Design:
Internet Technology in Pervasive Games
Mobile and Ubiquitous Games
ICS 163
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Content adapted from:
Pervasive Games: Theory and Design
Experiences on the Boundary between Life and Play
• Supporting Play with Technology
• Giving Technology a Role
• Case Study: Epidemic Menace
• Designing Interactive Artifacts
IT in Pervasive Games

• Supporting Play with Technology
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Using technology in pervasive games has benefits.

It has a cost:
- economic
- time
  - develop
  - deploy
  - test
- risk of failure
IT in Pervasive Games: Supporting Play with Technology

- Technology often suffers from:
  - break downs
  - position inaccuracies
  - network outages
  - network lag

- As a result:
  - You need fall back solutions
IT in Pervasive Games: Technology-Sustained Games

- **Technology-Sustained vs Technology-Supported Games**
  - *-Sustained* means
    - game is executed by technology
    - simulated world is maintained by a computer
    - state is revealed to players through technology
  - *-Supported* means
    - game uses technology
    - “rule-engine” is not fully implemented by tech
    - game may be able to continue in the face of tech failure

- How does this apply to Killer?
IT in Pervasive Games: Technology-Sustained Games

- Supporting communication
  - Between players
  - Between game-masters and players
  - Between computer and players
  - Actual diegetic roles may be different
- Games can be built entirely around communication
  - SpyGames
  - Day of the Figurines
IT in Pervasive Games: Technology-Sustained Games

- Keeping track of score and player activities
  - Sensors
  - Hiding information
  - Passwords
  - QR codes
- Sequencing Tasks
- Game Mastering
Too much technology induces cheating

- impersonal

- the game becomes about beating the technology

- To fix this, use technology to provide rewards rather than restricting actions or assigning penalties
IT in Pervasive Games: Seamful Design

- Seamful design
  - acknowledges that tech always breaks down
  - use it as a design resource rather than a limitation
  - applies to -sustained or -supported
• Seamless design examples

• GPS
  • only works outdoors
  • takes time to lock-on to satellites (5 - 20 minutes)

• Bluetooth takes time to form connections (10-20 sec)

• Kinects have a limited field of view

• Microphones fidelity falls off with distance

• WiFi has a limited range and is attenuated by environs
Seamful design as a resource

- Turn limitations into assets

- "Treasure"
  - Getting coins required GPS
  - Turning in coins required Wifi
  - Being in both GPS and Wifi coverage was a liability
IT in Pervasive Games: Seamful Design
• Seamful design as a resource
  • Incorporate maintenance in a positive way
    • Design technology that clearly displays errors
      • e.g., dot matrix printer in Momentum
• Show the environmental influence on the technology
  • Provide feedback about why technology is failing
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IT in Pervasive Games: Giving Technology a Role

- Technology-supported games
  - technology is made available to improve game context
- Four strategies
  - Gaming Device
  - Diegetic Artifact
  - Body Extensions
  - Environmental Embedding
    - possibly invisible to players
    - possibly a problem with the magician’s curtain
IT in Pervasive Games: Giving Technology a Role

- Giving information a role
  - Technology delivers information
  - What information are you delivering?
    - How does that inform the technology used?
  - Information can be diegetic
  - Information can be meta- or back story
  - Information can be graphical
**Technological Performatives**

- The use of technology impacts the game play

### Effects

<table>
<thead>
<tr>
<th>Hidden</th>
<th>Revealed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secretive</td>
<td>Suspensful</td>
</tr>
<tr>
<td>Magical</td>
<td>Expressive</td>
</tr>
</tbody>
</table>
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IT in Pervasive Games: Epidemic Menace

- **Scenario**
  - Biohazard, pre-zombie, disease epidemic
- **Goal:** Prototype to explore cross-media gaming
- **Game play:**
  - Competitive
  - Technological mediated
    - Augmented Reality
  - Score
  - Whodunnit
IT in Pervasive Games: Epidemic Menace

- Technology
  - Cellular phones
  - Augmented Reality goggles
  - Video Feeds
  - Public displays
- Props
  - Movie sequences
  - Live actors
- Campus/Hospital setting
## IT in Pervasive Games: Epidemic Menace

<table>
<thead>
<tr>
<th>Technology/Device</th>
<th>Amount</th>
<th>Mode of play</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCD touch screen, large (&gt;30&quot;)</td>
<td>2 (1/team)</td>
<td>Stationary players</td>
<td>• Overview 2D map of playing field, main tool of interaction</td>
</tr>
<tr>
<td>PC workstation</td>
<td>2 (1/team)</td>
<td>Stationary players</td>
<td>• Communication</td>
</tr>
<tr>
<td>PC workstation</td>
<td>2</td>
<td>Stationary players</td>
<td>• Observation, access to video streams</td>
</tr>
<tr>
<td>PC workstation</td>
<td>2</td>
<td>Stationary players</td>
<td>• Time count and decision window</td>
</tr>
<tr>
<td>Mobile phone</td>
<td>4 (2/team)</td>
<td>Mobile players</td>
<td>• Anti-virus weapon</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Communication device</td>
</tr>
<tr>
<td>PDA</td>
<td>2 (1/team)</td>
<td>Mobile players</td>
<td>• Positioning</td>
</tr>
<tr>
<td>Augmented Reality system</td>
<td>2 (1/team)</td>
<td>Mobile players</td>
<td>• Augmented reality visual system</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Player can carry another gaming device as well</td>
</tr>
<tr>
<td>Webcams</td>
<td>4</td>
<td>Playing field</td>
<td>• Fixed positions on campus.</td>
</tr>
<tr>
<td>Weather station</td>
<td>1</td>
<td>Playing field</td>
<td>• To influence virus spreading.</td>
</tr>
<tr>
<td>Name</td>
<td>Hardware equipment (per team)</td>
<td>Display resolution</td>
<td>Purpose</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
<td>--------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Stationary control board</td>
<td>Large display (&gt;30&quot;), SMART board interactive overlay, Windows XP workstation, loudspeaker, keyboard</td>
<td>1280 x 1024</td>
<td>Application to observe and control virus behavior.</td>
</tr>
<tr>
<td>Stationary monitors</td>
<td>3 TFT monitors, 3 Windows XP workstations or laptops</td>
<td>1024 x 768</td>
<td>1. Webcam access, 2. Communication, 3. Time count &amp; decisions</td>
</tr>
<tr>
<td>Mobile phone</td>
<td>Sony Ericsson V800</td>
<td>176 x 220</td>
<td>Mobile phone application</td>
</tr>
<tr>
<td>Mobile Augmented Reality system</td>
<td>Shimadzu Data Glass 2/A monocular HMD, Windows XP Laptop in backpack, Intersense InertiaCube, Holux GR-236 GPS-Empfänger</td>
<td>800 x 600</td>
<td>3D virus augmentation outdoors</td>
</tr>
<tr>
<td>Spray system</td>
<td>Bluetooth mouse connected to mobile Augmented Reality system</td>
<td>-</td>
<td>Destroying the virus.</td>
</tr>
<tr>
<td>Spectator website</td>
<td>Windows XP computer with web browser, standard mouse and keyboard</td>
<td>1024 x 768</td>
<td>Watch some aspects of the game.</td>
</tr>
<tr>
<td>Orchestratio n interface</td>
<td>Windows XP workstation, large TFT monitor</td>
<td>1024 x 786</td>
<td>Control board for game masters</td>
</tr>
<tr>
<td>Mobile Positioning system</td>
<td>Windows Mobile 2005 PDA, Holux GPSlim236 GPS receiver</td>
<td>640 x 480</td>
<td>Positioning of mobile players.</td>
</tr>
<tr>
<td>Weather station</td>
<td>Weather station, data available via website</td>
<td>-</td>
<td>Monitor weather conditions that influence virus behavior.</td>
</tr>
</tbody>
</table>
IT in Pervasive Games: Epidemic Menace

- Game play
  - Command Center
    - Strategic
  - Field Workers
    - Tactical
  - Minimal Role-playing
  - T-shirts
  - Device upgrades
  - Hyper-surveillance
  - video feeds shown to other teams
IT in Pervasive Games: Epidemic Menace

• Cross-media gaming
  • vs multi-platform games

• Cross media
  • different interfaces do different things
  • multiple interfaces are typically necessary
  • consider baseball: bat, glove

• Multi-platform
  • different interfaces generally are interchangeable
  • consider tennis: one of many rackets
IT in Pervasive Games: Epidemic Menace

- **Unique elements**
  - Real weather impacted virus spread
    - wind
    - humidity
    - temperature
  - Limited pervasive qualities
    - No social expansion
    - Limited temporal duration
    - Limited spacial expansion
IT in Pervasive Games: Epidemic Menace
Please correspond to the following statements:

It was easy, to use the mobile phone to capture viruses.

It was easy, to use the AR to capture viruses.

It was easy, to use the tablet AR to capture viruses.

It was easy, to use the control screen.

It was easy, to use the communication station.

The devices provided good feedback, I always knew, what I just did in the game.
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Figure 8: Commercial Potential
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Sensors are cheap

- Arduino
- SparkFun

Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists and anyone interested in creating interactive objects or environments.
• Design interaction to fit all play modes in your game
  • Custom built hardware has limited flexibility
• Create consistent aesthetics
  • Aesthetics provide hints about how to play
  • Support style or mood of play
• Provide instantaneous feedback
  • Basic HCI principle to avoid confusion