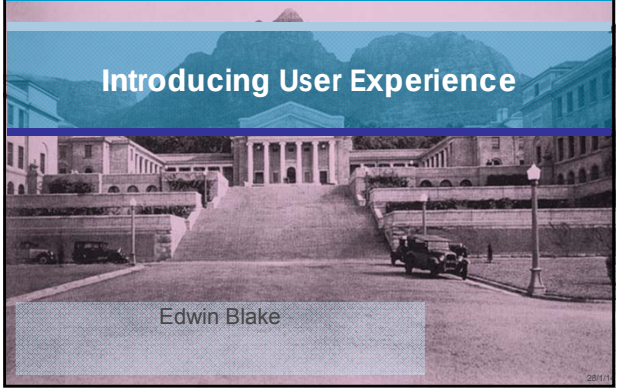
UNIVERSITY OF CAPE TOWN
Department of Computer Science

Introducing User Experience



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28/1/14

Department of Computer Science

2 INTRODUCTION

Introduction — characterizing experience
Definitions and Characteristics
Immersion, Presence and Measurement
Flow — Common Elements of Enjoyment
The Flow Dimensions
Design and Emotion

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Attentional Resources

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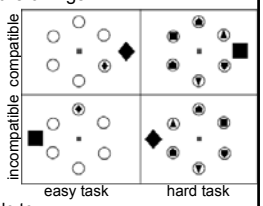
Measured by Flanker compatibility task.
Decide if square or diamond is in one of the 6 rings (target task), while ignoring distracter shape outside the rings
Distracter shape:
- either compatible (same as target)
- or incompatible (alternative shape)

What's difference in target processing speed between compatible and incompatible trials?
- Difference called 'compatibility effect'
- measures attentional resources available to participant



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Attention Results

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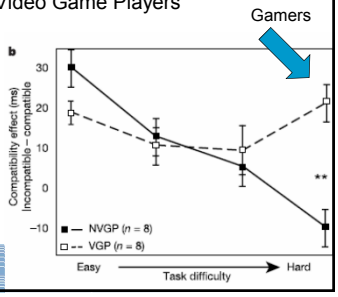
- Video Game Players (VGPs) show compatibility effects at task difficulties for which attentional resources are usually exhausted in Non Video Game Players (NVGPs)
  - Action-game training led to greater performance improvement than did the control game
- Green & Bavelier, 2003, "Action video game modifies visual selective attention"



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Presence in Games

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Storyline vs. No Story in first-person shooters

H1: Video game players will identify with characters and their goals to a greater extent when a story is present than when a story is not present ✓

H2: Video game players will report greater presence when a story is present than when no story is present. ✓

H3: Video game players will report feeling more positive and more aroused when playing story based games compared to nonstory based games.

H4: Video game players will show greater physiological arousal when playing story based games compared to nonstory based games. ✓

Contrast with traditional interpretations of Presence in VEs
- Schneider, Lang, Shin, & Bradley, 2004

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Psychological Absorption

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The "absorption rate" relates to how quickly the player gets into the game.
- rated as important by over three-quarters of the sample with no gender differences evident
- Wood, Griffiths, Chappell, and Davies, 2004

Psychological absorption is considered to be one type of altered state of consciousness, occurring when one becomes totally immersed in the present experience.
- Funk, Pasold and Baumgardner, 2003

Like Presence

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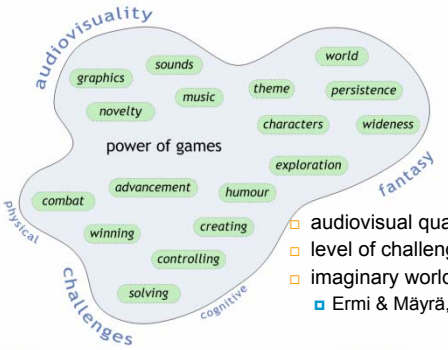
Children's Accounts of Gameplay



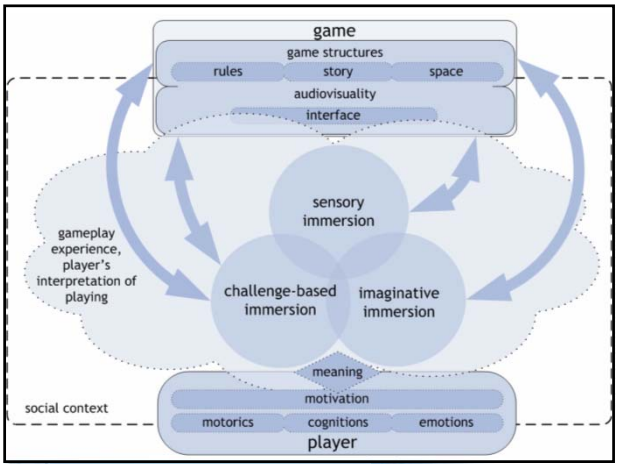
- audiovisual quality and style
- level of challenge
- imaginary world and fantasy
  - Ermi & Mäyrä, 2005

Gameplay Experience Model

sensory immersion — related to the audiovisual execution of games.
- even the parents got this!

challenge-based immersion
- enhanced by satisfying balance of challenges and abilities

imaginative immersion
- absorbed with the stories and the world
- identify with a game character



10 DEFINITIONS AND DEFINING CHARACTERISTICS

Introduction — characterizing experience
Definitions and Characteristics
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No Common Definition of User Experience

- Too broad a range of concepts:
  - experience
  - emotion
  - affect
  - aesthetics
- Too many diverse areas of application
- It would be nice to have one but we will not be holding our breath.
  - We use it to indicate that we are looking beyond usability, functionality and accomplishing tasks (Hassenzahl 2003).

Some Attempts

- User experience does include a look on all the (qualitative) experience a user is gaining while interacting with a product (McCarthy and Wright 2004)
- The current ISO definition on user experience focuses on a person's perception and responses resulting from the use or anticipated use of a product, system, or service. (see ISO 9241-210:2010)

Defining User Experience

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- User experience (UX) considers the totality of a person's perceptions and (qualitative) responses when interacting with an artefact (like a game or a virtual environment).
  - Umbrella term that looks beyond usability and task-orientated instrumental responses.
- The task of evaluating UX is a psychological one: one has to decide which psychological concepts best capture the experience.
- As computer scientists we want to use UX to drive and measure effective design.

CVEs: Qualitatively Different User Experience

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- Collaborative Virtual Environments (CVEs):
  - Computer system mediates the interaction of users with one another and with computational objects
  - *But* creates the illusion of non-mediation
  - Such systems form a new paradigm for communication between people
- Challenge:
  - Characterize and
  - Measure this qualitative difference.

Illusion of non-mediation

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- Psychological state where a viewer fails to perceive the medium of communication, and responds as if the medium were not there (Lombard & Ditton 1997)
  - An invisible medium can provide stimuli which are more rich and meaningful.
  - Barrier of "inside the VE" and "outside the VE" disappears
    - Objects and persons on both sides share a common space
  - Actors in the medium perceived as being non-mediated
    - User responds with social responses normally reserved for inhabitants of the real world
  - Social cues produced by actors in the VE interpreted as real social cues coming from real persons

Avatars

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- From Hindu mythology: The incarnation of a spirit in an earthly form
- Here means the virtual representations of participants in a Virtual Environment or Game
- Users are represented by avatars
  - representations of the users themselves within the environment
  - not only interface where users directly manipulates objects, but where the environment can have effects on them.
    - not move onto areas which do not suggest a floor for to walk on.
- Importance of avatars in VEs:
  - Social representation
  - Identity
  - Interaction and communication

User behaviour and Virtual Reality

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- VEs: designed to create a sense in the user of existing in rather than simply viewing.
  - 3D visualization of data might look like a mountain
  - VE gives impression that the users are standing on a mountain.
- Sense of "being", or "immersion" or "presence" defines VEs. (Sheridan 92, Witmer 98, Slater 99).
- Marked impact on user behaviour:
  - environment is experienced as if it were real
  - users think of themselves as actors in the space not simply observers.

Therefore …

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- Participants exhibit similar reactions to VE as in real life
  - show fear reactions
  - perform tasks in "normal" manner
  - show socially conditioned responses

Concepts used in evaluation

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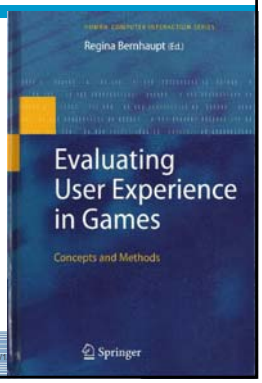
- Presence
- Immersion
- Engagement
- Flow
- Involvement
- Fun
- Playability



UX Tools in Game Development Phases

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- Concept phase: initial game idea
  - User-centred design (like paper prototyping)
  - Technology probe/demo
- Preproduction: determining art style, production planning, game design and technical design documents
  - Heuristic evaluation
- Prototype: demo key aspects and decide if it is “fun to play”
- Production
  - User testing
- Localization (tailored to markets), Alpha (playable start to finish: UX testing), Beta (fine-tuning & bug fixing), Gold (manufactured)
- Post-launch
  - Reviews
  - User forums

Early User Experience Evaluation Tools

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- Initial phases: pre-production and prototype
  - Focus groups
  - Interviews
  - Informal play testing
  - Questionnaires

Later phase UX

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- Implementation and testing phases:
  - Play testing (including biometrics)
  - Semi-structured interviews
  - Player Observation
  - Quantitative comparison of users’ behaviours
  - Questionnaires focussing on users’ attitudes and experiences
  - Heuristic evaluation (e.g., heuristics for playability)

23 IMMERSION, PRESENCE & MEASUREMENT

Immersion I

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- Function of the VR system
- Level to which VR system replaces real world information sources with generated virtual information sources.
  - E.g., system which provides visual as well as aural information to the user gives more immersion than one which only provides visual information.
- Immersion is wholly a product of the system,
  - subjective presence is wholly a product of the subject's psychology.

Immersion II

- Consists of
  - Vision: direct and peripheral
  - Audio: spatialized
  - Proprioceptive feedback from own movements
  - Haptic feedback

Does Immersion Lead to Presence?

- Maybe:
  - Is it sufficient?
  - Is it necessary?

Immersive Tendencies

- Due to Witmer and Singer (1998)
- Personality trait which is theorized to predict subjects' reactions to virtual environments.
- Predicted presence scores (which included both immersion and subjective presence factors).
- Measured by means of the Immersive Tendencies Questionnaire (ITQ)

Witmer & Singer's Immersive Tendencies Questionnaire

1. Do you ever become so involved in a TV program or a book that people have problems getting your attention?
   1 Never ... 4 Occasionally ... 7 Often
2. How good are you at blocking external distractions when you are involved in something?
   1 Not very good ... 4 Somewhat good ... 7 Very good
3. Have you ever remained apprehensive or fearful long after watching a scary movie?
   1 Never ... 4 Occasionally ... 7 Often

Presence

- Immersion
- Subjective Presence
  - Personal experience of a user
  - Sense of "being" or existing in the VE.
- Subjective Presence further divided into
  - Personal Presence: the extent to which a users feels present in an environment
  - Co-presence: the extent to which users regard virtual collaborators as truly co-existing in the environment

Personal Presence

- Personal presence is mediated by the user's *immersive tendencies*
  - The degree to which the VE affects them
  - Presence is reported to be related to immersive tendencies
  - Immersive tendencies are determined by personality variables & learning history

Subjective Presence

- Personal presence:
  - characterized by the user's sense of being in the space indicated by the VE rather than in the real world.
- Co-presence
  - feeling that other participants in the CVE actually exist and are really present in the environment
  - feeling that one is interacting with real people.
  - perception that persons with whom one is engaged in communication are in the same (virtual) location
    - in fact they are in a different real locations.

Co-Presence

- Co-presence refers to having a sense that others are present in the virtual environment, being part of a group, and having a feeling that one is collaborating with real people.
  1. To what extent did you have a sense that you were in the same place as [participant x] during the course of the experience?
  2. To what extent did you have a sense of being “part of the group”?
  3. To what extent did you have a sense of the emergence of a group during the course of the experience?

Measuring Co-Presence

- Easiest to use subjective measures (self-report questionnaire)
- Slater et al (2000) used 3 questions to measure co-presence
  1. In the last meeting, to what extent did you have the sense of the other two people being together with you?
  2. Continue to think back about the last meeting. To what extent can you imagine yourself being now with the other two people in that room?
  3. Please rate how closely your sense of being together with others in a real world setting resembles your sense of being with them in the virtual world.

Our Measure of Co-Presence I

- To what extent did you have a sense that the other members of the group were in the same place as you during the course of these events?
  I sensed that the others were in the same place as me... 1. Never ... 4. About 50/50 ... 7. All the time
- To what extent did you have a sense that you where in the same place as the other group members during the course of the experience?
  I sensed that I was in the same place as the others... 1. Never ... 4. About 50/50 ... 7. All the time
- To what extent did you have a sense of the emergence of a group/community during the course of these events?
  I sensed the emergence of a group... 1. Never ... 4. About 50/50 ... 7. All the time

Our Measure of Co-Presence II

- To what extent did you did you have a feeling that you were collaborating with real people and not robots?
  I had a feeling that I was collaborating with real people... 1. Never ... 4. About 50/50 ... 7. All the time
- When you think back about your last experience, do you remember this as more like talking to a computer or communicating with a group of people?
  1.Talking to a computer ... 4. About 50/50 ... 7. Communicating with a group
- To what extent did you have a sense of being ``part of the group''?
  I had a sense of being ``part of the group'' ... 1. Never ... 4. Sometimes ... 7. All the time

Are Personal Presence and Co-presence Orthogonal?

- Slater et al (2000) say so.
  - talking on the telephone with someone might give you a sense of co-presence (i.e., “being with them”) but will not give you a sense of presence (i.e., “being there”).
- What do you think?
- Useful to examine the extent to which personal presence and co-presence are related.

Embodied Presence

- Alternative view of Presence: "tantamount to successfully supported action in the environment" (Zahoric & Jenison)
  - Action and affordances, rather than
  - Appearances
- "Being there" ⇔ "doing there"
- Proprioception and Exteroception (Sensory Data) go together in a real environment.
  - Needs close match between kinaesthetic proprioception and the stream of sensory data.

Is there such a thing as Presence?

- Evidence depends on introspection …

Objective Presence?

Slater (2002):

Presence may be operationally defined based on the similarity of perceptual activity and overall body engagement and response to virtual or real stimuli. Responses are multi-dimensional and will include those obtained from brain imaging, physiological measures, eye, tracking, behaviour and subjective reporting.

- Comment?

Measurement of Presence

- Subjective Questionnaires
  - "To what extent did you feel the virtual reality overwhelmed you"
- Observational Measures
  - Appropriate reaction
- Objective Measures
  - Galvanic skin response

Observational Measures

- Observing the behaviour of participants reacting to different stimuli in the VE.
  - Fear, looming, surprise, expectation
  - Not available in general
- Task performance

Issues in Measurement

- Subjective questionnaires
  - Used post experience (recall problem)
  - Language difficulties
- Observational
  - Probably artificial given the situation
  - Can't have cliffs/objects every VE!
- Objective
  - Hard to measure, probably related to other cognitive factors (such as load)

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FLOW — COMMON ELEMENTS OF ENJOYMENT

Ask people what they enjoy and they give a large variety of activities.

But they all describe enjoyment in a very similar way, this is regardless of their culture, stage of modernisation, social class, age, or gender.

Flow: Optimal Experience

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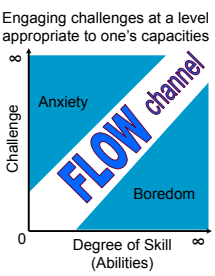
Flow is the mental state a person is fully immersed in an activity

Conditions:

1. *Activity where skills and challenge* are in balance (stretching, but not too difficult).
2. *Clear* proximal *goals*.
3. Direct and immediate *feedback* on progress.



Definition of Flow

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"The state in which people are so involved in an activity that nothing else seems to matter, the experience itself is so enjoyable that people will do it even at great cost, for the sheer sake of doing it." (Csíkszentmihályi, 1991)

"Flow is a state or a sensation that occurs when someone is participating in an activity for its own sake." (Weibel et. al., 2008)

Enter Subjective State

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Experience seamlessly unfolds from moment to moment.

- Concentrating and focusing on the present moment
- Merging action and awareness
- Loss of self-consciousness (loss of awareness of oneself as a social actor)
- Sense of personal control
- Distorted sense of time.
- Intrinsically rewarding, (effortlessnes
  - Csíkszentmihályi (1990, 2002)
- Absorption?
- Presence?

Flow in Games

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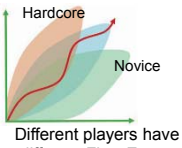
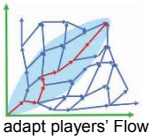
- Core elements a video game must have in order to evoke Flow experience:
  1. As a premise, the game is intrinsically rewarding, and the player is up to play the game.
  2. The game offers right amount of challenges to match with the player's ability, which allows him/her to delve deeply into the game.
  3. The player needs to feel a sense of personal control over the game activity.
- As a result, the game will make player lose track of time and self-consciousness.
  - Chen 2007



Different players have different Flow Zones



Designers adapt players' Flow experience through the choices they deliberately build into the experience.

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THE FLOW DIMENSIONS

Phenomenology of Enjoyment

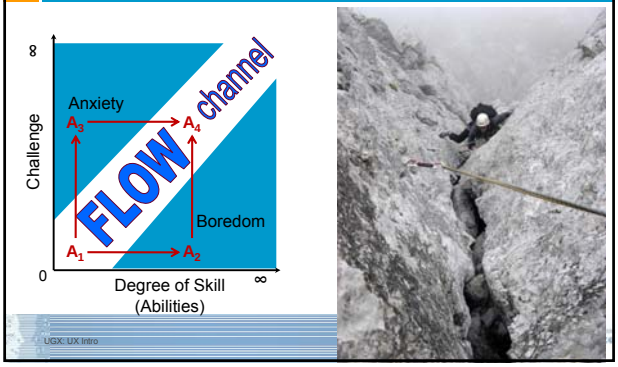
1. A challenging activity that requires skill
2. The merging of action and awareness
3. Clear Goals
4. Unambiguous feedback
5. Concentration on the task at hand
6. The Paradox of control
7. Loss of self-consciousness
8. Transformation of time
9. Autotelic experience

Not all of the elements are required for a person to have an Optimal Experience

1. Challenging Activity that Requires Skill

- Enjoyment is achieved whenever the opportunities for action *perceived* by the individual are equal to his/her *perceived* capabilities.
- Flow ⇔ a dynamic balance exists between perception of challenges and confidence in skills

Engaging in challenges appropriate to one's capacities



2. The merging of Action and Awareness

- All the person's skills are needed to cope with the challenge of a situation. The person's entire supply of psychic energy is in use.
- The result above is the complete absorption in the activity.
  - Feeling at one with the activity
- Csíkszentmihályi (1991) says that this is one of the most universal and distinctive features of an Optimal Experience. The activity that takes place is spontaneous or automatic, the person stops being aware of themselves as separate from the actions they are performing.
- This is reason why Csíkszentmihályi called Optimal Experience: "Flow"

3. Clear Goals

- Proper setting of goals moment-by-moment helps a player to achieve an optimal experience
  - if trivial then full enjoyment cannot take place
  - must know clearly what to do
  - personal
- Keeps the performer fully connected to the task and responsive to appropriate cues.
- closely connected to feedback

4. Unambiguous Feedback

- Feedback needs to be immediate
  - to determine if goals are being met.
  - not just positive feedback: player wants to adjust responses
- The information received from the activity is valuable because of the symbolic message it contains: I have succeeded in my goal. This knowledge creates order in consciousness, and strengthens the structure of the self.

5. Concentration on the Task at Hand

- Enjoyable activities require the person to fully focus on the task at hand.
  - This leaves no room for other thoughts.
- Flow happens when we are completely absorbed in the present moment.

6. The Paradox of Control

- The flow experience provides a sense of control, or rather the lack of the sense of worry about losing control.
  - fine balance between perception of control and lack of absolute control
  - total control would lead to boredom
    - relates to the challenge vs. skill balance
- In dangerous sports, like rock climbing or base jumping, enjoyment comes from being abl to minimise the risk with correct and careful preparation.
- Not by increasing uncontrolled nature of it.

7. Loss of Self-Consciousness

- As mentioned before, a characteristic of a Flow Experience is the loss of the separate self to become with the activity.
  - Preoccupation of the self consumes psychic energy.
  - We focus on appearance and how others may think of us.
  - In flow there is no room for self-scrutiny.
- This does not mean that we should try eliminate the self from our consciousness.
  - We do not give up our control of psychic energy, the opposite is in fact true, an Optimal Experience involves a very active role for the self.
  - This is how we grow from our experiences.

8. Transformation of Time

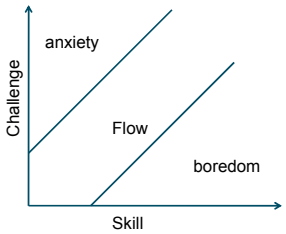
- Ordinary time cycles seem to distort.
  - Hours can feel like minutes (most common feeling according to studies done by Csíkszentmihályi and other researchers)
  - however seconds can feel like minutes.
- Exception to this rule: when time is necessary to the activity.
  - Such as a computer gamer needing to collect a certain number of items in a specified time.
- This is not a major element of enjoyment, but can contribute to a full or complete enjoyment.
- It reflects the intensity of the focus of attention on the experience itself

9. Autotelic Experience

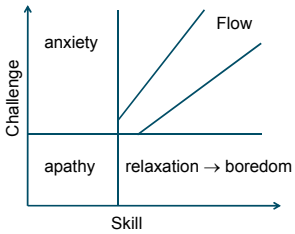
- This is a key element of an Optimal Experience.
- Autotelic comes from two words in Greek:
  - "*auto*", meaning self,
  - "*telos*", meaning goal.
- It can be defined as a self-contained activity, one that is done not with the expectation of some future benefit, but simply because the doing itself is the reward.
- Flow Experience – The person pays attention to the activity for its own sake; when this is not the case, the person focuses on its consequences.

Basic Flow Models

Original Flow Model

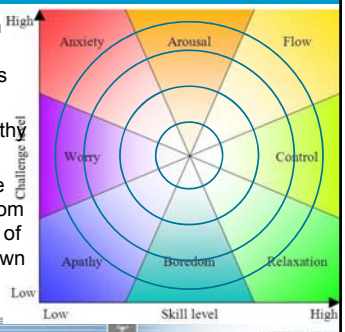


Four Channel Flow Model



Eight Channel Model of Flow State

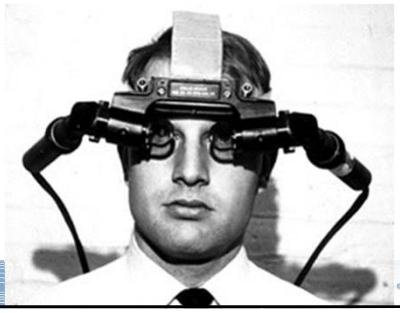
- Flow is experienced when perceived challenges and skills are above the actor's average levels;
- when they are below, apathy is experienced.
- Intensity of the experience increases with distance from the actor's average levels of challenge and skill as shown by the concentric rings.



62 DESIGN AND EMOTION

Enhancing Presence and Flow

- What can you do to help?



Virtual Ante-Room

- Entry into VE can be abrupt, leaving the users confused: do not know what to expect to see and experience.
- The virtual ante-room technique can help with entry.
  - See a virtual copy of the real world.
  - Real world is a laboratory.
  - The main experience took place in a VE through a doorway,
  - Final step of preparation: go through the door into the main VE.
  - ⇒ splits the transition into 2 steps, second is a continuous experience.
- Immersive Projection Technology (IPT) is different: entering the IPT space is a physical transition.

IPT Garden

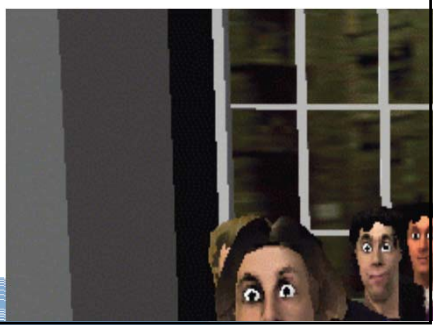
- Based on lessons from theme park rides.
  - Show participants something of what they can expect.
  - Introducing characters and back-story of the experience
  - Describing the controls.
- Can make environment less surprising when actually entered.
- Give impression VE exists before user enters (life of its own).
- Let fragments of the VE "leak out":
  - views of the environment through windows that might be explained as if they were remote cameras.
  - Priming …

Thematic Inertia and Priming

- Read story before VR experience
  - Relevant
  - Irrelevant
- Relevant story makes "good" VE better and bad VE worse (compare background in slide 4 and this one)
  - At least in presence scores
  - Irrelevant has no influence
- Why?
  - Base line?

Fear of Public Speaking I

- Interesting Effects with People
  - Avatars
  - Actors
- For example:
  - Are they scary?



Fear of Public Speaking II

- And these?

Positive and Negative Behaviours

- maintain eye contact
- lean forwards & pay attention
- encouraging noises
- smile frequently
- enthusiastic applause
- nod encouragingly
- standing ovation

- avoid eye contact
- turn away & talk to each other
- yawn, cough, mumble
- frown and fall asleep
- read papers/notes
- put feet on table
- walk out of room

Emotional Consequences

- 'It was clear that the audience was really positive and interested in what I was saying and it made you feel like telling them what you know.'
- 'I felt great. Finally nobody was interrupting me. .. Here I felt people were there to listen to me.'
- 'They were staring at me. They loved you unconditionally, you could say anything, you didn't have to work'.

- 'It felt really bad. I couldn't just ignore them. I had to talk to them and tell them to sit up and pay attention. Especially the man on the left who put his head in his hands; I had to ask him to sit up and listen….
- I entered a negative feedback loop where I would receive bad responses from the audience and my performance would get even worse'
- 'I was upset, really thrown. I totally lost my train of thought. They weren't looking at me and I didn't know what to do. … I was very frustrated. I felt I had no connection to them. …'

Relation of Emotion to Presence Slater: "A Note on Presence Terminology"

Immersion: what the technology delivers (objective)

Presence: (subjective) human reaction to immersion

Involvement (or interest) is separate from presence
- Content, not form

Emotional content is orthogonal to presence
- Presence is separable (logically distinct) from emotion.
  - You can be bored and still very present
- Again form versus content.

You may use emotion to test if there is presence
- Same emotional response as in the real world
- The very fact that you can do this says presence and emotional response are logically distinct.

Emotions as a Determinant of Presence

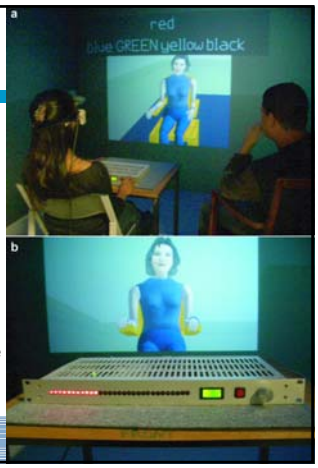
- Emotional responses could play a key role in generating and enhancing presence
  - Emotions affect behaviours and cognitions
- Presence ("being there") is a complex experience.
  - Interplay of raw sensory data and various cognitive processes
  - Users "feel" present
- Aim: design more effective virtual experiences.
  - Need to understand presence and emotional reactions to VE better

Virtual Reprise of Milgram Obedience Experiment

- Stanley Milgram 1960s: people will administer apparently lethal electric shocks to a stranger at the behest of an authority figure.
- Objective was not to study obedience
- Extent to which participants would respond to this extreme social situation as if it were real in spite of their knowing that it wasn't.
- Participants were invited to administer a series of word association memory tests to the (female) virtual human representing the stranger.
  - When she gave an incorrect answer, the participants were instructed to administer an 'electric shock' to her, increasing the voltage each time.
  - She responded with increasing discomfort and protests, eventually demanding termination of the experiment.

Results

- 34 participants
  - 23 saw and heard the virtual human
  - 11 communicated with her only through a text interface.
- All participants knew for sure that neither the stranger nor the shocks were real
  - But the participants who saw and heard her tended to respond to the situation at the subjective, behavioural and physiological levels as if it were real.



Resources

- Presence: Teleoperators and Virtual Environments.
  - Go via library website
  - From EBSCO with 12 month delay
- Cyberpsychology & Behaviour
  - www.liebertonline.com.ezproxy.uct.ac.za/cpb
- Flow
  - www.bodyandmindflow.com.au
  - www.mindgarden.com/products/flow.htm
- Fun: Mel Slater's Blog
  - www.presence-thoughts.blogspot.com/