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● **Research activity @**

Human–Computer Interaction Laboratory
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UA-Games Activity: What we do

- Research, design & develop
  - Universally Accessible Games

- Create new & test
  - Concepts
  - Interaction techniques
  - Methods
  - Software tools
Key Results

- **Method**
  - Unified Design for UA-Games

- **Concept**
  - The Theory of Parallel Game Universes

- **Games**
  - 2-fold role: proofs of concept + case studies
    1. UA-Chess
    2. Access Invaders
    3. Game Over!
    4. Terrestrial Invaders
Universally Accessible Games

- Follow the principles of Design for All
  - can adapt to different individual gamer characteristics

- Can be concurrently played among people with different abilities
  - ideally also while sharing the same computer

- May be played
  - on various hardware and software platforms
  - within alternative environments of use
  - utilizing the currently available device
  - while appropriately interoperating with assistive technology add-ons
Why UA-Games?

- The concept has been proposed to overcome the limitations of previous approaches to game accessibility
- Primarily emphasize game accessibility
  - but also put forward the objective of creating multiplayer games that are concurrently accessible to people with diverse abilities
What is a UA-Game?

- A game that can adapt its interface and content to best serve the requirements of a specific gamer under specific gaming conditions.
Designing UA-Games

1. Design the interactive game space at an abstract level
   ● in a representation-independent way
   ● eliminating all references to the physical-level of interaction

2. Appropriately capture the lower-level design details
   ● incrementally specializing towards the physical level of interaction by addressing particular user characteristics
   ● The direct involvement of several representative end-users (gamers) with diverse characteristics, as well as domain experts (usability, accessibility, gaming, etc.) is required

● Unified Design method
   ● Can represent an open set of alternative physical designs under a common abstract design umbrella
Unified Design Method

1. Abstract task-based game design
2. Polymorphic specialization with design alternatives
3. Appropriateness analysis for the design alternatives
4. Compatibility analysis among design alternatives

5.1 Prototyping
5.2 Usability & accessibility evaluation

User, technical & other requirements

Assess with experts & end-users

"Tunnelway" prototypes

Design Specification

Game programming

Gamasutra Feature article, December 7, 2006
http://www.gamasutra.com/features/20061207/grammenos_01.shtml
The Theory of Parallel Game Universes

- Aims to provide a way for creating multiplayer games where people with diverse abilities can play cooperatively or even against each other

**Basic idea**
- Allow each player to play in a different “game universe” and then somehow project each universe to the other(s)

**Game Universe**
- An instance of the game after it has been adapted to best suit the requirements and needs of a particular gamer playing under particular conditions

PGUs – Example 1

Single player game (X)

Single player game (Y)

Multiplayer game (X ∩ Y)
PGUs – Example 2

Player's A game universe

Player's B game universe
Key Properties - Individualization

Player A  Player B  Player C  Player D

Parallel Game Universes

.......... Game Experience
Key Properties - Balance

Typical unbalanced game

Achieving balance through PGUs

human vs. human or computer

Assistance (by human or AI)

Adapted game content & rules
UA-Games vs. Serious Games

- Serious Games are games that, in a broader sense, “educate”
- 3 key qualities of education are:
  - Individualization
    - of both content & delivery method
      - Learner-centered design
  - Equality
    - All learners have the right to access the same educational content
      - in terms of both quality & quantity
  - Social setting
    - That’s where education works best
- Which are the very same qualities that UA-Games strive for in computer games
The Games....
UA-Chess

- Can be played through a Web browser
- Alternative I/O modalities & interaction techniques
- Customizable player profiles
- Fully accessible through:
  - the mouse
  - the keyboard
  - 1-3 switches
  - speech recognition
- Built-in screen reader
UA-Chess DfA Award

- Nominated for the final jury decision of the European Design for All Awards set by the European Commission in the category “AT/Culture, Leisure and Sport”
Access Invaders

- Accessible remake of the classic Space Invaders game
- Highly customizable
  - Creation & use of unlimited user profiles
- Each game parameter can be adapted based on the player's profile and the current game level
- Multi-player games
  - Unlimited number of concurrent players
  - Each player can be using a different profile
Experimental input techniques

- Musical input
  - e.g., whistling

- Vision-based gesture recognition
  - In cooperation with the Computational Vision and Robotics Laboratory of ICS-FORTH
Game Over!
Because no one can save the Universe...

- The World’s First Universally Inaccessible Game!
- An educational tool for disseminating, understanding and consolidating game accessibility guidelines
- Aims to provide game developers a first-hand (frustrating) experience of how it feels interacting with a game that is not accessible due to the fact that important accessibility design rules were not considered or applied.
- Contains 21 levels, each of which violates a fundamental game accessibility guideline
Packed with accessibility features that can be switched on and off, both off-line and on-the-fly:

- Adjustable game speed
- Adjustable size of all game graphics
- Adjustable FX, music and speech volume
- 2D sound for localizing objects on a 2D plane
- Spatially localised captions using text and / or graphics for visualizing all game sounds
- Reading aloud and automatic scanning of the game menus
- 2 high contrast modes
- 2 alternative types of audio descriptions that verbalise the relative position of game elements
- The option of using simple shapes to render all graphic elements
Can be played using diverse alternative controls and interaction techniques, such as:

- Multiple keyboard keys
  - or switches
- A single key
  - i.e., one-switch game
- The mouse
- By typing keywords
  - e.g., “left” to go left, etc.
- By blowing into a microphone
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