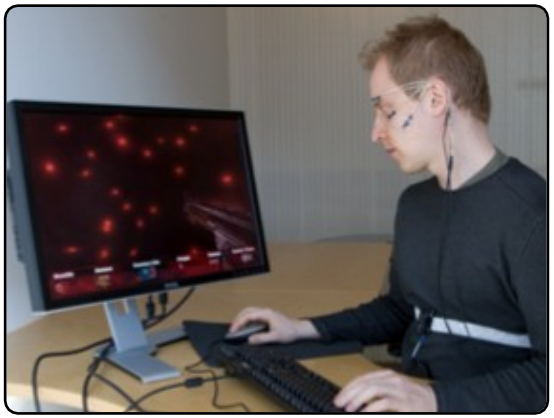
DiGRA 2009: Breaking New Ground
Innovation in Games, Play, Practice and Theory

Playability & Player Experience Research


Lennart Nacke, Anders Drachen, Hannu Korhonen, Kai Kuikkaniemi, Jörg Niesenhaus, Wouter van den Hoogen, Karolien Poels, Wijnand IJsselsteijn, Yvonne de Kort

Overview

- Games, gamers or gaming? *(for Staffan)*
- Player research studies a bit of all three
- Games
  - Provide logging mechanisms and tools
- Gamers/Players
  - Affective, emotional, and cognitive responses
- Gaming
  - Studying the interaction of players with games
  - Research knowledge feeds back into game design
  - Empirical basis for design and development

Why Player Experience Research Now?

- Game studies in need of empirical perspectives
- User Experience of growing interest in HCI research
- No common methods
  - Qualitative gameplay investigations
  - Quantitative gameplay investigations

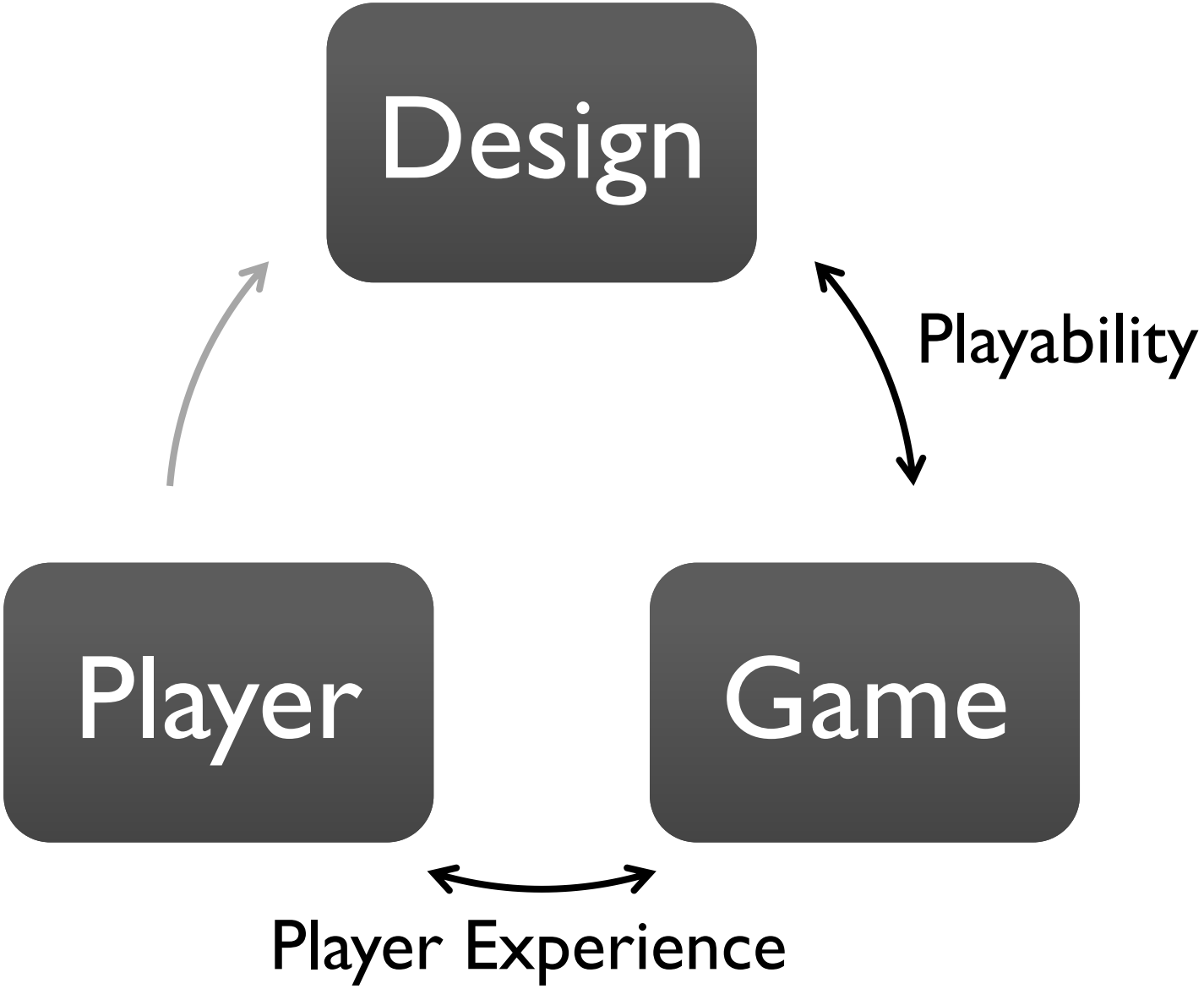
- Gameplay is the gaming process of player with game
  - Good gameplay == good game
  - Good game == good sales
  - Good sales == industry interest
  - Industry interest ≈ academic funding

Playability and Player Experience

- Playability
  - Directed toward Games

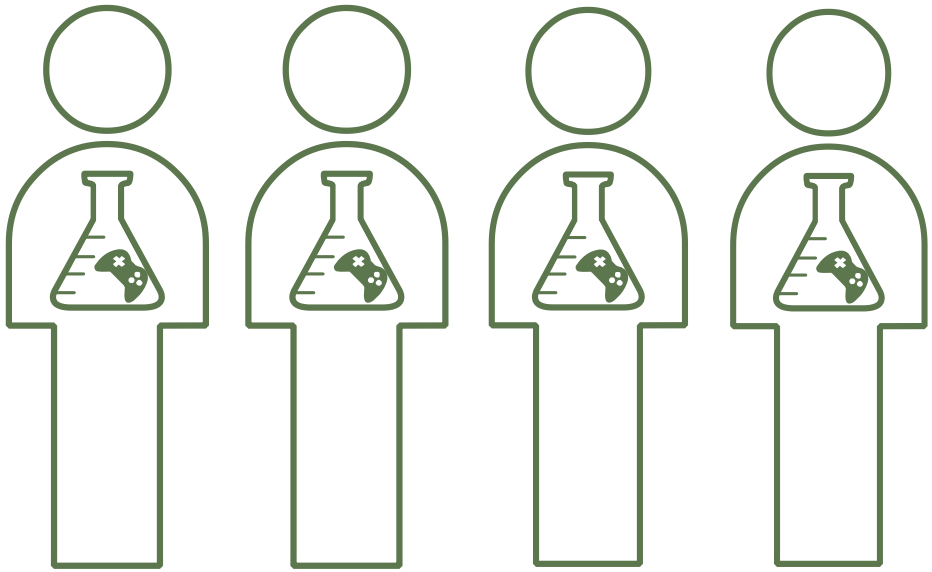
- Player Experience
  - Directed toward Players

The Player Experience Design Process?



This Panel

- People
  - User Experience Specialists and Researchers
- Topics
  - Perspectives on Playability Research
  - Biometrics and Player Experience
  - Gameplay Metrics and Player Experience
  - A Multi-method Approach to Measuring Player Experience
- Discussion



MEET THE PLAYERS

Lennart Nacke

- Blekinge Institute of Technology
  - PhD Candidate
  - Digital Game Development and Human Computer Interaction
- EU FUGA Project
- Fun and Player Experience Research
  - Psychophysiology (i.e. Biometrics), Game Metrics, UX, HCI
- Consulting on using biometrics for game evaluation

Kai Kuikanniemi

- Helsinki Institute of Information Technology
  - PhD Candidate
  - Digital Content Communities (DCC) research group
- Experimental game designs
  - Biofeedback gaming
  - Cinema gaming
  - Design games
- Action research
  - Design
  - Prototyping
  - Experiments
  - Business models
- EU FUGA Project and several national research projects

Anders Drachen & Alessandro Canossa

- Center for Computer Games Research, ITU Copenhagen
  - Post. doc.
  - Game Development, Human Computer Interaction, User Experience & Data Mining, Player Behavior Modeling
  - drachen@itu.dk

- IO Interactive & Danish Design School
  - PhD-candidate
  - Game & Level Design, User Experience, Player Behavior Modeling
  - alessandroc@ioi.dk

- Consulting on using game metrics for user-oriented testing/game development

Hannu Korhonen

- Nokia Research Tampere (Finland)
  - Senior Researcher
  - PhD Candidate at University of Tampere

- Playful Experiences and Game Evaluation Methods
  - Usability Engineering
  - Mobile HCI
  - UX Research

Jörg Niesenhaus

- University of Duisburg-Essen (Germany)
  - Research Associate, PhD Candidate
  - Chair of Interactive Systems and Interaction Design

- Game Usability & Game Interface Design Research
  - Usability Engineering, HCI, Game Development
- Game Developer & Publisher Consulting
  - User tests & expert reviews
  - Concept work

Wouter van den Hoogen

- Eindhoven University of Technology (TU/e)
  - Post-doc at Game Experience Lab

- Areas of interest
  - People's behavior, emotions, and cognitions
    - while interacting with their physical & virtual environments
  - Conservation and consumer behavior
  - Attitude formation and the underlying cognitive processes
  - Real time measurement of people's experiences

Karolien Poels

- Eindhoven University of Technology (TU/e)
  - Post-doc at Game Experience Lab

- Research areas
  - Categorizing dimensions of digital game experience and developing a game experience questionnaire
  - Observational coding of players' behavior as a continuous measure of digital game experience

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Nokia Research Center

PERSPECTIVES ON PLAYABILITY RESEARCH

Jörg Niesenhaus & Hannu Korhonen

Expert Reviews & Heuristics

- Tradition of expert reviews and heuristics in the 'traditional' usability & software engineering
- Games demand specifically designed heuristics
- Easy implementation in the game design and development process

General Gameplay and Game Interface Heuristics

- Desurvire et al.: Heuristics for evaluating playability
  - Gameplay
  - Game story
  - Mechanics
  - Usability
- Federoff: Game heuristics
  - Gameplay
  - Game Mechanics
  - Game Interface
- Korhonen and Koivisto: Playability heuristics
  - Game Usability
  - Gameplay
  - Mobility

Focused Game Usability Heuristics

- Mobile games / mobile multiplayer games (Korhonen and Koivisto)
- Action games (Fabricatore et al.)
- Technical aspects (Pinelle et al.)
- Game-based learning (Malone)

Pros of Heuristics & Expert Reviews

- Cost-efficient; only small groups of experts needed
- Time-efficient; The evaluation can be conducted in few hours
- Can be implemented at any stage of a project & used iteratively
- Experts able to identify majority of existing bugs and playability problems
- Several sets of heuristics to choose from

Cons of Heuristics & Expert Reviews

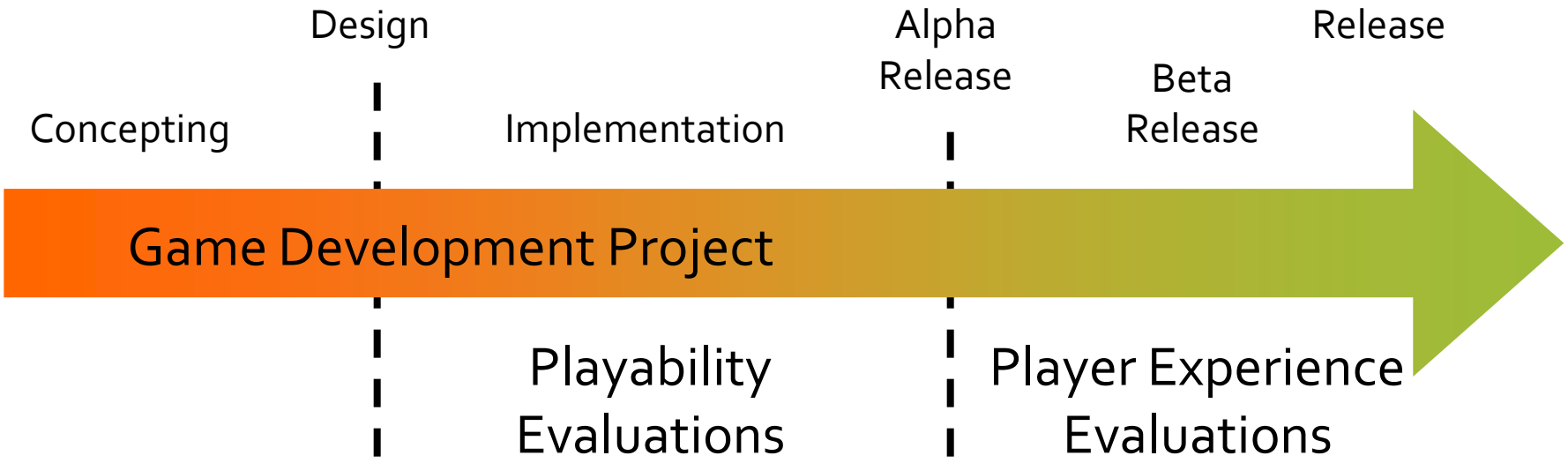
- Diversification of
  - Game genres
  - Input devices
  - Goals Challenges Heuristics

- Lack of game usability & playability experts in the game industry

Future Research Questions

- Need for more focused heuristics and / or customizable sets of heuristics
  - Depending on genre, platform, interaction, context
- Standardized Heuristics and Questionnaires
  - Developers demand (standardized) test instruments
  - Better comparison between research projects
  - Trade-offs: Questionnaires only for mainstream products?
- Ranking & Priorities of heuristics
  - What heuristics are most important for what kind of game?
  - Weight of single heuristics
- Case studies & Evaluation of heuristics

Overview of Expert Reviews & Heuristics



FUGA - Fun of Gaming

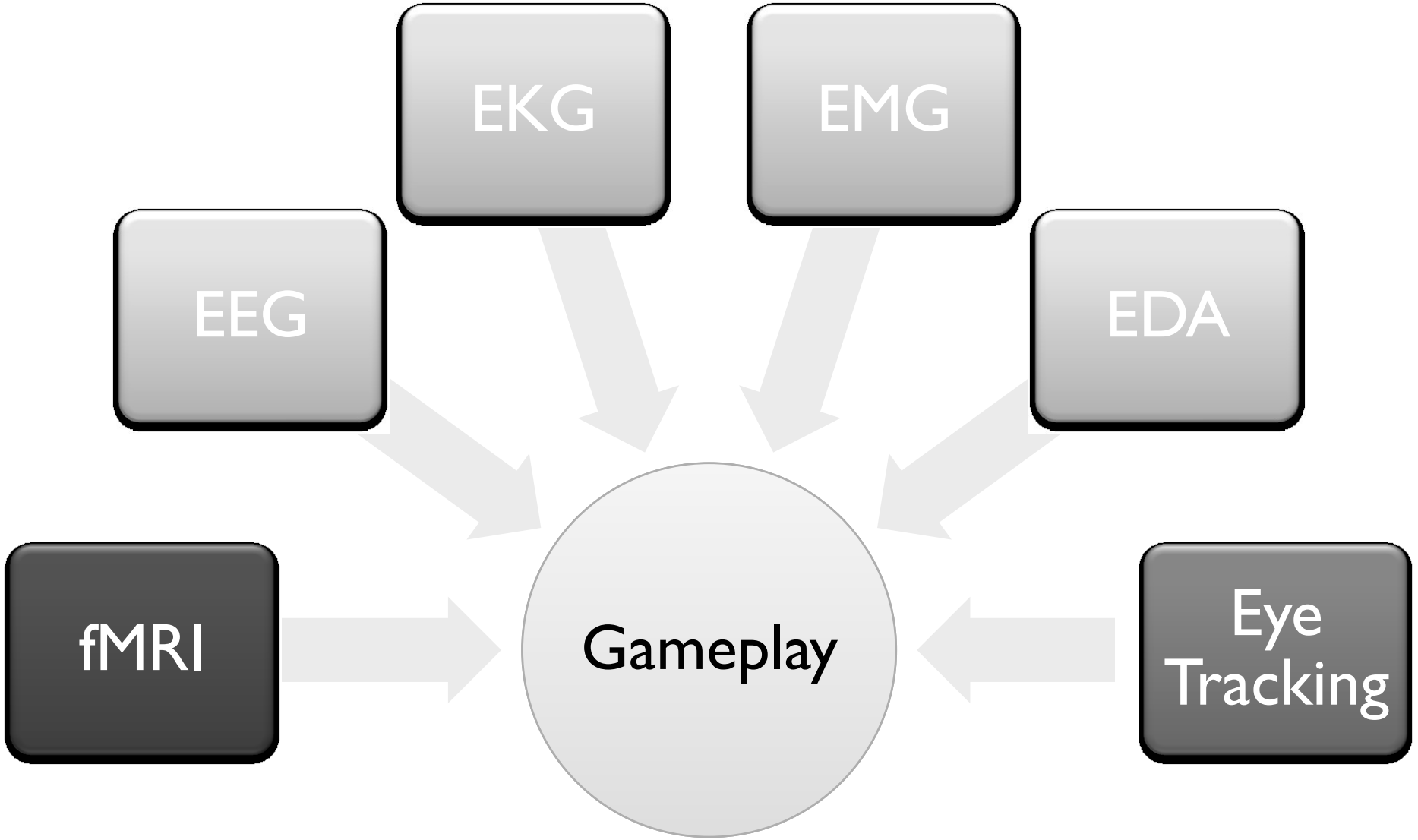
BLEKINGE TEKNISKA HÖGSKOLA · BTH ·

HELSINKI INSTITUTE FOR INFORMATION TECHNOLOGY

BIOMETRICS AND PLAYER EXPERIENCE

Lennart Nacke & Kai Kuikanniemi

Biometric Assessment of Player Experience

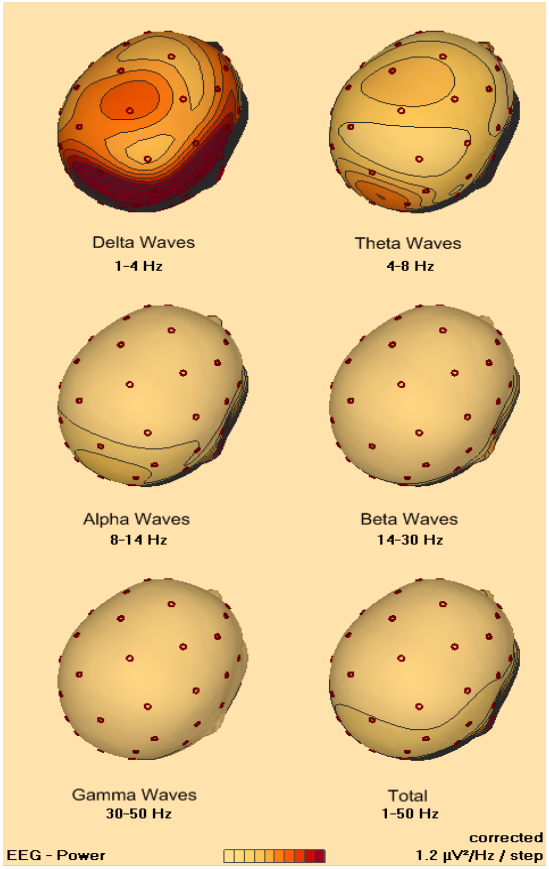


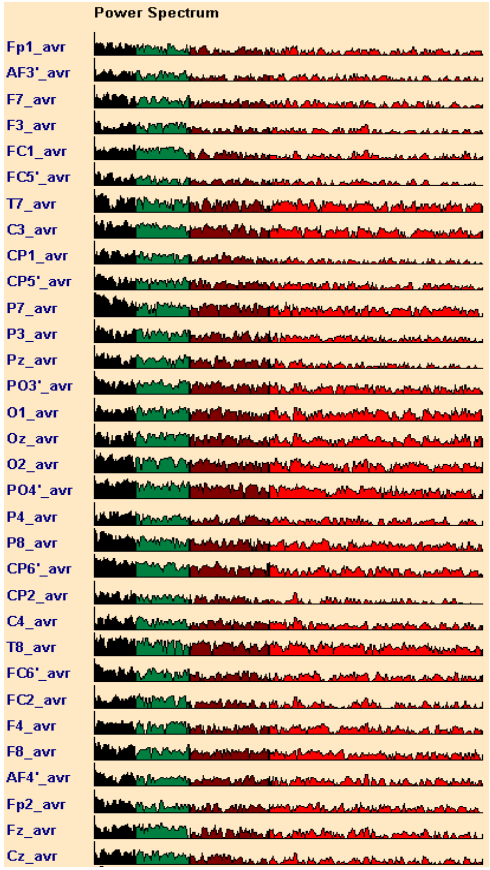
Psychophysiological Instrumentation

- Electrodermal activity (EDA)
  - Electrical conductance between two electrodes
  - Hands, feet (eccrine sweat glands)
- Cardiovascular measures (EKG, HRV, IBI, BVP, BP)
- Electromyography of the face (EMG)
  - Muscle tension,
  - Face (cheek, brow, eyelid)
- Electroencephalography (EEG)
  - Nerve cells activity in cerebral cortex
  - Frequency bands (δθαβγ frequency ranges between 1-50Hz)

Full Biometric Game Testing Lab

A full biometric testing lab with EEG, EMG, EDA, Eye Tracker, logging software and gaming hardware (Game Systems and Interaction Research Lab)





EEG Frequency Power Bands

Analysis of EEG data is done in the frequency domain using FFTs

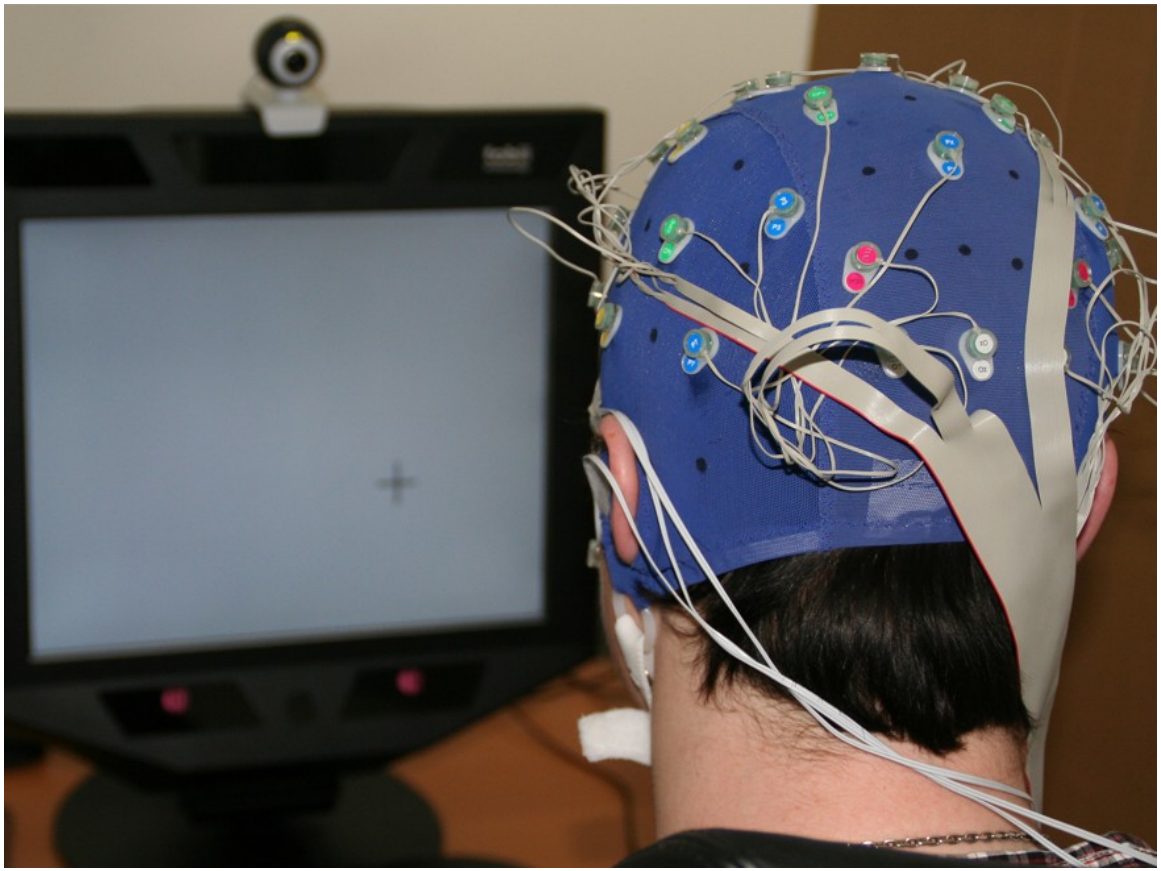
Pro & Con of Psychophysiological Testing

PRO

- Objective
- Covert & continuous recording
- Quantifiable
- Reliable
- Replicable
- High temporal accuracy

CON

- Complicated setup
- Expensive
- Artifact scoring
- Data amount
- Hard to interpret
- Difficult and time-consuming analysis



EEG and Eye Tracker

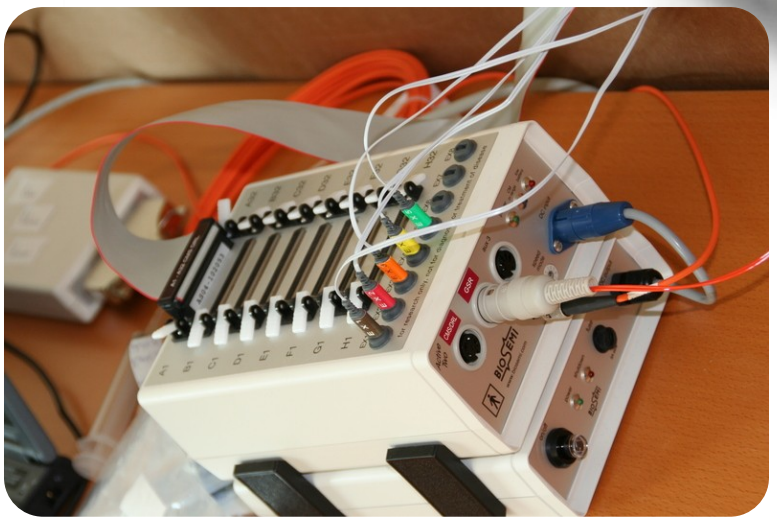
Some Hardware

www.emotiv.com

www.brainfingers.com
www.ocztechnology.com

~ $120

www.biosemi.com



www.neurosky.com

~ $300

www.wilddivine.com

www.emsense.com

www.tobii.com

Biofeedback Gaming

Psychophysiological measurements are used in making adaptive games.

Emotional adaptation, new challenge, interface, virtual social expression.

Future of Psychophysiological Measurements

- Better sensors
  - Cheaper
  - Lighter
  - More sensitive
  - Wireless
  - Long battery life
- Better understanding
  - Correlation between
    - Behavior
    - Physiological response
    - Emotion
  - Long experiment sessions

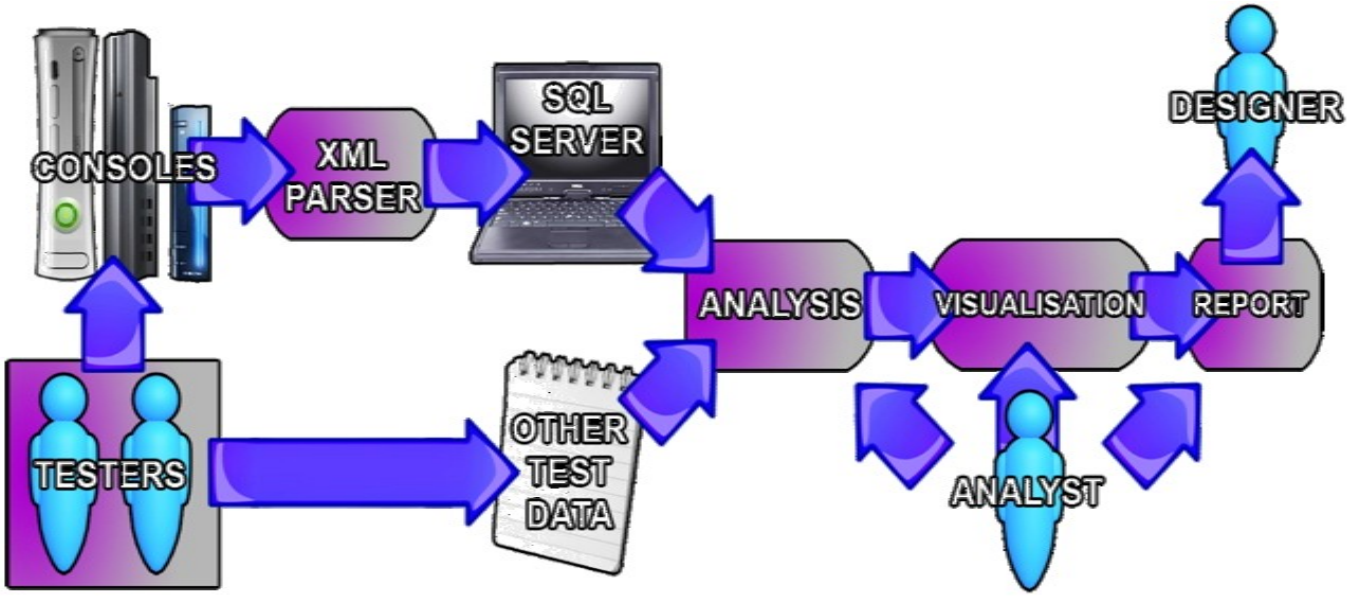
Center for Computer Games Research | THE DANISH DESIGN SCHOOL | DANMARKS DESIGNSKOLE | CRYSTAL DYNAMICS | IO-Interactive | eidos

GAMEPLAY METRICS AND PLAYER EXPERIENCE

Anders Drachen & Alessandro Canossa

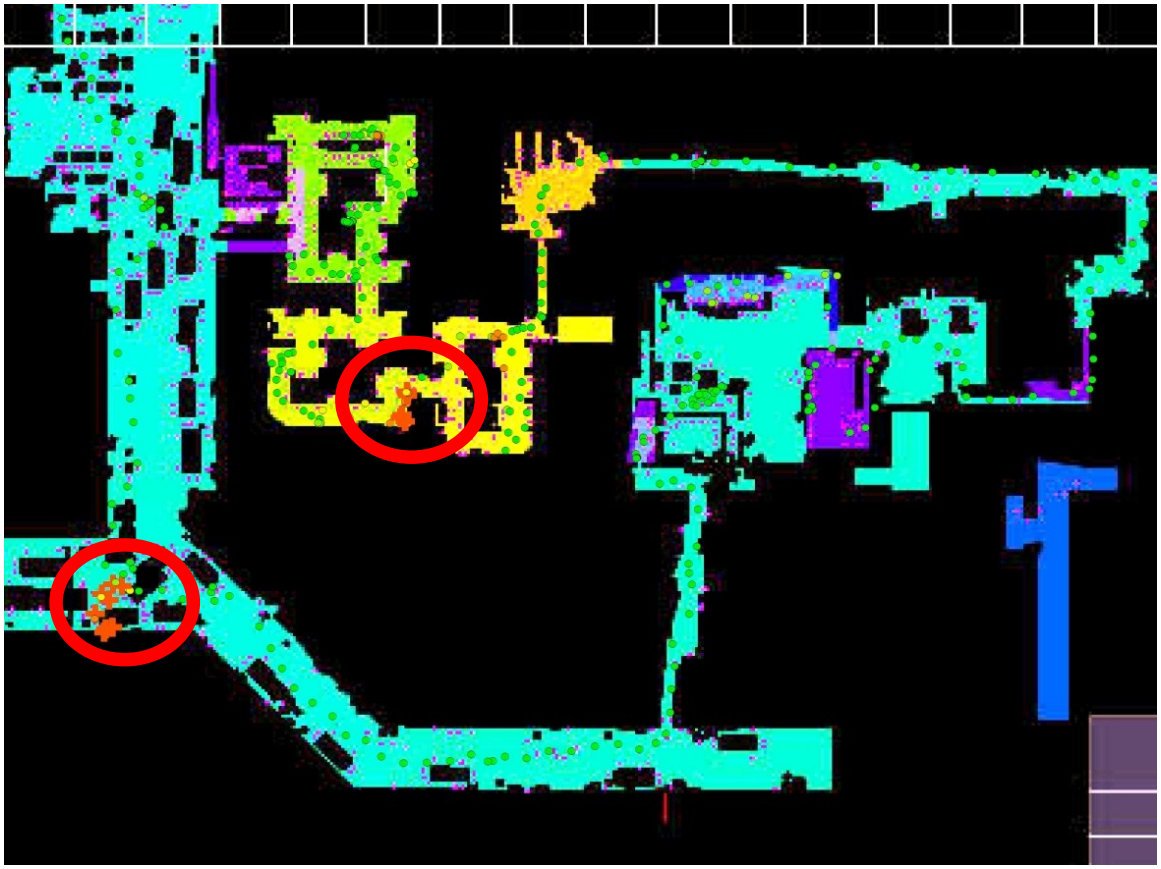
About Gameplay Metrics

- Gameplay metrics are
  - **objective data** about the
  - **behavior of players**
    - within game environments
- Anything recordable in a game engine
- Examples
  - Player movement
  - Firing weapons
  - Interacting with NPCs
  - Interface interaction
  - Game economy behavior ...

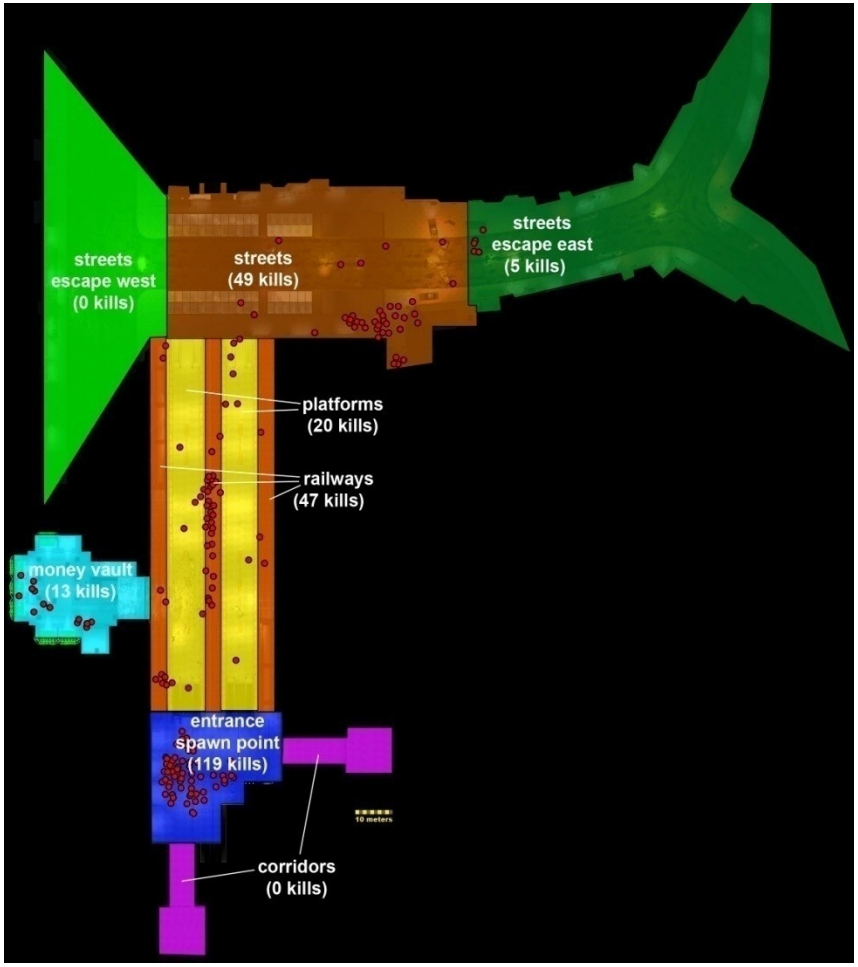


Metrics Collection System

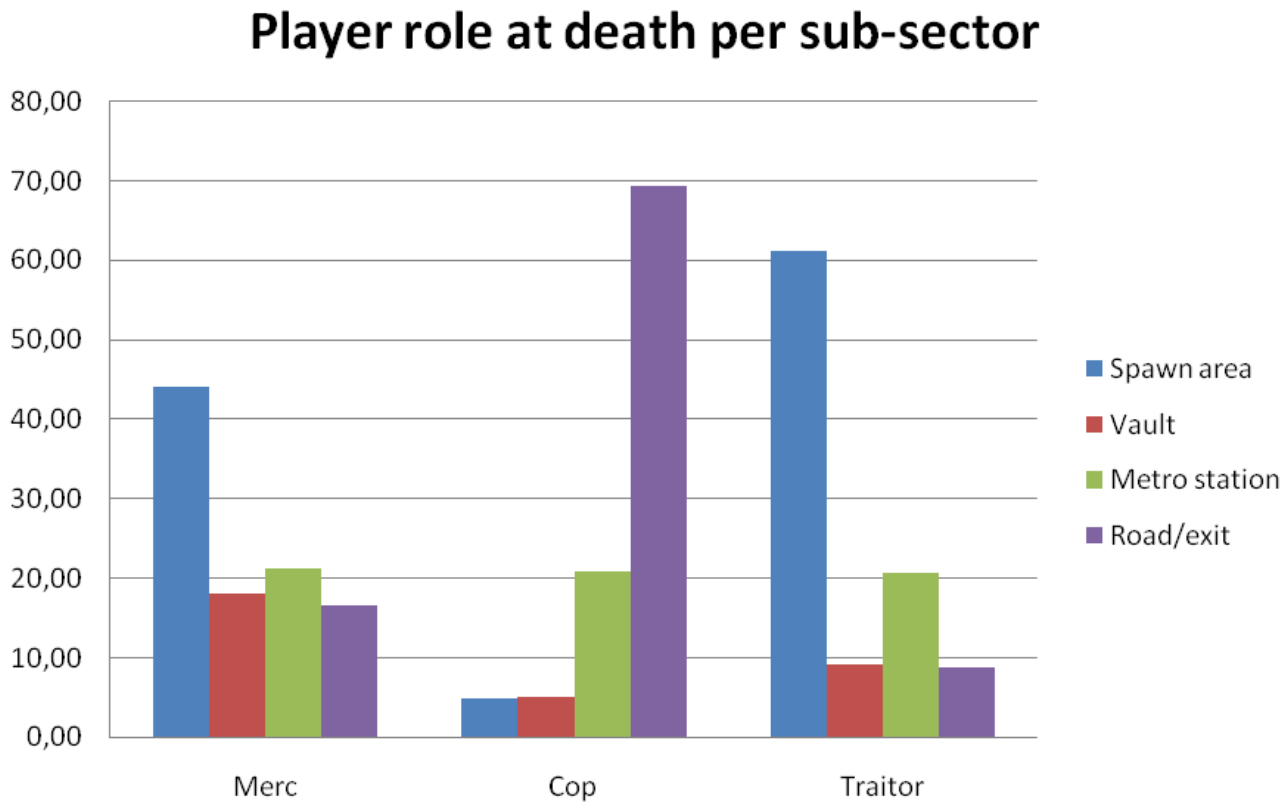
Metrics are collected from games using custom **logging software**



Metrics Example



Metrics Example



Metrics Example

***Pros** of Gameplay Metrics (1)*

- Allow data collection from entire **population** of players
  - not just a **sample**
  - Examples
    - Everyone playing Tomb Raider: Underworld on Xbox Live!
    -  metrics suite has logged data from 1.5+ million players

- Data can be collected in **natural environment** (homes, internet cafés, etc.)
  - No bias of introducing players to laboratory-based studies

***Pros** of Gameplay Metrics (2)*

- Provide highly detailed information about
  - **What players do in the game**

- Permit
  - **linking PXP measures with actual game features**
  - Example
    - Combining GSR with metrics we can show **exactly when in the game players are aroused, and what they were doing at the time**

Cons of Gameplay Metrics

- Cannot provide any **contextual data**
  - Only records information from the specific game software
    - Is player having fun?
    - Is player male or female?
    - Are there other players present?
- Need to be **combined** with other PXP data
  - Provides linkage between
    - User behavior
    - Game experience
  - Examples
    - Surveys
    - Interviews
    - Observations
    - Physiological and Psychophysiological

Gameplay Metrics

- Gameplay metrics highly useful to evaluate game design
  - Do players experience all the content in the game?
  - Do people play the game as we expected?
  - **Adapting games in real-time to the players**
- UX research in games hindered by linking problem
  - PXP
  - Actual player behavior
  - Game itself
- With gameplay metrics this linking problem is overcome

Gameplay Metrics

- Supplement existing methods
- Game industry is investing in metrics-based tracking
- Bolsters user-oriented testing methods
  - **Usability testing**
    - How easy can the users operate the game controls?
  - **Playability testing**
    - Are users having a good playing experience?
  - **Metrics testing**
    - How do the users actually play the game?

FUGA - Fun of Gaming

HTI Human-Technology Interaction

TU/e Technische Universiteit Eindhoven University of Technology

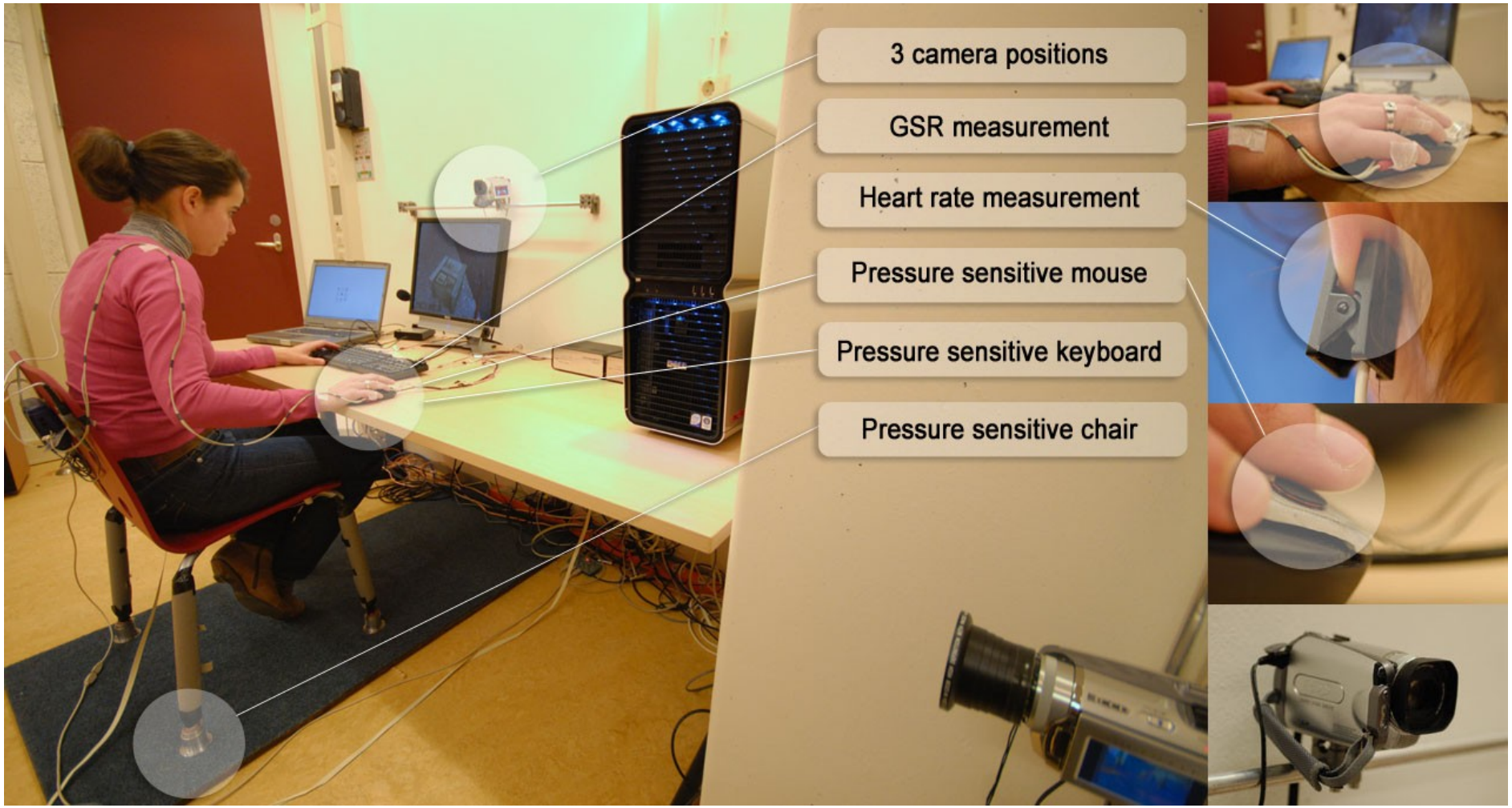
GAME EXPERIENCE LAB

A MULTI-METHOD APPROACH TO MEASURING PLAYER EXPERIENCE

Wouter van den Hoogen & Karolien Poels

Player Experiences are Myriad

Multi Method Approach @ GAME EXPERIENCE LAB



Self-Report and Behavioral Player Experience Measures

- Game Experience Questionnaire (GEQ)
  - important, yet after the fact
  - Subjective self-report measurement
- Observational Coding of Player Behavior
  - Facial expressions
  - Body movement
- Development of Automated Behavioral Measures
  - Explorative
  - Objective
  - Real-time

Game Experience Questionnaire (GEQ)

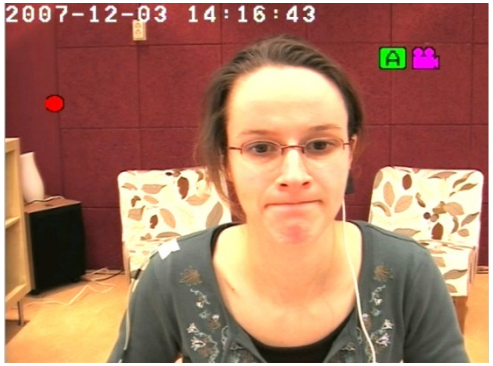
- Broad
- Easily applicable
- Robust
- Agnostic to the type of game, platform, or gamer
- Sensitive to changes in game interface, content and setting
- Reliable
- Valid

GEQ Development & Structure

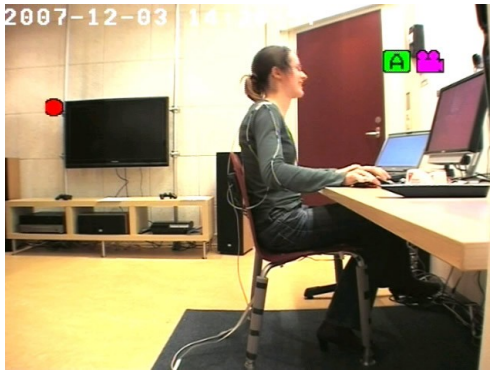
- Development
  - Existing game experience literature
  - Related existing experience questionnaires
  - Conceptualizations of game experience through focus groups
  - Two large scale surveys with factor and scale analysis
- Final Structure (7 components)
  - Immersion
  - Tension
  - Competence
  - Flow
  - Negative affect
  - Challenge
  - Positive affect

Observational Coding of Player Behaviour

- Facial expressions:
  - smile
  - compressing lips



- Body movement:
  - forwards movement
  - backwards movement



- Inter-rater reliability

  only clear expressions and movements were coded

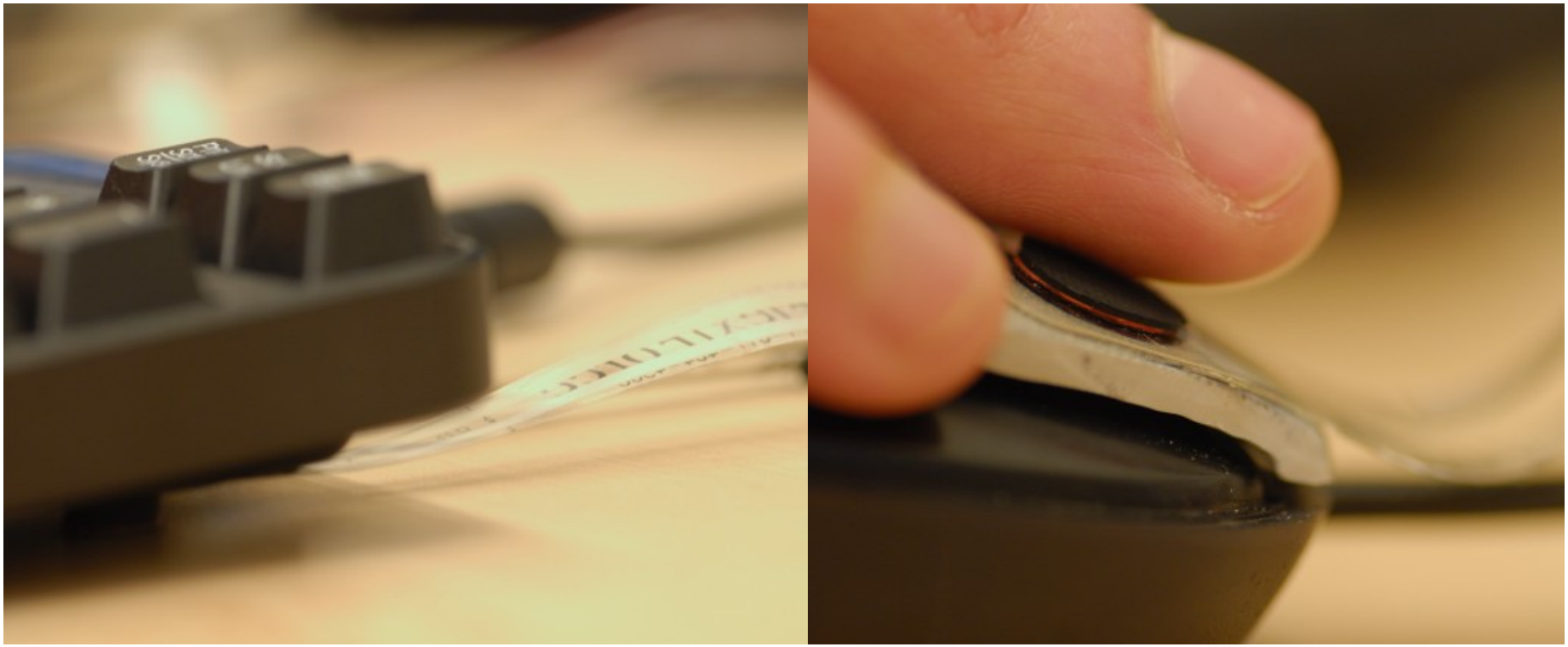
Behavioral Indicators

- Pros
  - natural responses
  - display during game-play (i.e. continuous real time)
  - integrated in game-peripherals (e.g. game-pad)

- Cons
  - Individual differences
    - Button presses
    - Movement intensity

Body Position

Pressure Sensitive Chair



Pressure Sensitive Devices

Keyboard and Mouse

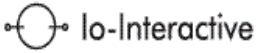
Force on Interface Devices

Conclusions

- Game Experience Questionnaire
  - Reliable, sensitive, and multi-dimensional
  - Long (5 items per dimension)
  - Short (iGEQ, 2 items)

- Behavioral Indicators Indicate Player Experience
  - Correlate with specific experiences
  - Reliable
  - Multiple behaviors show similar relation with self report
  - Intensity of behavior and actions indicative of arousal
  - Related to future game preferences

#thankUX



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