Contemporary Video Game Design.

Challenges in Visualization
Interaction and Simulation

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[Talk. Origins.]

• 2 years (= 3 classes) of teaching game design
  – **40 graduates**: teams of four students make a game from prototype to final product in 14 weeks

• Collaboration on the Design and Programming of the award winning video game **Osmos** (demo to follow)

• Talks, panels, roundtables and blogs

• Many, many years of “**game analysis**”
  – Yes, I play many (video) games 😊
Talk. Motivations in 2D.

[Talk. Rules.]

• Please interrupt me if you like
• Even better: interrupt me if you can educate me on a topic
• This talk is a first
  – I am a structural engineer/architect/computer scientist (= computer graphics researcher) by education
• Ideally I will learn from you
  – While making this as entertaining as I can
Games are about meaningful interaction with and within a dynamic formal system.

Games have rules.

Games have goals.
  - and these goals can be explicit or implicit.
  - or even consist entirely of playful sense-pleasure.

Games (can) contain resources.

Games are abstractions.
[Example. Osmos.]

This is you.

• **Interaction:** mouse clicks + mote collisions
• **Dynamic formal system:** “Newtonian” physics
• **Rules:** absorb smaller motes, etc.
• **Goals:** become the biggest + sense pleasure
• **Resources:** mote size. coupled to propulsion mechanic. arguably the key contribution.
• **Abstractions:** gravitational motion, energy conservation, linear momentum, actio = reactio... etc.
• **Player interaction** should (ideally) be

• **Discernable**
  – Perceive the immediate outcome of player action
  – Sound or visual effect, game state change

• **Integrated**
  – Outcome of action is woven into the game system
  – Long term consequences
  – Actions in earlier stages have far reaching influence

[Rules of Play. Salen and Zimmerman.]
[Digital. Analog.]
• Two forms of interaction in video games
  • Direct interaction
  • Indirect interaction
    – State change. An earlier decision/action has far reaching influence on the dynamic simulation
• Contemporary games have problems simulating direct interaction
  – Instead. state manipulation through abstracted direct interaction
• Discernable actions
  = abstracted direct interaction

• Integrated actions
  = state changes and long term consequences as a result of discernable actions
  – These are generally also simplified/abstracted to make the game tractable and learnable
Abstraction. Why?.

- Ongoing discussion among game designers
- Controller mappings and tactile feedback
  - Example. Motion sensing on Nintendo Wii
- Where this works well.
- Where 1:1 mapping breaks
  - Collision. Absence of feedback.
    Solution. Abstraction (break 1:1 motion of device)
- Games are always abstractions on some levels

[Tetris. Alexey Pajitnov]
• Tetris input and feedback is **discrete**.
  – Many casual players tend to enjoy this kind of play style tremendously.

• Learning the game controls is near trivial.
  – This is not snowboarding. Playing the piano. Etc.

• Mastering the game is hard and rewarding.
  – Balancing the game is difficult.
  – Iteration and rapid prototyping are valuable tools.
[Visual. Abstraction.]
A map of visual iconography
• A map of visual iconography

• Lower left: visual resemblance (e.g. photography)
A map of visual iconography

Lower right: iconic abstraction (e.g. cartooning)
• A map of visual iconography

• Top: picture plane („pure“ abstraction)
• A map of visual iconography

• Far right: from realism to cartoons... words as the next logical step

[Understanding Comics. Scott McCloud]
• A map of visual iconography

• Interesting tool for thinking about comics and games as art

[Understanding Comics. Scott McCloud]
• Areas of game design iconography
Uncanny Valley.

[Bukimi no tani The uncanny valley. Masahiro Mori 1970]
[Uncanny valley. Solved?.]
Uncanny valley. Solved?.
• Still images are continuously improving
  – Just a matter of time. **Potentially solvable.**
• Problem is exacerbated in human animation
  – Motion capture works for film.
    Infeasible for physical interaction in games.
  – Much research effort. **Potentially solvable.**

• **But what about digital interaction?**
[Digital. Development.]

[Rendering.]

[Animation.]

[Interaction.]
Currently, meaningful interaction in photorealistic environments is quasi non-existent.


Notable example. Exploration.
  – Sense-pleasure as a goal is possible.
    Explicit interaction goals other than the most primitive kind are generally absent.

Other Direct interactions?
Indirect interactions/simulations?
[Visual. Interaction. Abstraction.]
[Engineering. Abstraction.]

[World of Goo. Ron Carmel and Kyle Gabler]
[2D to 3D. Abstraction.]

[Shadow Physics. Steve Swink and Scott Anderson]
Success of 2D low DOF games often and mostly attributed to nostalgia.
   — Surely this helps. But...

Reduced DOFs, **Abstraction** and simplicity of control equally important

If the game does not feel right it will not succeed
Games. **Strengths.**

- **Platforms.**
  - Individuals. Authors. Renaissance people.
- **Abstraction of and interaction with and within**
- **Low degrees of freedom input. Large possibility space.**
  - Design is hard. Be challenged. Persevere.
• Data mining
  – Use games as vehicles to explore human behavior. To improve game systems and interfaces.
  – As tools to help guide research. ESP Game.

• Research into game controls + response
  – How many and which degrees of freedom.
  – How many redundant feedback systems.
  – How to meld sense pleasure and explicit goals.
[Visual feedback. Eye candy?..]

• Computer science
• Art
• Cognitive science
  – Intelligence and adaption of game systems.
• Perceptual science
  – Quantify audiovisual feedback mechanisms.
• English / Composition / Drama
• More rich interactions. Interfaces. Mappings.
  – Use time as an additional degree of freedom.
  – Not only binary/analog input devices
• Use of games as educational tools.
• New exploratory and participatory art forms.
• Adaptive games. Adaptive rule sets.