SITUATED SYLLABUS

VR emphasizes the relationship between participant and environment. Theories which recognize that content and context are inextricably interrelated (intertwingled) are called *situated*. In AI, it's called situated automata; in industrial engineering, it's ecological psychology; in mathematics, it's general systems; in psychology, its Gestalt.

In traditional classes, what you are expected to learn is defined ahead of time. In this class, we will respond to events dynamically. This is called *situated learning*. The theory is that the dynamic context impacts what and how we learn. As a consequence, the syllabus will change dynamically over time, in response to class needs and evolving understandings.

In VR, you enter first into a void; you then load a constructed database that is the world. In physical reality, you are born into a world that is already full. The difference is that VR demands active participation, inside and out. VR emphasizes *constructivism*, the theory that mind and body coparticipate to construct our experience of reality. In education, constructivism says that students build their own understanding through experience. This means that students must actively engage in and work with the subject matter, and that will be the general rule for this class. It also means that each student will construct an essentially different understanding of VR. In VR software terms, we all live in divergent realities.

Finally, the essence of VR is direct interaction with information. Right now, universities use a *symbolic mediation* strategy almost exclusively. To learn something, we translate it into what it is not (symbols), study the symbols (words, formulae, programs), then reconstruct the something. In this class, we will attempt to engage in direct learning by constantly anchoring the symbols we use with the reality they refer to.

Virtual World Development is a graduate seminar. Class grading will be based on individual understanding, participation, and growth. You will be required to attend class and to develop or improve a skill related to the design and construction of virtual worlds. Each student will probably develop a different skill, at a different rate, with different criteria of success.

Students who are concerned about this approach to teaching should meet with the instructor. An option of individual performance contracts is available.

POSSIBLE CONTENT (no particular order, not necessarily complete):

VR software architectures and functionalities

VR varieties and taxonomies

Theory of Inclusion

Systems oriented programming
- parallelism
- modularity
- partitioning

Situated agents (entities)
- reactivity and responsiveness
- dramatic theory
- embedded narrative
- dispositions
- autonomy

Building virtual worlds
- software tools
  - CAD
  - dynamics
  - animation
  - scientific visualization
- techniques
  - enumeration
  - decomposition
  - CSG
  - boundary models
  - sweeps
- design
  - participation who/what/why
  - physiological constraints
  - tight coupling

Display
- rendering choices
- adaptive refinement
- viewpoint control, navigation

Abstraction
- varieties of space
- networks
- form abstraction
- application specific construction kits
- semantics

Computation
- pattern matching
- constraints and possibility spaces
- inference
- history and statistics
- resource management
- editors
- molecular programming

Inclusive tools
- cursors
- backdrops and foredrops
- virtual body
- wand
- inhabitation
- artificial life

Multiple participation
- inconsistency maintenance
- uniqueness
- negotiation

Experiential mathematics
- logic blocks
- boundary mathematics
- spatial algebra

Teleoperation and telepresence
- presence
- out-of-body experience
- physical and sensory extension

Physiological modeling
- sensory models
- physical constraints
- plasticity

Cognitive modeling
- information processing
- gestalt
- situated intelligence

PROJECTS

Each student is expected to contribute to our state of knowledge about VR. Projects document this contribution. Project work will be presented to the class, so that the class can review the work. This list is suggestive:

Virtual World Development

Design and/or build a VR tool
- wand
- physiological model
- virtual body
- virtual community
- editor for entities
- form abstraction
- logic blocks
- mapping tools
- projection tools
- navigation tools
- divergent worlds
- conversational programming
- music

Research and design a VR language
- behavioral modeling
- construction from inside VR
- algebraic specifications
- gesture languages
- virtual machines
- sound

Write and publish a VR article
- VEOS
- entities
- social implications

Develop VR operating system tools
- FERN
- Linda
- device drivers
- graphics drivers
- world building maintenance tools
- UM

Explore an important VR issue
- access
- cognitive plasticity
- ecstasy machines
- cultural bias
- ownership and legalities
- philosophy and metaphysics

TEXTS

No text is required for this class. Readings and references will be provided by the instructor as appropriate. Some good general (popular) books on VR include:

Aukstakalnis, S., & Blatner, D. (1992). Silicon Mirage: The Art & Science of Virtual Reality. Berkeley, CA: Peachpit Press.

Rheingold, H. (1992). Virtual Reality: The Revolutionary Technology of Computer-Generated Artificial Worlds - & How It Promises to Transform Society. New York, NY: Simon & Schuster Trade.

Ellis, S.R. (ed.). (1991).Pictorial Communication in Virtual and Real Environments. London: Taylor & Francis.

Benedikt, M.L.(ed.). (1991). Cyberspace: First Steps. Cambridge, MA: MIT Press.

Woolley, B. (1992). Virtual Worlds: A Journey in Hype and Hyperreality. Oxford, UK: Blackwell Publishers.

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