities

Patterns in game design (game development series), Bjork and Holopainen, 2004

Narrative Immersion

• Occurs when players become invested in a story

• Similar to what is experienced while reading a book or watching a

movie

Patterns in game design (game development series), Bjork and Holopainen, 2004

Spatial Immersion

• Occurs when a player feels the simulated world is perceptually

convincing

• The player feels that he or she is really "there" and that a simulated

world looks and feels "real"

Patterns in game design (game development series), Bjork and Holopainen, 2004

Presence

- The concept of spatial immersion is the category most addressed by new display devices

- The current tread of virtual reality glasses and head-mounted display can produce a visceral feeling of being in the virtual world
    - this is called Presence (a type of spatial immersion)

- According to a talk by Michael Abrash the VR research team at Valve identified aspects needed to establish Presence

What VR could, should, and almost certainly will be within two years, Abrash, 2014

Presence

- A wide field of view (80 degrees or better)
- Adequate resolution (1080p or better)
- Low pixel persistence (3 ms or less)
- A high enough refresh rate (>60 Hz, 95 Hz is enough but less may be adequate)
- Global display where all pixels are illuminated simultaneously (rolling display may work with eye tracking.)
- Optics (at most two lenses per eye with trade-offs, ideal optics not practical using current technology)
- Optical calibration
- Rock-solid tracking - translation with millimeter accuracy or better, orientation with quarter degree accuracy or better, and volume of 1.5 meter or more on a side
- Low latency (20 ms motion to last photon, 25 ms may be good enough)

What VR could, should, and almost certainly will be within two years, Abrash, 2014

Displays

- Display devices offer differing levels of spatial immersion based simply on their design

- The basic desktop monitor offers little immersion, a window into a world.

Displays

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Augmented Reality

- Augmented Reality/Mixed Reality has mixed challenges in terms of immersion

- There are added challenges such as tracking and rendering virtual objects consistently in a real world

  - however augmented reality has the benefit that the user will already be immersed as they are viewing the real world, not a purely virtual one.

Quantifying Immersion

- There have been multiple attempts at quantifying some aspect of immersion.

- 1997 - Randy Pausch, Dennis Proffitt, George Williams
  - Compared search tasks using a HMD compared to a desktop
  - Found that when the target was camouflaged there was no difference in performance
  - When the target did not existed VR users were much better at determining when they had searched the whole space

Figure 1: *Users Stood in the Center of This Room and Looked For Target Letters.*

Quantifying immersion in virtual reality, Pausch, Randy and Proffitt, 1997

Quantifying Immersion

- 1997 - Boyd
  - Compared three kinds of virtual environments
    - Head-tracked walking (HMD)
    - Subject holds a hand-tracking device to simulate holding a puppet or a doll by the head to walk it around in a scaled-down virtual world
    - Flying (operates a metaphorical vehicle)
  - The task was to locate a virtual object that looked like a telescope, walk up to it and look through it
  - For all but two subjects, mean time was lower for the immersive design than for the other two designs, often by a large factor

Does immersion make a virtual environment more usable?, Boyd, 1997

Immersive Interaction