



Virtual Trillium Trail Simulated Ecological Environments for Education

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Motivation:

“Can Simulated Ecological Environments of nature inspire independent exploration, an intrinsic desire to learn and acts of creation for the child?”

1. Virtual Reality and Environment

- PC Virtual Reality feasible with Game Engines
- Data Simulations of Geo-Spatial information
- Known transfer from simulations to real world tasks

2. Real World Situated Learning

- Observations as a volunteer and parent
- Beechwood Nature Camp at the Audubon Society of Western Pennsylvania
- Spontaneous lesson: Food or poison?
- Audubon “Natural Communities” curriculum
- Situated Learning Theory - Lave, 1990
- Theory of Multiple Intelligences - Gardner, 1993
- Informal Learning - Crowley, 2002
- Episodic Memory - Janet Kolodner, 1983

3. Research Question

- Information Science view of direct learning – Gibson, 1979
- Intersection of knowledge acquisition systems, geo-spatial simulations of nature, and child-centric user interfaces.
- Extreme personalization... each child, each experience is unique and a perfect fit.
- Central to this research is the investigation of the interplay of *salience, semantics, emotions, aesthetics and memory*



Our Approach:

1. Sound HCI techniques: Activity Study

- Approached the problem from bottom-up
- What were the Child’s goals?
- How to maintain intrinsic motivation?
- How to support learning as a self directed act?
- How to support independent exploration?
- How to support spontaneous inquiry?
- Facilitate learning, understanding & knowledge acquisition
- Encourage full synthesis, evaluation and creation with microworld activity



2. Design, Prototype, Test and Build Virtual World

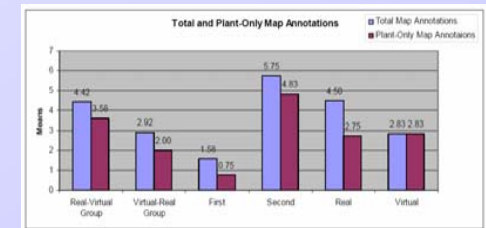
- Built a statistically ecologically accurate, and visually true to life, photo-realistic, 3D computer graphic model of a real environment.
- Study One: Real vs. Virtual
- Study Two: 2x2 ANOVA for visual fidelity and navigational freedom

3. Experimental Methods

- Pre-experimental user profile survey
- Two groups, Real-Virtual and Virtual-Real
- 2x2 ANOVA, counterbalanced design.
- In-situ data gathered by student marking a map for “anything that is personally important”.
- Flowers factual data presented or selected
- Free-choice to stop at anytime.
- Posttest on facts and concepts
- Post-experimental comparison attitudinal survey

4. Results from 2x2 ANOVA

- Real = Virtual (Stronger for Plant Only data)
- Second Experience > First Experience
- Interaction Effects -> “Salamander Effects”
- Transfer of in-situ activity from both Real to Virtual and Virtual to Real
- Subjective survey show Real is better for learning
- Strong correlations between Beauty and Learning
- Microworld activity strong evidence of Learning



Future Research:

Investigate other questions

- Unpack the User Interface Design parameters that impact attention, curiosity, exploration, inquiry, emotions and learning of scientific material and acts of creation for the child.
- An emotional sense of awe and wonder.
- Aesthetics in terms of “Beauty” as User Interface Design factors.

