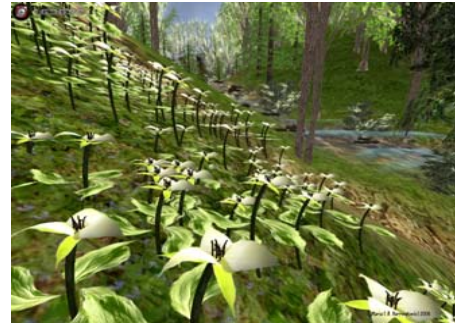


# Trees of Life: Models of Children's Creative Processes



Simulated Ecological Environments for Education (SEEE)

Maria C.R. Harrington

*DIS 2006*

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# Maria C.R. Harrington

Advisor: Dr. Stephen Hirtle

- PhD Student and Teaching Fellow  
School of Information Sciences  
Department of Information Science and Telecommunications  
University of Pittsburgh
- Adjunct Professor for Human Computer Interaction
- Over 10 years of Software Development UI Experience in Finance and C3I
- BS Economics and Art from CMU
- Finished third year in PhD at SIS
- PhD Candidate: Defend next Spring 2007

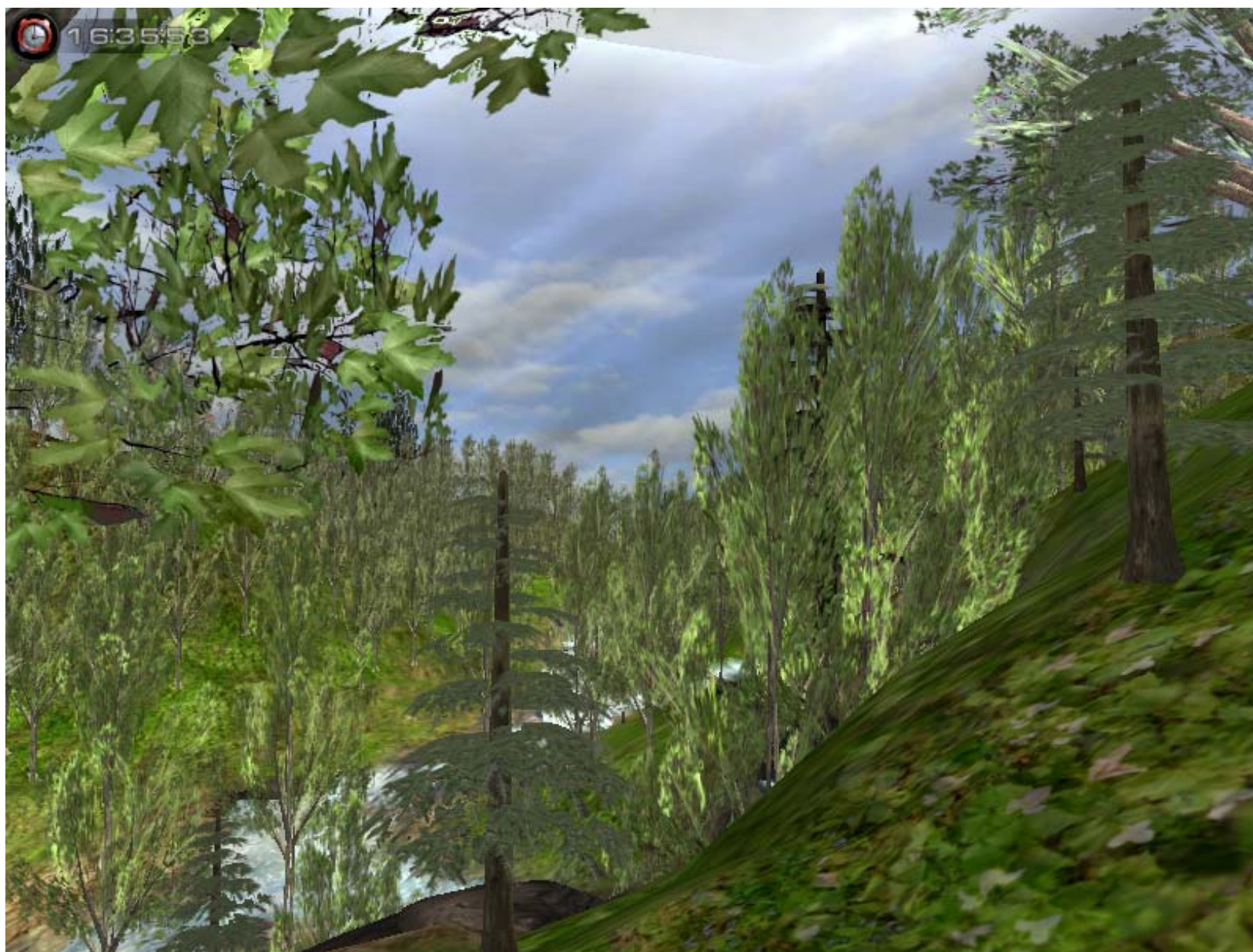
# Simulated Ecological Environments for Education (SEEE)

- Dissertation Topic
  - Research Domain
  - Scientific Questions
- System Design
- Research Design
  - Experiment 1: Qualitative study
  - Experiment 2: Quantitative study
  - Empirical Analysis, Causal Model & Regression Equations
- Framework & Evaluation

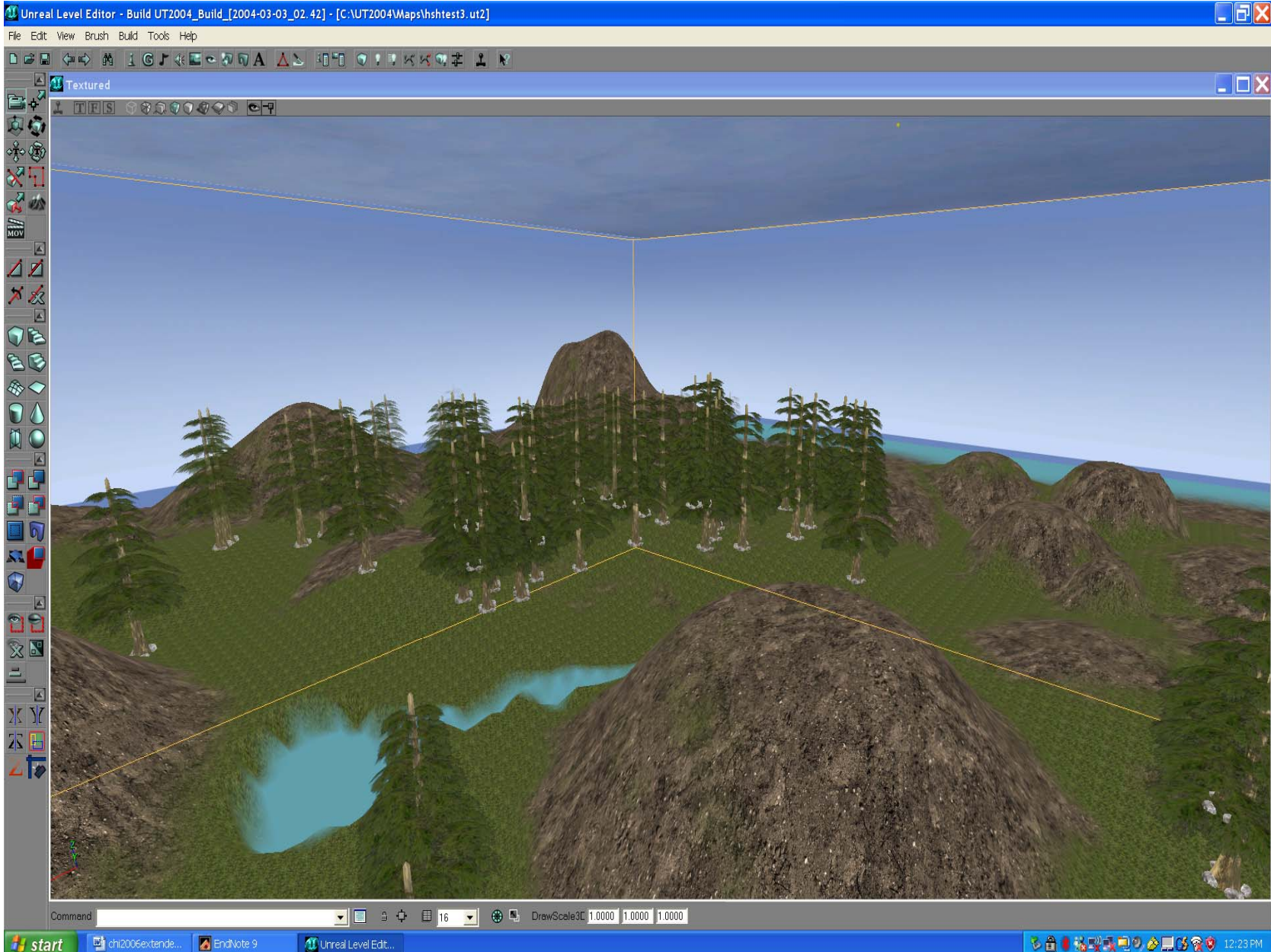
*“Can Simulated Ecological Environments of nature inspire independent exploration, an intrinsic desire to learn and acts of creation for the child?”*





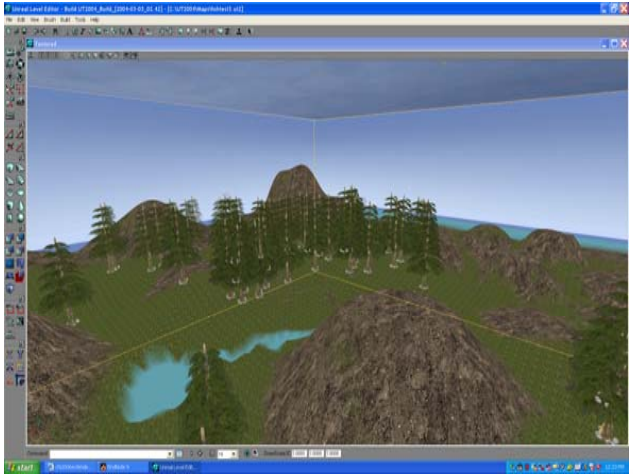
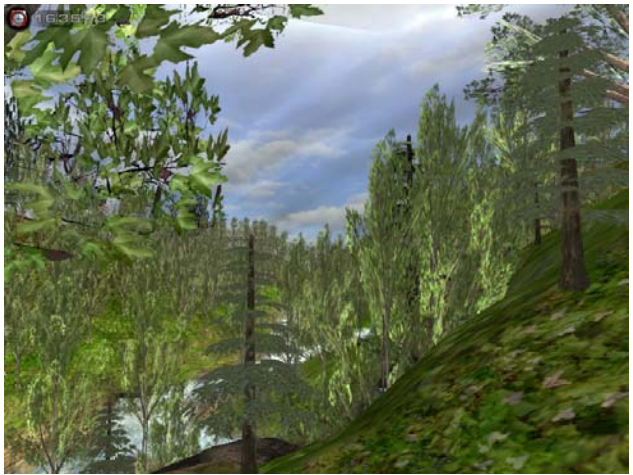






# Experiment 1: Qualitative Study

- 8-10 Subjects
- Counterbalanced and in order
  - VR and then Field Trip
  - Field Trip and then VR
- Pre and post test will be open ended questions





# Research Domain

- Human Computer Interaction
- User Centered Design and Situational Learning
- Spatial Information Theory





# Human Computer Interaction

- New Virtual Environments for Information Retrieval, Knowledge Discovery and Creative Activity
  - Perceptual Ambient Array
    - Real Field Trip or Virtual-Computer Graphics Simulated Field Trip
  - 3DUIs
    - Search, Navigation, Augmentation & Annotations
  - User's Mental Model and Interaction with Knowledge Ontology Imbedded in System
    - Intelligent Tutoring Systems
    - Knowledge Acquisition Systems

# User Centered Design and Situational Learning

- Elementary School Aged Children
- Science Education on Field Trips to Natural Environments
- Creating Individual Records of Meaning



# Spatial Information Theory

- The Role of Context
- Figure / Ground Interaction
- Navigation and Exploration
- Spatial Temporal Impacts on Knowledge Acquisition





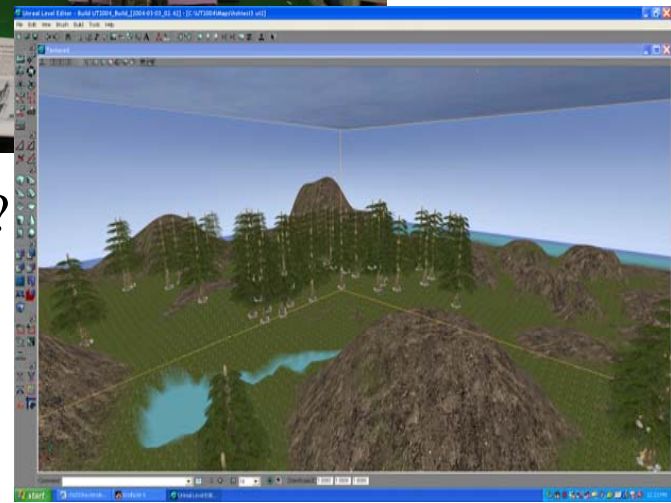


# Social Impact of Research

- How can we **best design** interfaces to virtual and augmented reality technologies to support children in their **independent quests** for **knowledge** and **acts of creation**?

# Prototyping Methods & Iterative Design

- Real World
  - Paper? Clay? Dioramas?
- Game Engines
  - UnReal? GarageGames? Torque?
- On-line
  - Sims? There.com? Secondlife.com?
- Open Source
  - VR Juggler? X3D?OpenGL? ActiveWorlds?





# Open for Investigation

## ■ Context

- **Salience & Semantics Interplay**

## ■ Individual

- **Emotions, Cognitive Ecology & Ambient Array**

## ■ User Interface & Augmentation

- **Intentional Frames of Reference**



# Scientific Questions

## ■ Dissertation Problem

### ■ How to find the HCI Design Parameters?

- Really three computer systems: Virtual Environment, the Knowledge Based System, and the Augmentation Level of a 3DUI.

### ■ Meta-Perception, Awareness & Attention:

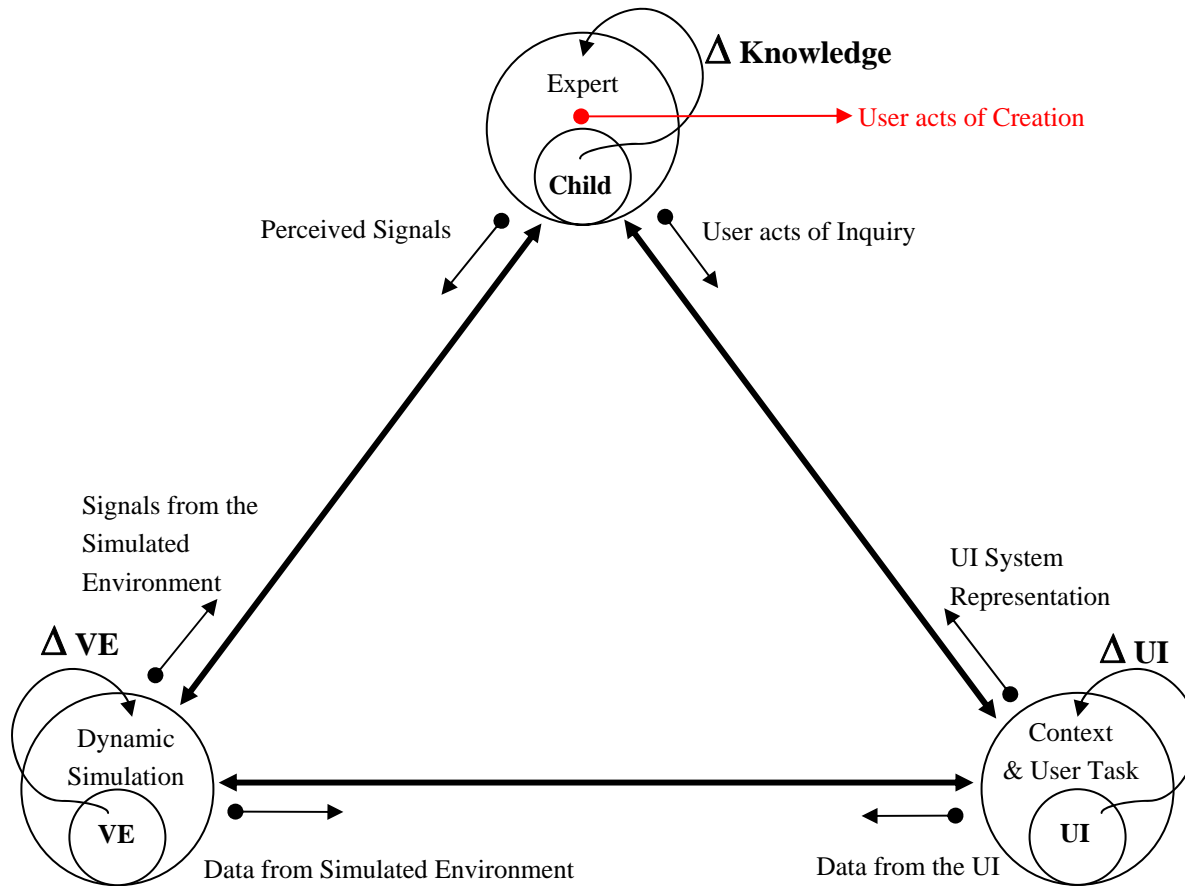
- Interplay of VE & UI
- Postulate that visual fidelity, context, salience, intensity, surprise and visual accuracy all relate to increased attention and curiosity.

### ■ Immediate Exploration & Inquiry:

- Interplay of VE & UI
- Postulate that for each individual there is a key moment where they want to know, is interested in inquiry, and they need to have the freedom to investigate unrestrained for maximum impact.

# Framework

## The SEEE Tripartite Model



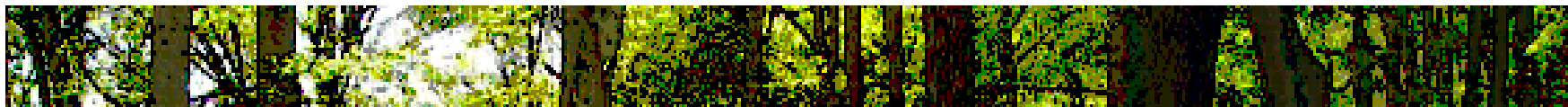
# In Conclusion

- This research is intended to help us understand the context, factors, and variables in HCI Research and Design for Learning in Virtual Environments.
  - Sense of Awe and Wonder
  - Interplay of Signals, Salience and Choice
  - Interconnection of Dynamics within a Framework





# Questions?



**Maria C.R. Harrington**

University of Pittsburgh

School of Information Sciences

135 North Bellefield Avenue

Pittsburgh, PA 15260

Email: [mharring@pitt.edu](mailto:mharring@pitt.edu)

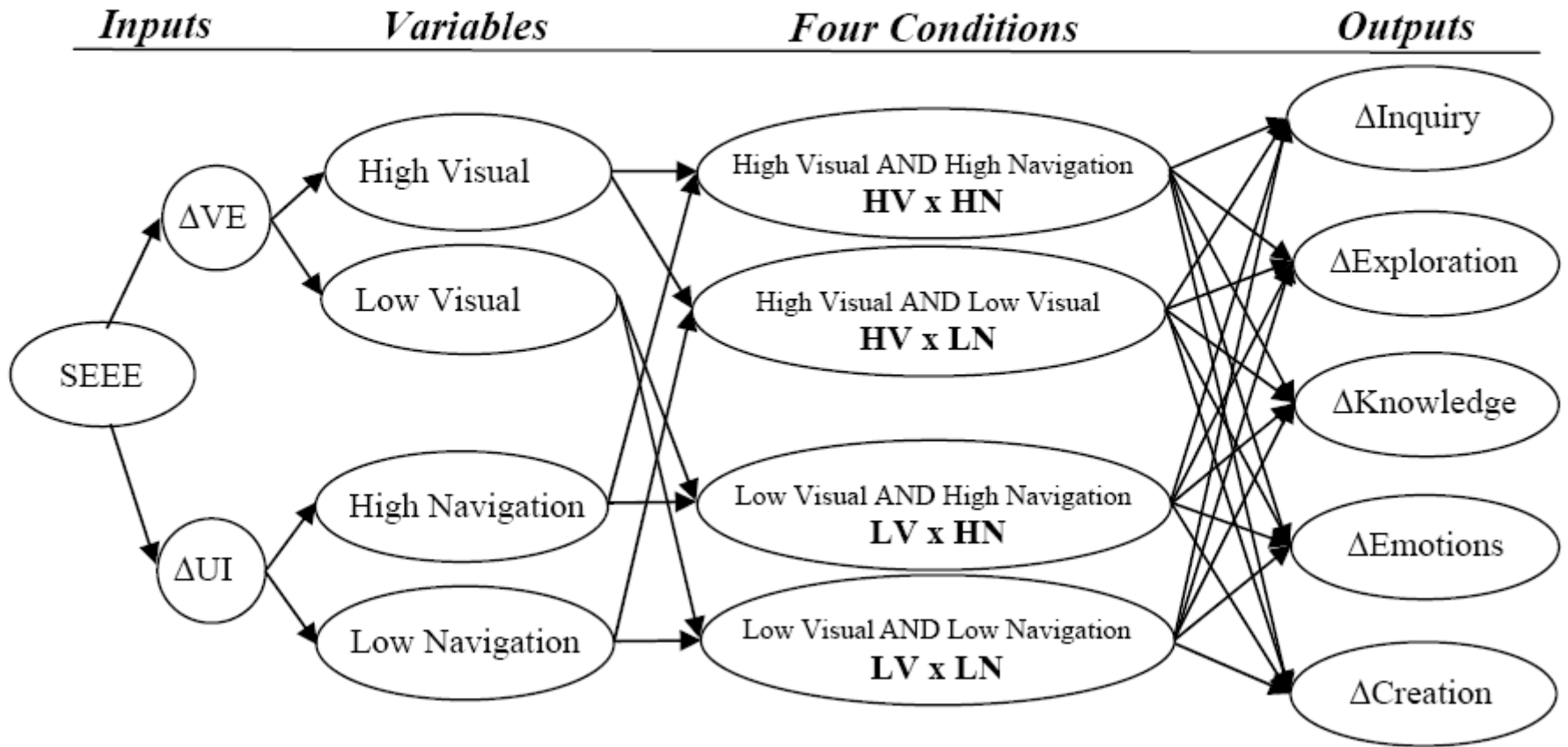
Web: <http://www2.sis.pitt.edu/~mariah/phd/research.html>

# Causal Factors in Acts of Creation

- How to start to explore a new space, virtual or real?
- A powerful emotional experience?
- Skill and knowledge level can influence perception, as well as the speed and the quality of execution.
- Tools and technology can augment the environment, by making it more conducive for creation, and the process, by making it more efficient or richer in meaning.

# Causal Model?

## The SEEE Causal Model

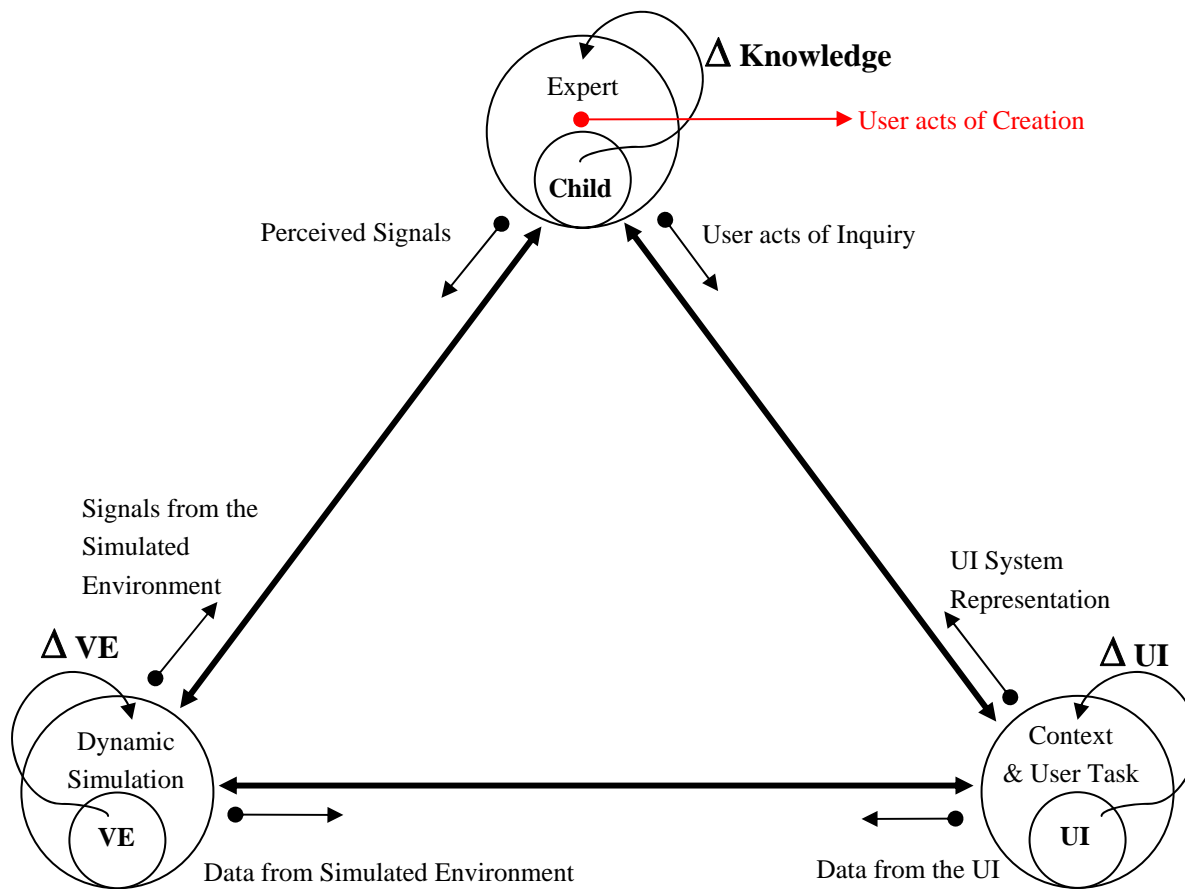


# The Problem

- How to design a virtual space that will **inspire a sense of awe and wonder**?
- What UI **triggers** can be designed for knowledge seeking and complex problem solving behavior.
- How to best **measure scientific inquiry**? Yet more challenging still, is the task of how to best measure **acts of creations** that are meaningful and valued.

# Framework

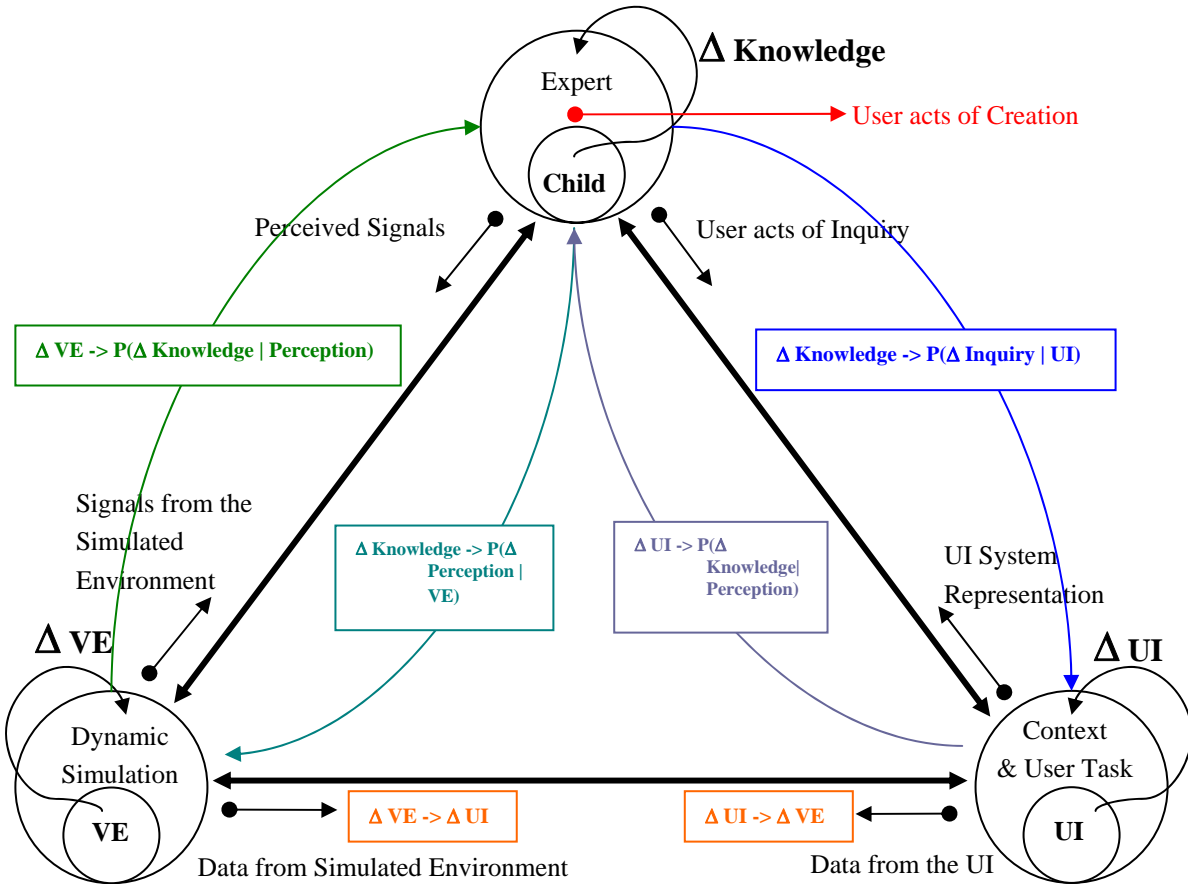
## The SEEE Tripartite Model





# Dynamic Framework?

## The SEEE Tripartite Model





# Framework Relationships?

$\Delta$  VE  $\rightarrow$  P( $\Delta$  Knowledge | Perception)

$\Delta$  UI  $\rightarrow$  P( $\Delta$  Knowledge | Perception)

$\Delta$  Knowledge  $\rightarrow$  P( $\Delta$  Perception | VE)

$\Delta$  Knowledge  $\rightarrow$  P( $\Delta$  Inquiry | UI)

$\Delta$  Knowledge  $\rightarrow$  P( $\Delta$  Creation | ((UI) & (VE)))