Center for
**LifeLong
Learning
& Design**
University of Colorado at Boulder

**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"

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and
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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
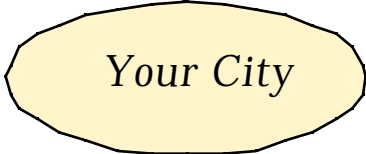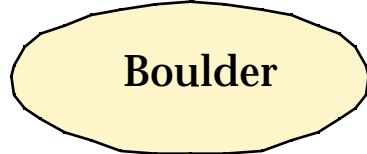
The Architecture of the EDC

Domain-Independent Architecture
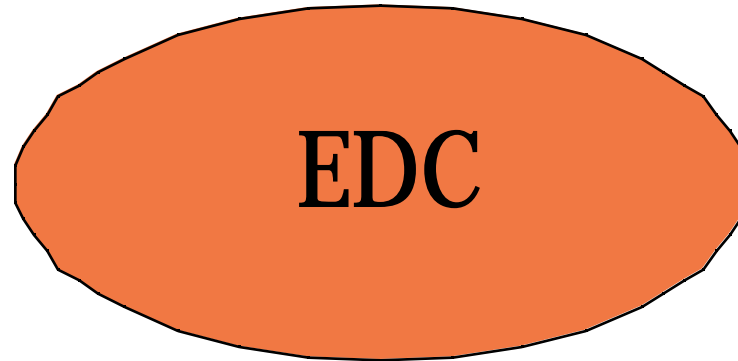
EDC

Application Domains

Spaces for Learning

Urban Planning

Specific Applications

L3D Lab

DLC

Boulder

Your City

Characterization and Research Activities in the Action Space

| Level	Technology Used	Research Problems
Hardware	Touch-sensitive SMART Board 360; computationally enriched physical objects	recognize the physical construction; turn physical objects into computational entities
Software and End-User Modifiability	AgentSheets simulation environment and Visual AgenTalk	extend domain models, visualize outcomes, create and utilize critics
Linkage to the Reflection Space	critics	recognize breakdowns, contextualize information

Characterization and Research Activities in the Reflection Space

Level	Technology Used	Research Problems
Hardware	rear-projection white-board SMART Board 720	multi-model interaction techniques
Software and End-user Modifiability	DynaSites — a substrate for dynamic, evolvable, Web-based information spaces	encourage user participation and evolution of information over time
Linkage to the Action Space	priority specification, maps, previous constructions, questionnaires	make the linkage mechanisms end-user modifiable

The Strength and Weaknesses of Physical Media

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

Embedding Communication in Design Activities

Designing

Communicating

Computer stores
the artifact

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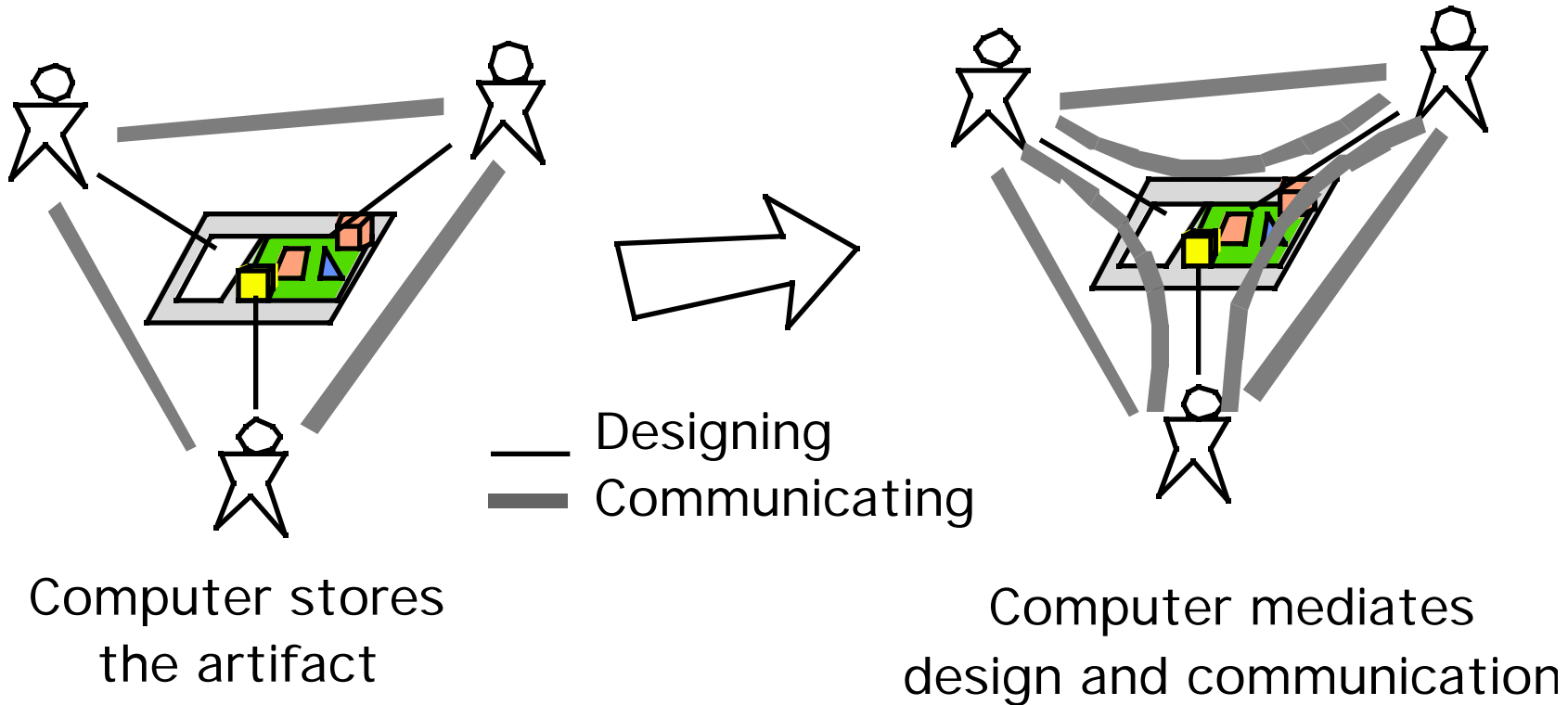
Meta-Design Aspects in the EDC: Closed versus Open Systems

- **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

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