Wisdom is not the product of schooling but the lifelong attempt to acquire it.
- Albert Einstein

The Envisionment and Discovery Collaboratory (EDC)
__
A Specific Example of the Integration between Technology, Arts and Media”

Ernesto Arias & Gerhard Fischer
and
Andy Gorman, Rogerio de Paula & Eric Scharff

ATLAS TAM Course, Spring 2000 — January 31
The Research Goals and Objectives behind the EDC

http://www.cs.colorado.edu/~l3d/systems/EDC

• creating shared understanding through collaborative design
  - symmetry of ignorance, mutual competence, and breakdowns as sources of opportunity

• integration of physical and computational environments
  - hardware: electronic whiteboards, crickets
  - software: AgentSheets, Dynasites
  - beyond the screen: immersive environments

• support for reflection-in-action
  - action space: AgentSheets, Visual AgenTalk,
  - reflection space: Dynasites
  - critics and usage data, preferences linking the two spaces

• open system — seeding, evolutionary growth, reseeding (SER) process model

• words in this color ➔ go to:
  http://Seed.cs.colorado.edu/dynagloss.MakeGlossaryPage.fcgi
Transcending the Individual Human Mind—
Creating Shared Understanding through Collaborative Design

transcending the individual human mind → why conveys Rodin’s “Thinker” the wrong image?

claims from our paper:
complex design problems require more knowledge than any single person possesses because the knowledge relevant to a problem is usually distributed among stakeholders. Bringing different and often controversial points of view together to create a shared understanding among these stakeholders can lead to new insights, new ideas, and new artifacts. New media that allow owners of problems to contribute to framing and resolving complex design problems can extend the power of the individual human mind.

the vision behind the EDC:
- shifts future development away from the computer as the focal point
- emphasis that tries to improve our understanding of the human, social, and cultural system that creates the context for use
- conceptual principles:
  * creating shared understanding among various stakeholders
  * contextualizing information to the task at hand
  * creating objects-to-think-with in collaborative design activities
The Architecture of the EDC

Domain-Independent Architecture

EDC

Application Domains

Spaces for Learning

Urban Planning

Specific Applications

L3D Lab

DLC

Boulder

Your City
Characterization and Research Activities in the Action Space

<table>
<thead>
<tr>
<th>Level</th>
<th>Technology Used</th>
<th>Research Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hardware</strong></td>
<td>Touch-sensitive SMART Board 360; computationally enriched physical objects</td>
<td>recognize the physical construction; turn physical objects into computational entities</td>
</tr>
<tr>
<td><strong>Software and End-User Modifiability</strong></td>
<td>AgentSheets simulation environment and Visual AgenTalk</td>
<td>extend domain models, visualize outcomes, create and utilize critics</td>
</tr>
<tr>
<td><strong>Linkage to the Reflection Space</strong></td>
<td>critics</td>
<td>recognize breakdowns, contextualize information</td>
</tr>
</tbody>
</table>
## Characterization and Research Activities in the Reflection Space

<table>
<thead>
<tr>
<th>Level</th>
<th>Technology Used</th>
<th>Research Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>rear-projection white-board SMART Board 720</td>
<td>multi-model interaction techniques</td>
</tr>
<tr>
<td>Software and End-user Modifiability</td>
<td>DynaSites — a substrate for dynamic, evolvable, Web-based information spaces</td>
<td>encourage user participation and evolution of information over time</td>
</tr>
<tr>
<td>Linkage to the Action Space</td>
<td>priority specification, maps, previous constructions, questionnaires</td>
<td>make the linkage mechanisms end-user modifiable</td>
</tr>
</tbody>
</table>
# The Strength and Weaknesses of Physical Media

<table>
<thead>
<tr>
<th>Strengths of Physical Media</th>
<th>Weaknesses of Physical Media</th>
</tr>
</thead>
<tbody>
<tr>
<td>direct, naive manipulability</td>
<td>models are passive; incapable of changing representation without intervention by users</td>
</tr>
<tr>
<td>intuitive understanding</td>
<td>behavior cannot be associated with physical objects</td>
</tr>
<tr>
<td>tactile interaction</td>
<td>no support for simulation and critiquing</td>
</tr>
<tr>
<td>mediation of communication and</td>
<td>feedback on the consequences of a decision is not provided</td>
</tr>
<tr>
<td>social interaction</td>
<td></td>
</tr>
<tr>
<td>relative high fidelity to reality</td>
<td>fidelity to reality is limited due to problems such as scaling</td>
</tr>
<tr>
<td>looking provides valuable information</td>
<td>no support for management of large amounts of information</td>
</tr>
</tbody>
</table>
Embedding Communication in Design Activities

Computer stores the artifact

Computer mediates design and communication
Meta-Design Aspects in the EDC: Closed versus Open Systems

• **user control:**
  - end-user modifiability (modification and programming by users)
  - conviviality (independence of high-tech scribes)
  - ownership (putting owner of problems in charge)

• **example for a closed system: SimCity** — too much crime
  - solution supported: build more police stations (fight crime)
  - solution *not* supported: increase social services, improve education (prevent crime)

• **important goal of EDC:** create end-user modifiable versions of SimCity
  - background knowledge can never be completely articulated
  - the world changes
## Closed versus Open Systems: SimCity™ versus EDC

<table>
<thead>
<tr>
<th>Issue</th>
<th>SimCity™</th>
<th>Research Problems of Open Systems Explored in the EDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>user-directedness, openness of systems</td>
<td>rich construction mechanisms, simulation is a “black” box</td>
<td>rich construction + end-user modification of model and behavior</td>
</tr>
<tr>
<td>contextualized information</td>
<td>no support for task-based indexing or reflection-in-action</td>
<td>linking of action and reflections with user-defined critics</td>
</tr>
<tr>
<td>engagement / motivation</td>
<td>game engaging but limited in modeling users’ own situations</td>
<td>owners of problems are in charge, and engage in self-directed activities</td>
</tr>
<tr>
<td>collaboration</td>
<td>multi-user version restricted to mayoral decisions and voting</td>
<td>ability to share argumentation and simulation components</td>
</tr>
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