Opportunistic RF Localization for Next Generation Wireless Devices
June 16-17, 2008
Worcester Polytechnic Institute
Worcester, MA, USA

6/22/2008

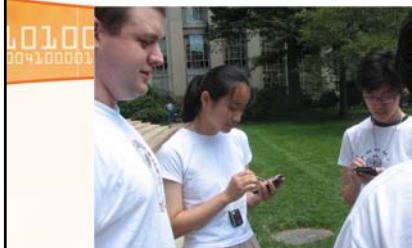# Augmenting Learning

Mobile Simulation Games for Learning

TimeLab 2100

Date: May 3, 2100

Map | People | Items | Docs

Eric Klopfer

MIT Scheller Teacher Education Program

Media Lab

The Education Arcade

http://education.mit.edu/ar

Mobile Games

- *Facilitate a new type of game*
  - *Don't just port big games to the small screen - situate games*
- *Combining **constructivist** and **situated learning** paradigms.*
- *Mobile learning games can be:*
  - *Social*
  - *Authentic and Meaningful*
  - *Connected to the Real World*
  - *Open-Ended/Multiple Pathways*
  - *Intrinsically Motivating*
  - *Filled with Feedback*

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Learning Goals

- *K-16 - **21st Century Skills***
  - *Engage in authentic science*
  - *Foster collaborative learning and communication*
  - *Capitalize on game play motivation*
  - *Solve complex problems with complex solutions*
- *Informal Education*
  - *Encourage deeper and broader interaction*
  - *Connect with real surroundings*
  - *Connect and collaborate with others*
- *Training*
  - *Promote teamwork and collaboration*
  - *Facilitate role playing*
  - *Provide new perspectives on real problems*
  - *Allow safe play*

Augmented Reality

Computer simulation on handheld computer triggered by real world location

- *Combines physical & virtual world contexts*
- *Embeds learners in authentic situations*
- *Engages users in a socially facilitated context*

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Heavy v. Light

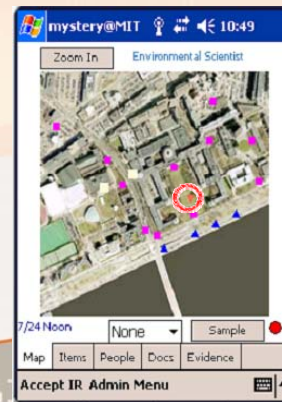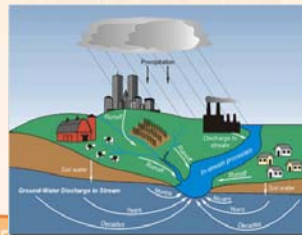- *Imagine that MIT is…*

Contaminated with a Toxin

An Underwater Aquarium

AR: Environmental Detectives

- *First Example - Part of G2T*
- *"Environmental Detectives"*
  - *Players briefed about rash of local **health problems linked to the environment***
  - *Need to determine source of pollution by **drilling sampling wells**, **interviewing virtual witnesses***

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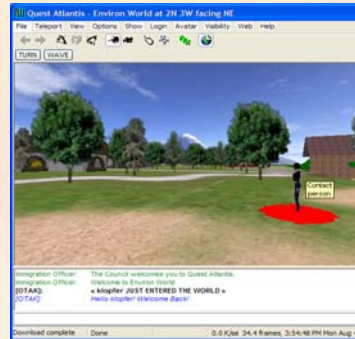Worcester Polytechnic Institute
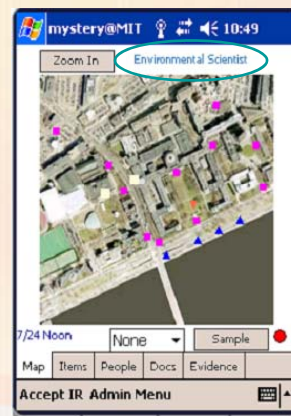Worcester, MA, USA

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Benefits of location basis

VS.

- *We can make multiplayer online games that recreate the locations and problem-solving in AR games, BUT*
- ***Communicating face to face** is different from online.*
- *Ability to **use the environment** differs*
- *Different **criteria are applied** in decision-making*

Outdoor AR: Features

- *Scenarios can include one or multiple player **roles***
- *Participants **interview virtual characters** by walking to their real world location (audio, video, images and text).*
- ***Collect data** from **underlying models** using simulated equipment and gather information from items within the game*
- ***Gates** allow participants in outdoor simulations to enter real buildings.*
- ***Collect evidence** for optional in-game conclusions or to prepare for off-line discussion.*

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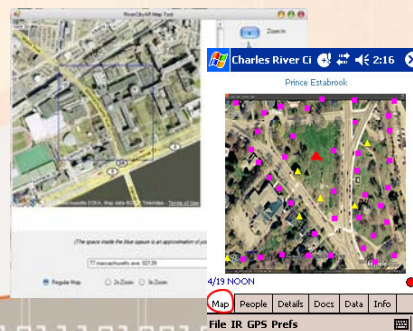Worcester, MA, USA

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Outdoor AR Toolkit

- *Map-based tool*
- *Grab map from Google Maps*
- *Insert into map and GPS coordinates into game*
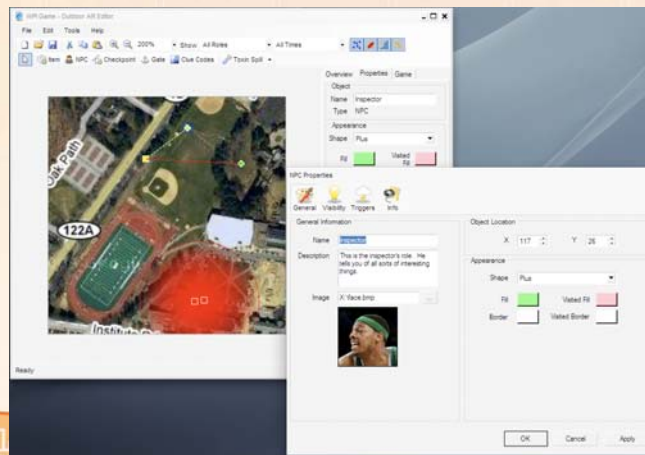
AR Games' Portability & Customization

- **Across wide range of subjects…**
    - **Public Health/Disease Outbreak** *(Charles RiverCity & Avian Bird Flu)*
    - **Forensics** *(Mad City Murder)*
    - **Historical Exploration** *(Battle of Lexington)*
    - **Mathematics** *(Alien Contact)*
    - **Economics** *(Hip-Hop Tycoon)*
- **…across locations**
    - *Local Communities (e.g., geographical tours)*
    - *Schools*
    - *Museums*
    - *Science Centers*
    - *Zoos/Nature Conserves*
- **…and across time**
    - *Beyond normal "class time"*
    - *Over extended period of time*

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Mystery @ The Museum

Analyze

Communicate

Investigate

Decide

Mysterious Game Play

Parents and Kids Collaborating

Fostering Collaboration Through Roles

Collecting Virtual Samples

Using Contextual Information

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POSIT

Game is focused around a single yes/no policy question (fictionalized). For example, "Should we build a biohazard level 4 research facility in our community?"

- *Briefing - Potential biohazard facility in Boston*
- *Roles - Playing realistic roles from scientist to resident*
- *Initial Opinion - Opinions "in role" are registered*
- *Collecting Data - Players collect information from virtual characters, and real artifacts/places*
- *Sharing Opinions - Players share information that they have collected to convince others of their [character's] point of view*
- *Influencing Others and Changing Opinions - Influence key individuals to sway the vote*
- *Final Decision - voting*
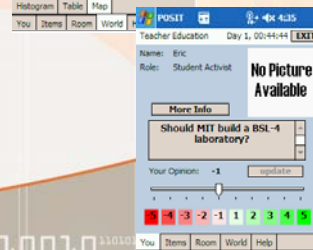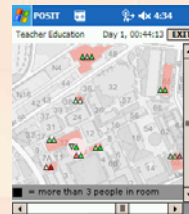
Issues Looking Forward

- *Weather/Seasons*
  - *Need indoor equivalents to outdoor positioning for our partner organizations (zoos, gardens, schools, etc.) to feel comfortable that they can run indoors in event of weather.*

- *Urban Campuses*
  - *Again we need indoor (course scale) positioning when there are more buildings than open spaces to run games.*

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Issues Looking Forward

- *Finer Grain Positioning*
  - *For both indoor and outdoor positioning it would be useful to have finer grained positioning so that we could use objects instead of areas or rooms as our unit.*
  - *But this needs to work without additional infrastructure or setup.*
- *Standardization and Abstraction*
  - *Need to make cross-platform application development and deployment easier.*

Thanks to:
- *US Department of Education and Microsoft iCampus*
- *TEP MEng and UROPs*

- *education@mit.edu*
- *http://education.mit.edu/ar*
- *http://educationarcade.org*