Challenges in Computer Game Research

Jim Whitehead
Some media form academic disciplines

- Fiction
  - English Literature
- Newspapers & magazines
  - Journalism, Communications
- Movies
  - Film Studies, Cinematic Arts
- Television
  - Television Studies, Cinema-Television
- Hypertext/Web
  - Web Engineering, Web Conference, ACM Hypertext

By hans_s, Flickr
http://www.flickr.com/photos/archeon/17009869/
Other media do not

- Telegraph, Telex, Fax
- Telephone, cell phones
- Citizen’s Band radio
- Instant messaging
- Email
- Board games

- These have all been the focus of academic study...
- ... but have not led to the formation of focused academic disciplines
- Why?
Understanding ourselves

- Media that create academic disciplines:
  - Are mass media
  - Tell stories (fiction and nonfiction) that allow us to reflect on the human condition
  - Help us understand ourselves
  - Open up new modes of expression
  - Have both serious and entertainment uses

- Computer games share these traits

- Airport Security, by Persuasive Games
  - www.shockwave.com/gamelanding/airportsecurity.jsp

- Combat Medic Training, America's Army
  - www.americasarmy.com
Research Challenges in Computer Games

- Interactive drama
  - How to create interactive stories where the reader/player has the ability to deeply affect the outcome?

- Game based learning
  - How to use game mechanics, storytelling, and reward systems to teach a wide range of subjects?

- Structure of games
  - Deeply understanding how the various elements of games—rules, mechanics, story, level geometry, reward structures—combine to create a playable experience.
Interactive Drama

- **Potential**
  - Creation of a new storytelling medium...
  - where the **player/reader interacts** with the story...
  - ...and hence is much **more engaged**.

- **Challenges**
  - Computational plot models that permit reasoning about stories
  - Rich conversational agents that have agendas, rich conversation, emotional states, deeply react to events in the plot
  - Authoring tools that make storytelling less complex
  - Computational film directing, placement of cameras, scene length, cuts, etc.
Façade

no, I think it looks fine!

www.interactivestory.net
Need story and character AI

**Plot structure**

- Exposition
- Inciting incident
- Rising action
- Crisis
- Climax
- Falling action
- Denouement

**Characters**

- Personality
- Emotion
- Self motivation
- Change
- Social relationships
- Consistency
- Illusion of life
Façade architecture

Drama Manager (sequences beats)

Bag of beats

Selected beat

Desired value arc(s)

Recognizers

History

Previous action
time

Current story values

Activity not part of a beat

Natural Language Processing

surface text → discourse acts

discourse acts → reactions

ABL agents

Story World

Player

Trip

Grace

EXPRESSIVE INTELLIGENCE STUDIO UC SANTA CRUZ
Game Based Learning

**Potential**
- Tap into the qualities that make games so compelling, to making learning more fun and engaging.
- Deeper understanding via playable simulation.
- Can we improve our nation’s academic performance (and hence long-term competitiveness)?

**Challenges**
- Deeply mapping academic subjects into game mechanics
- On-the-fly adaptation of game levels/puzzles to player’s skill level
- Automatic generation of games, game levels, and game artwork to keep players interested longer, reduce authoring costs
- Evaluating whether games taught transferrable knowledge
Collapsed Structure Rescue

Working with NASA Ames (DART)

AI research: dynamically generating new training scenarios
Understanding the Structure of Games

**Promise**
- Creation of models of how the various elements of a game interact
- Automatic generation of games and game levels
- Ability to apply games in other contexts and predict the outcome
- Creation of strong computer-based game players (better game AI)

**Challenges**
- Modeling how a player reacts to games
- Understanding the design rules inherent in creating game levels
- Understanding how game reward systems are similar/different to existing non-game rewards
- Creating systems that learn the rules of a game, then play the game (general game playing systems)
Modeling Platform Games
Video games: Birth of a new medium

- Games are the cinema of the 21st century

- UC Santa Cruz is moving to become a leader in education and research in this new medium
  - The creation of the first game degree program in the UC system
  - Cutting edge technical and design research in games

- UCSC’s unique interdisciplinary environment makes it a natural home for this work
  - Computer game design is inherently interdisciplinary

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