

week

14



Evaluating TUIs

Approaches for novel interfaces

Lecture Outline

- Quantitative evaluation of TUIs: Pico [Patten & Ishii, 2007]
- Multiple and heterogeneous interpretations [Sengers & Gaver, 2006]
- Research through design [Zimmerman et al., 2007]
- More examples

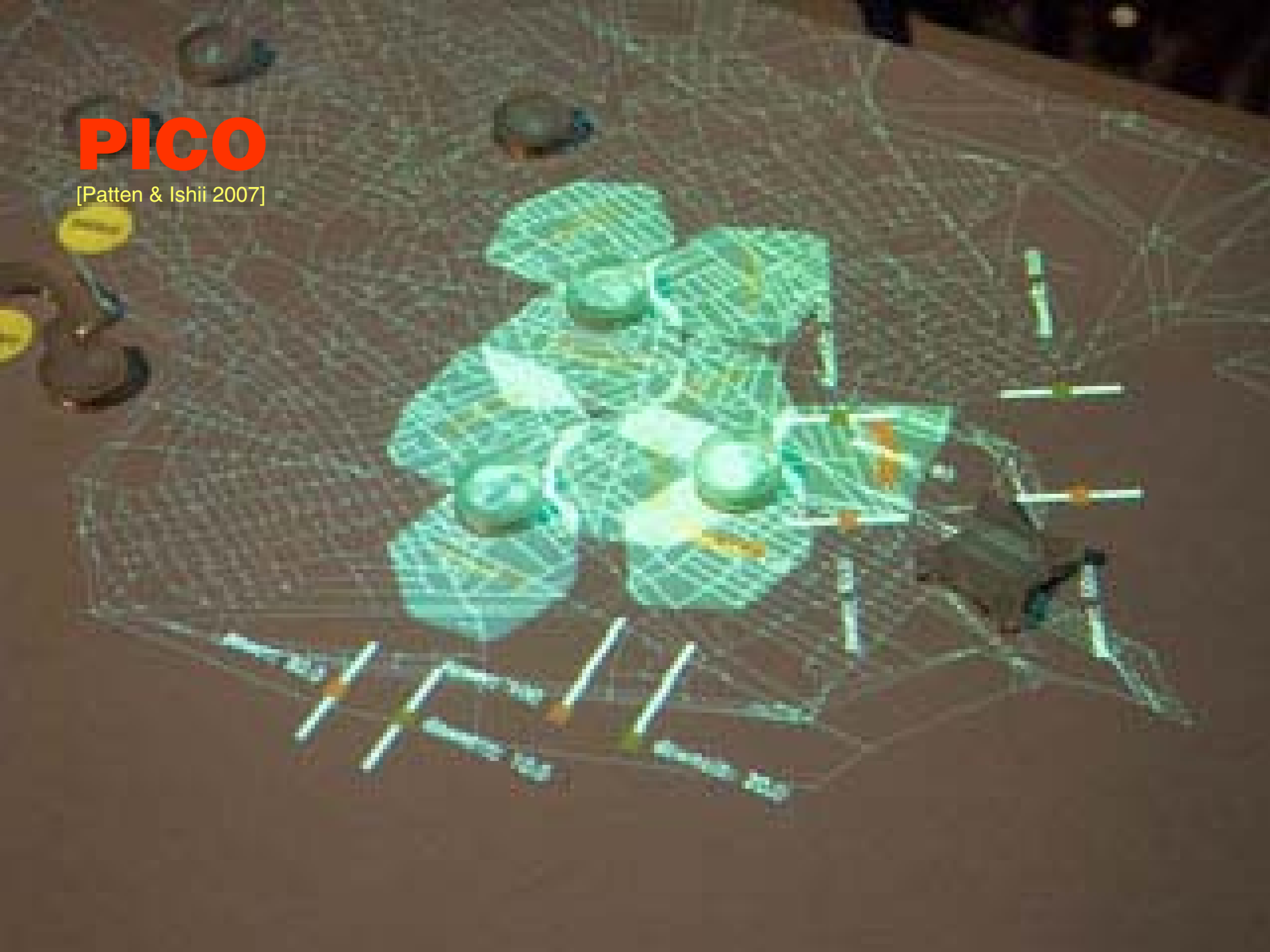
Evaluating Tangibility

Studies of TUI in the cellphone tower placement task

[Patten and Ishii, 2007]

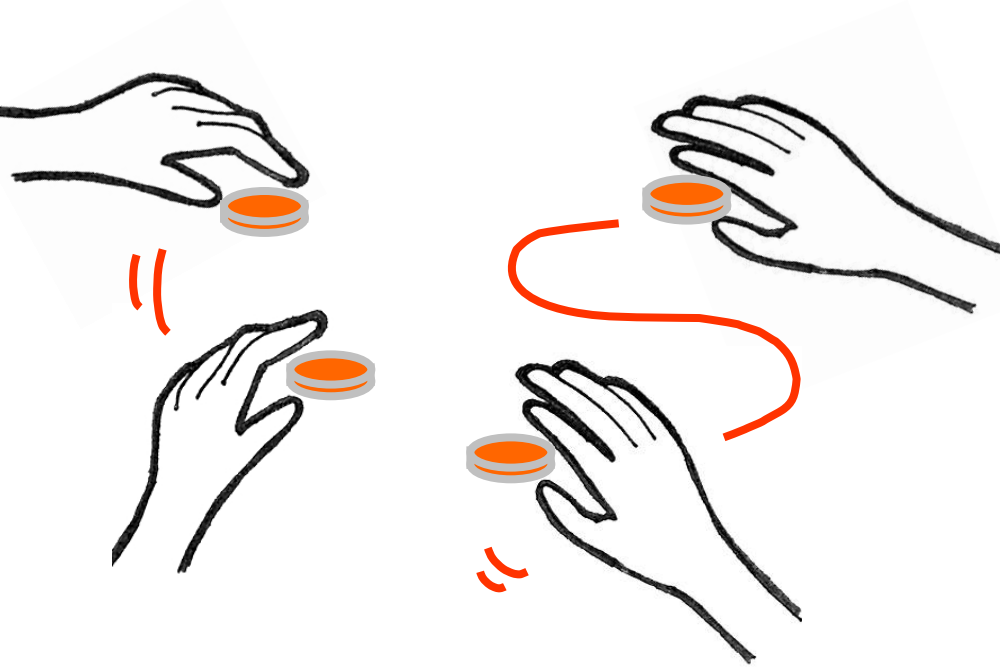
PICO

[Patten & Ishii 2007]



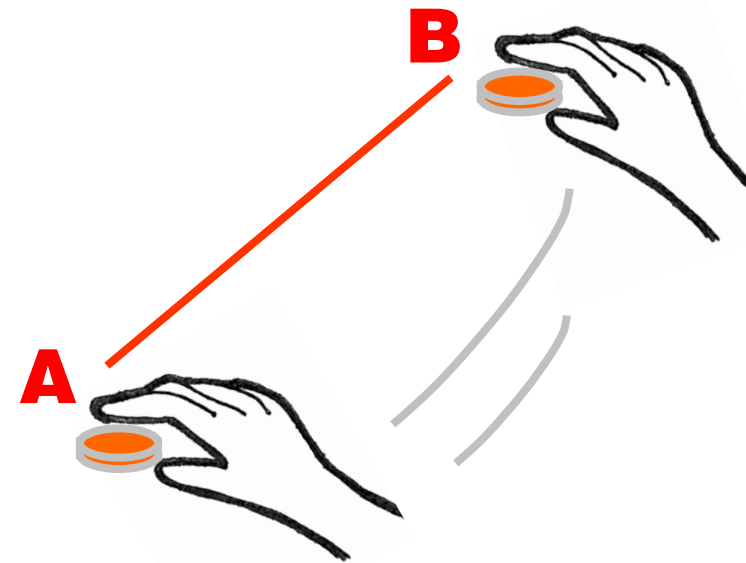
Epistemic Action

Users change their environment to search for the best solution or strategy to perform a task.



Pragmatic Action

Action taken to actually perform the task.



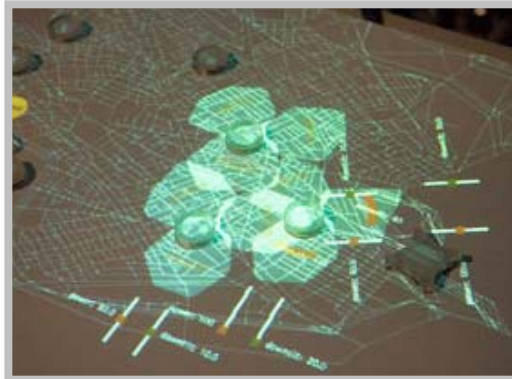
PICO Study

[Patten & Ishii, 2007]

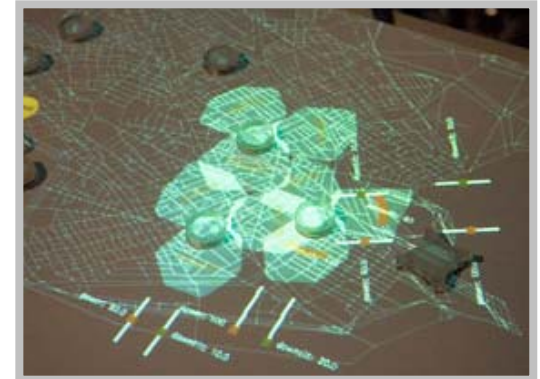
- 15 participants, within-subject study
- Position the towers to reach an optimal coverage under 4.5 minutes



Screen



Pico w/o actuation



Pico

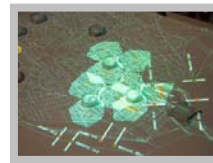
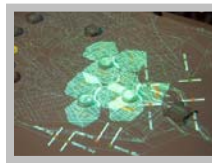
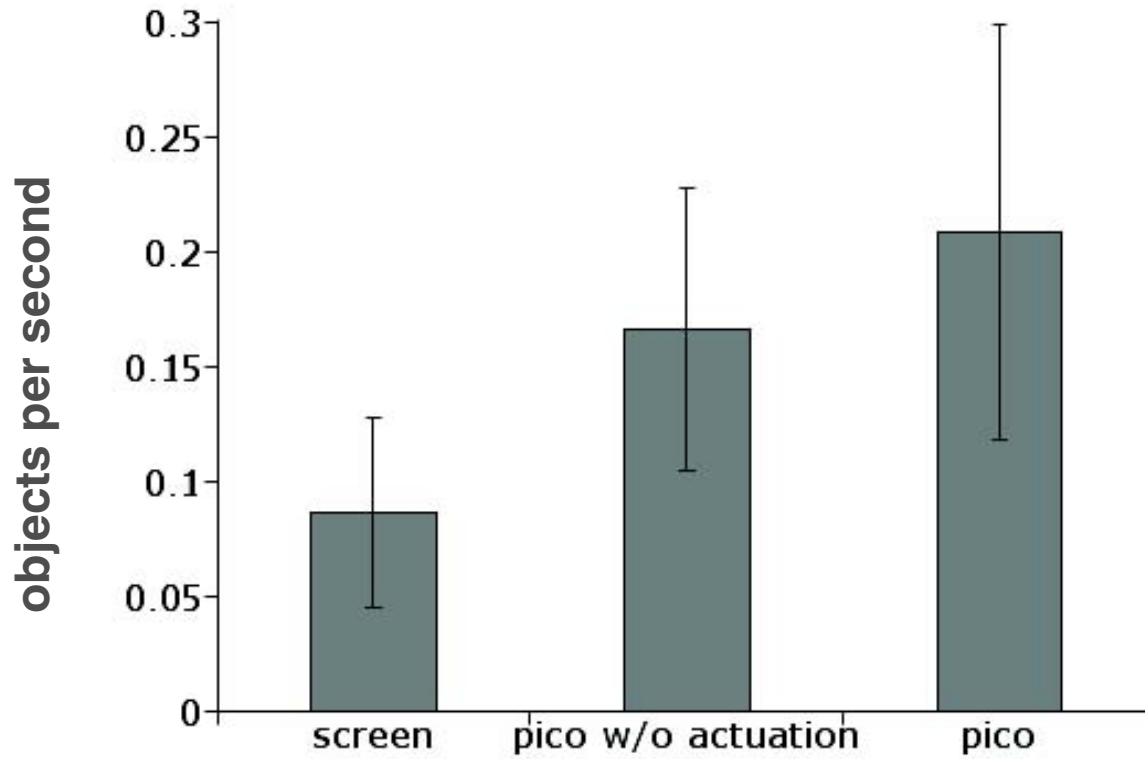
Hypotheses

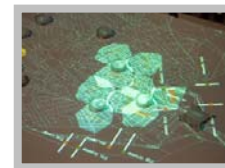
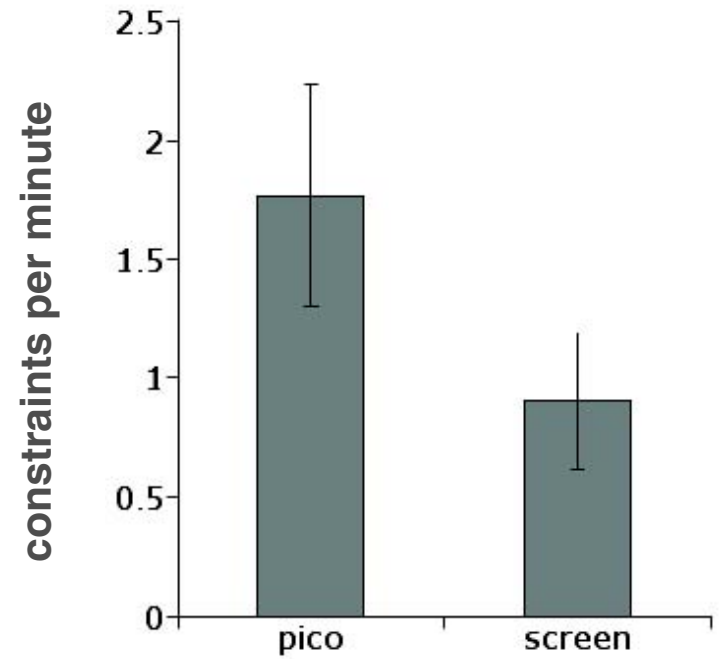
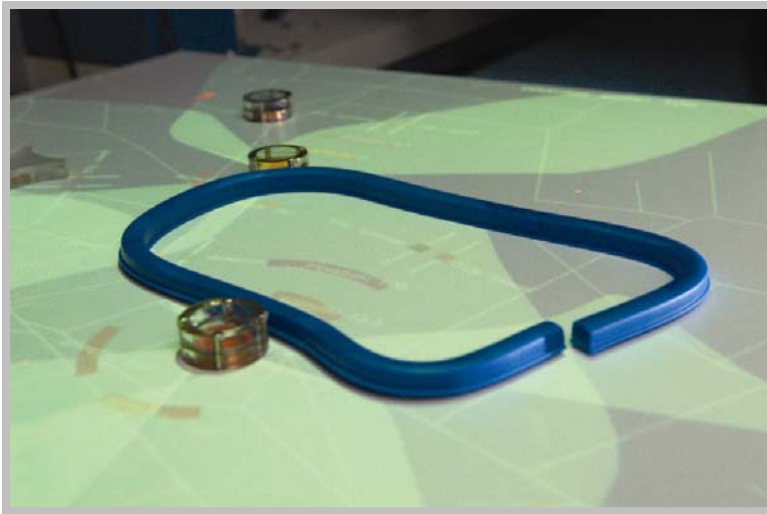
[Patten & Ishii, 2007]

H1: Users will shift their control between objects more often in the Pico condition than with the screen based condition.

H2: Users will shift their control between objects more often in the Pico condition than in the Pico without actuation condition.

H3: Users will constrain the motion of pucks more in the Pico case than the screen case.





Task Completed

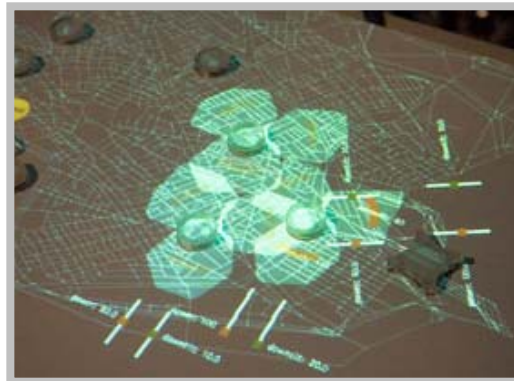
 [Patten & Ishii, 2007]

- 15 participants, within-subject study
- Position the towers to reach an optimal coverage under 4.5 minutes



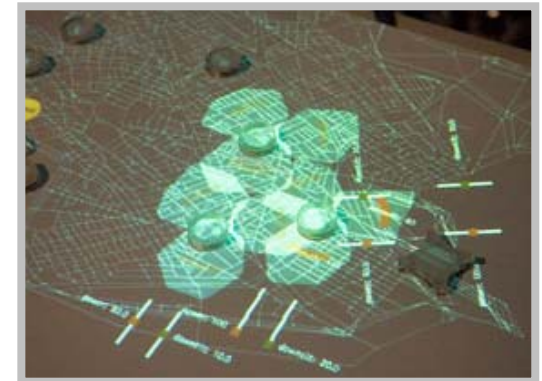
Screen

4 participants



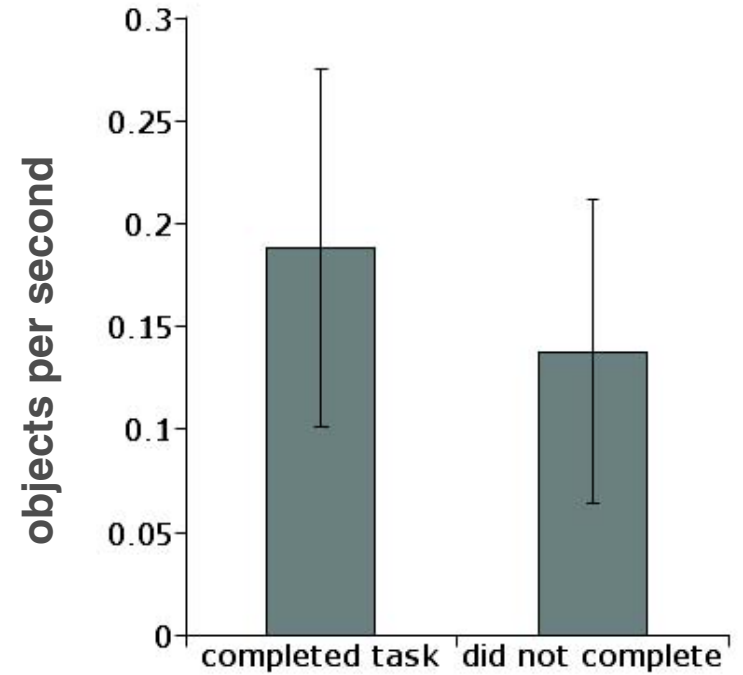
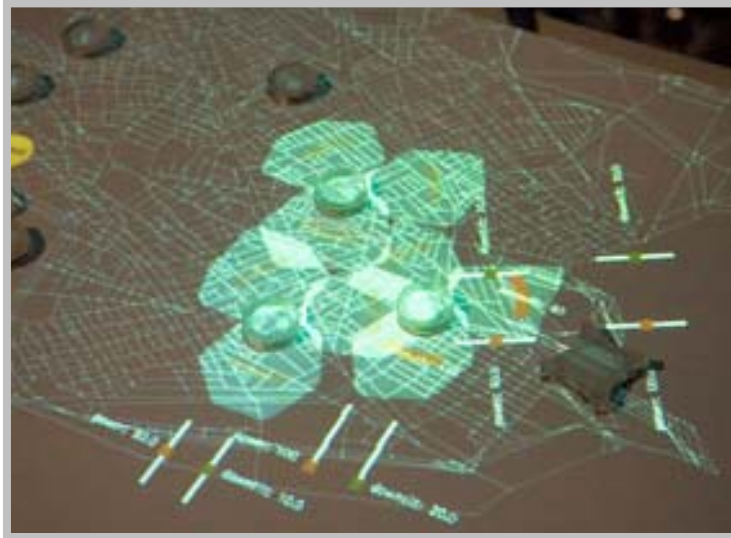
Pico w/o actuation

5 participants

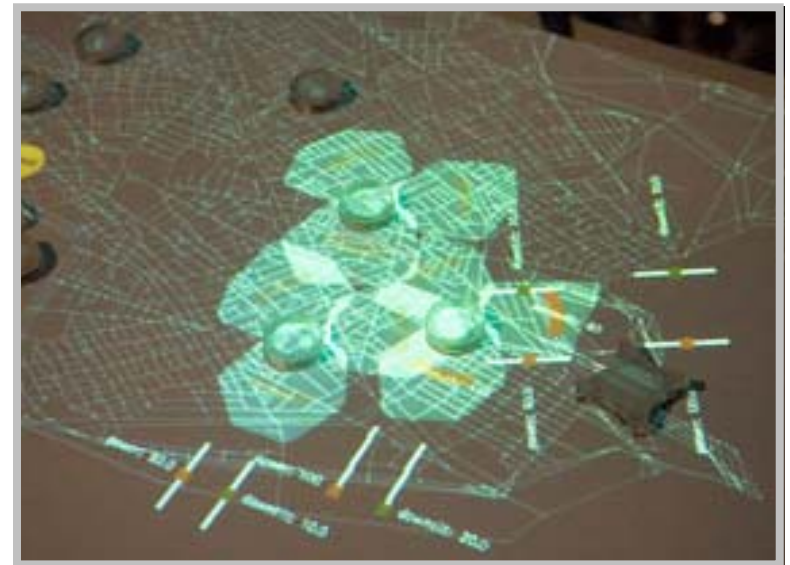


Pico

7 participants



Any Thoughts?



I/O Brush

[Ryokai, Marti, & Ishii, 2004]



Control Condition?



Staying Open to Interpretation

Engaging Multiple Meanings in Design and Evaluation

[Sengers & Gaver, 2006]

Design as Communication

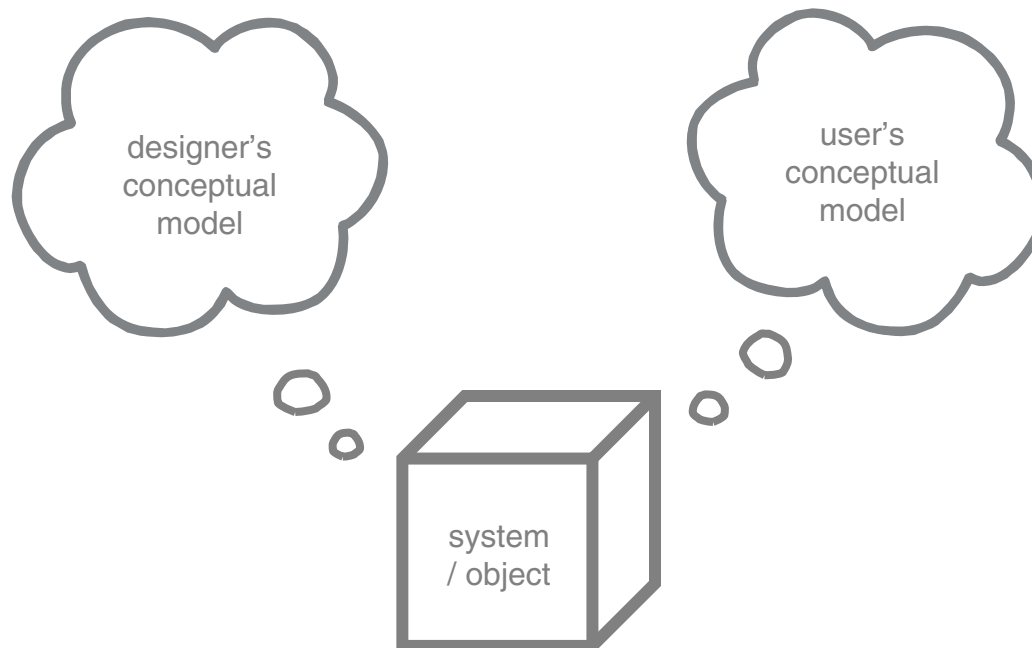
Design is a conversation between designer and user, even though the designer is no longer present once the user enters the scene.

[Norman, 2004]

Design as Communication

Design is a conversation between designer and user, even though the designer is no longer present once the user enters the scene.

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Levels of Interpretations

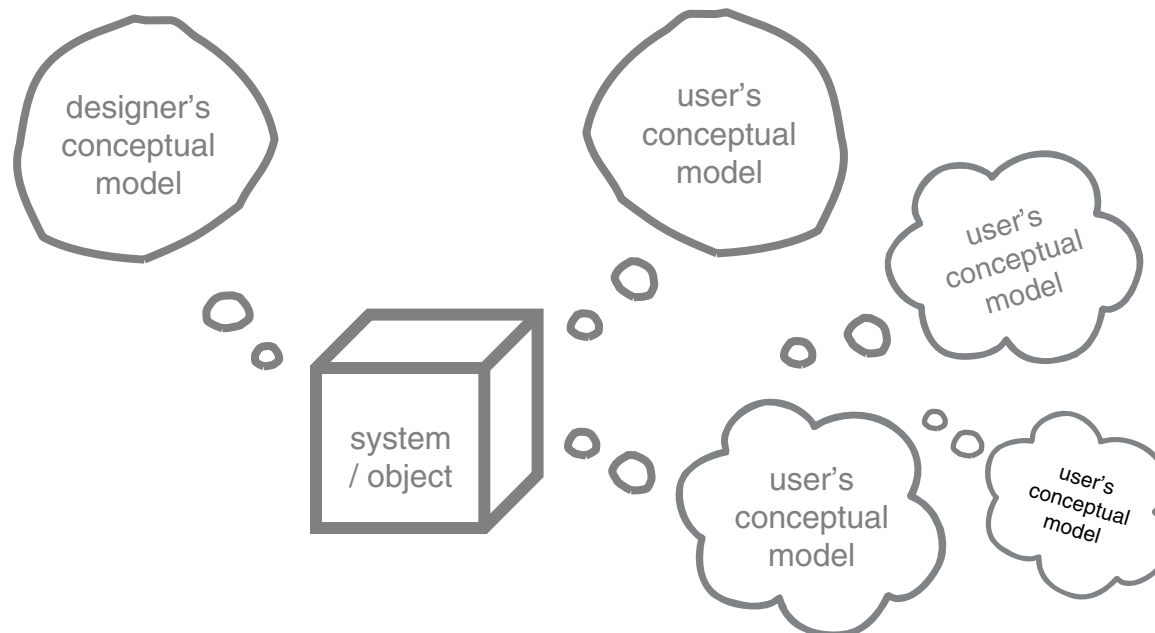
High level: “What does it mean to me, my social group, my society, my culture?” (social & cultural)

Mid level: “What activities is it appropriate for?”
“What role can it play in my everyday life?”

Low level: “Is this a button?” “What does this button do?” “How do I do this task?”

Open to Interpretations

“No single one of these perspectives may necessarily be ‘correct;’ instead, all may be useful in highlighting aspects of how systems will be understood, be used, and find roles in individual’s and community’s lives.” [Sengers & Gaver, 2006]



License to Interpret

Let individual users define their own meanings for them, rather than merely accept those imposed by designers.

Let people play a substantial role in determining the meaning of systems. This implies that they will be **actively engaged** in the process of understanding both **the system** and its **context of use**.

[Sengers & Gaver, 2006]

Meaning Making Process

Design shifts from deciding on and communicating an interpretation to **supporting and intervening in the processes of designer, system, user, and community meaning-making.**

[Sengers & Gaver, 2006]

Open to Interpretations

1. Specifying clearly usability without constraining use.
2. Supporting a space of interpretations around a topic.
3. Stimulating reinterpretations by blocking expected ones.
4. Unfolding new opportunities for interpretation.
5. Making space by downplaying system authority.
6. Thwarting any consistent interpretation.

[Sengers & Gaver, 2006]



Open to Interpretations

1. Specifying clearly usability without constraining use.

[Sengers & Gaver, 2006]

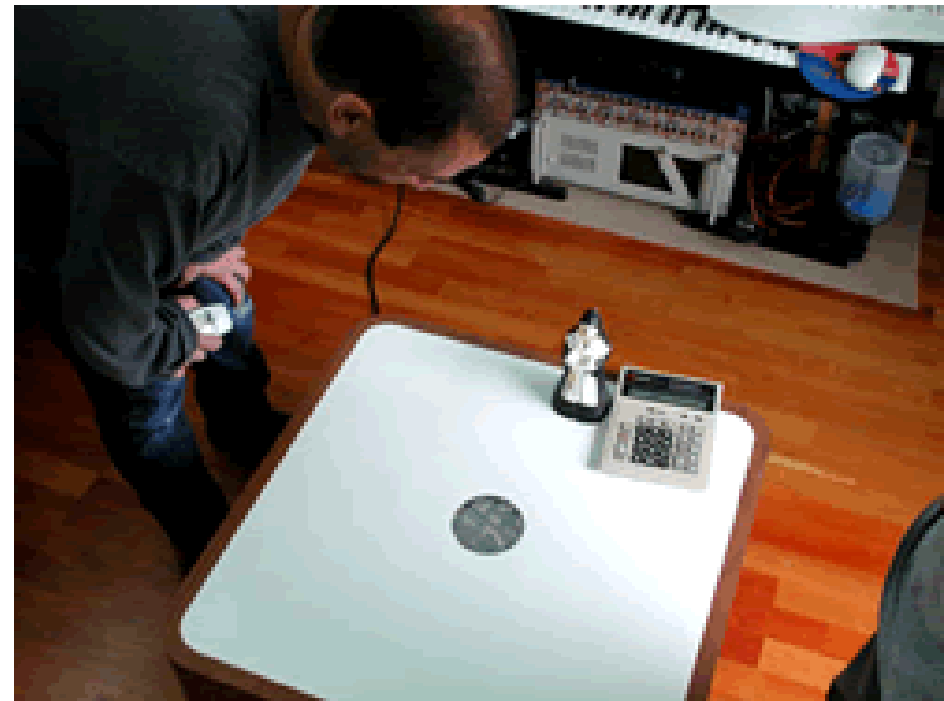


Open to Interpretations

2. Supporting a space of interpretations around a topic.

[Sengers & Gaver, 2006]

Drift Table [Chalmers et al., 2003]



Open to Interpretations

3. Stimulating reinterpretations by blocking expected ones.

[Sengers & Gaver, 2006]

Traces [Penny et al., 2001]

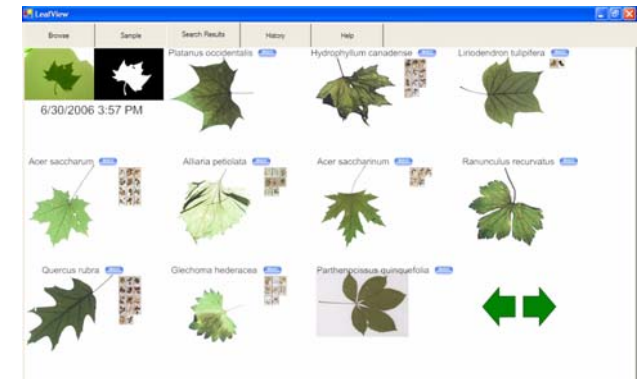
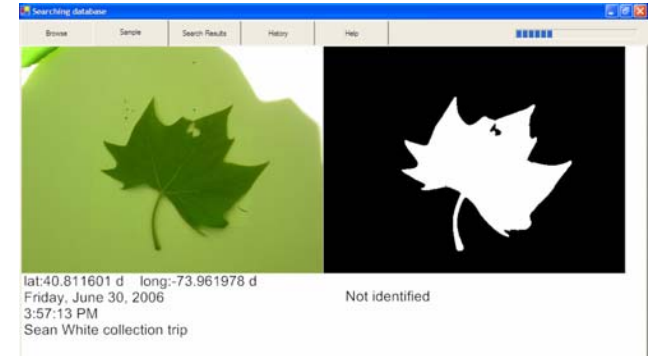


Open to Interpretations

4. Unfolding new opportunities for interpretation.

[Sengers & Gaver, 2006]

LeafView [White et al., 2007]



Open to Interpretations

5. Designs can make space for user re-interpretation by downplaying the system's authority. [Sengers & Gaver, 2006]



Image from: <http://reviews.zdnet.co.uk>

Open to Interpretations

6. Designs that thwart any consistent interpretation.

[Sengers & Gaver, 2006]

Evaluation Techniques

Instead of asking “Did the preferred interpretation take hold with users?” ask “How many different interpretations does a particular ‘blank canvas’ generate, and why?” or “Do users feel both stimulated and empowered to develop their own interpretations?”

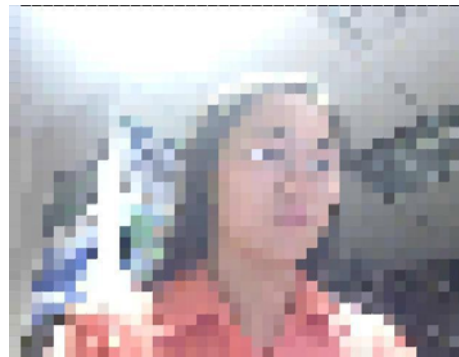
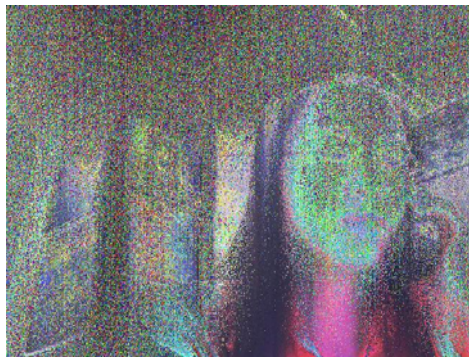
[Sengers & Gaver, 2006]

Evaluation Techniques

Dynamic Feedback [Boehner & Gay, 2005]

When using dynamic feedback, whatever information is collected about or from users is also given back to users to interpret.

Affector [Sengers et al., 2004]



Evaluation Techniques

Multiple, Potentially Inconsistent Assessments



Key Table [Equator IRC]

Research through Design

Method for Interaction Design Research in HCI

[Zimmerman et al., 2007]

Evaluation Techniques

1. Process
2. Invention
3. Relevance
4. Extensibility

[Zimmerman, 2007]

Process • Invention • Relevance • Extensibility

1. Process

“The rigor applied to the methods and the rationale for the selection of specific methods. In documenting their contributions, interaction design researchers must provide enough detail that the process they employed can be reproduced. In addition, they must provide a rationale for their selection of the specific methods they employed.”

[Zimmerman et al., 2007]

Process • **Invention** • Relevance • Extensibility

2. Invention

“Interaction design researchers must demonstrate that they have produced a novel integration of various subject matters to address a specific situation. An extensive literature review must be performed that situates the work and details the aspects that demonstrate how their contribution advances the current state of the art in the research community.”

[Zimmerman et al., 2007]

Vision of the Future Project [Philips, 1995]



Process • Invention • Relevance • Extensibility

Process • Invention • **Relevance** • Extensibility

3. Relevance

“The work must be documented in such a way that peers can reproduce the results. Also articulate the preferred state their design attempts to achieve and provide support for why the community should consider this state to be preferred. Without this critical component, a research through design approach appears to be a self-indulgent, personal exploration that informs the researcher but makes no promise to impact the world.”

[Zimmerman et al., 2007]

Process • Invention • Relevance • **Extensibility**

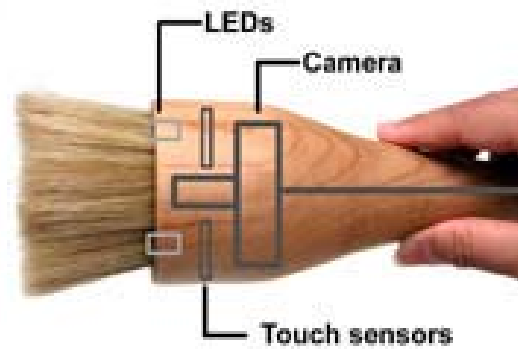
4. Extensibility

The design research should be described and documented in a way that the community can leverage the knowledge derived from the work.

[Zimmerman et al., 2007]

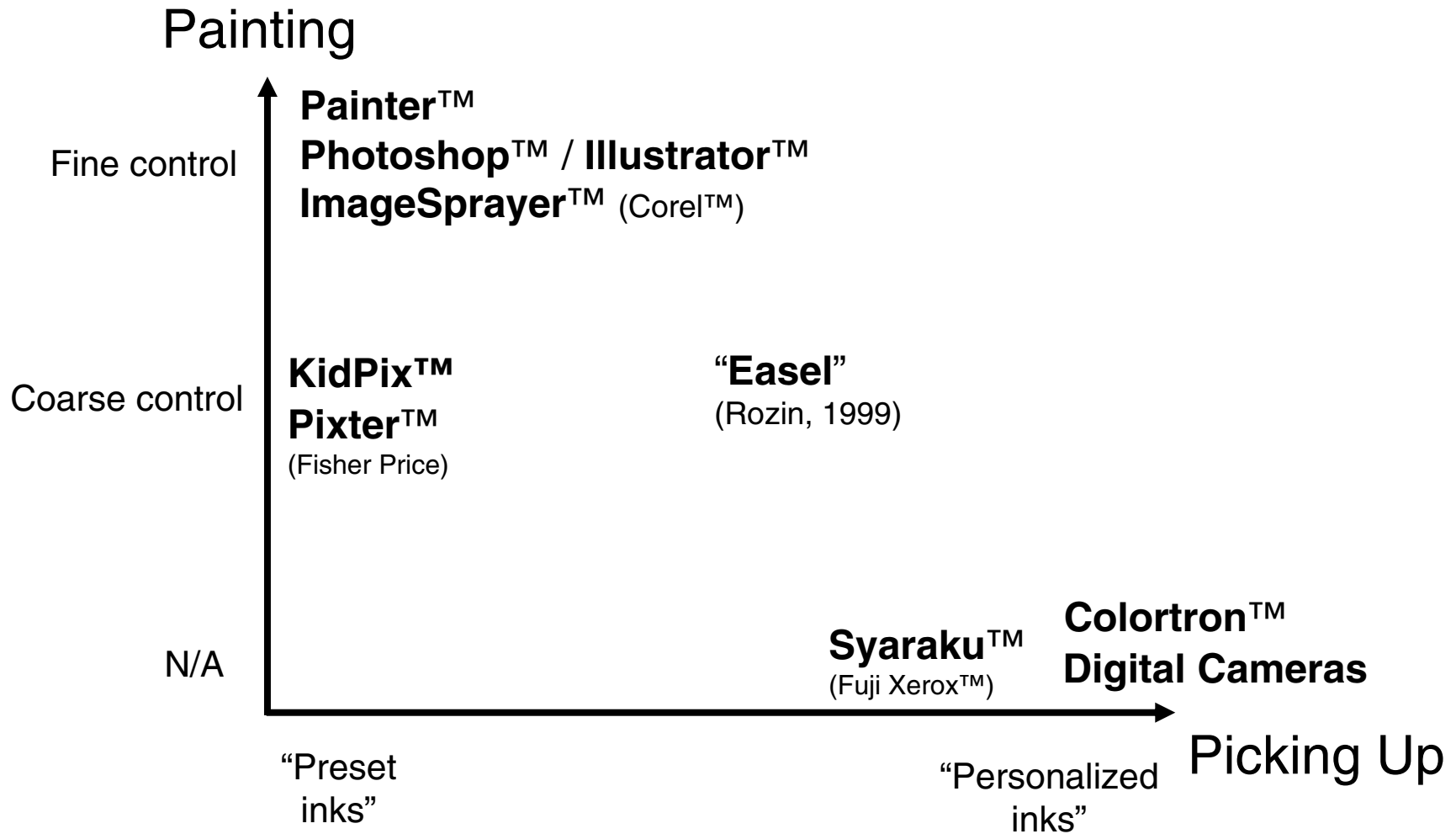


Process • Invention • Relevance • Extensibility

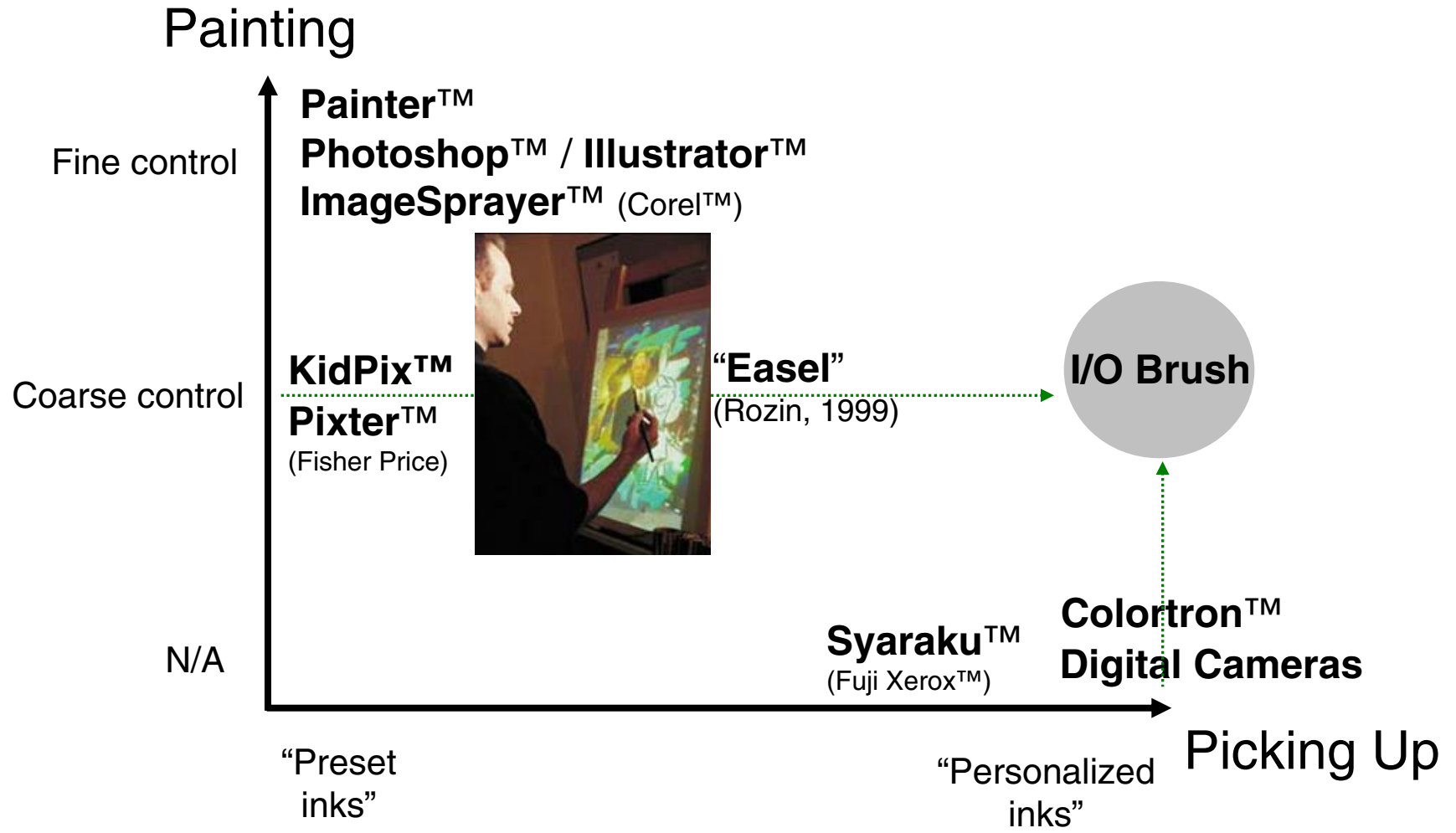


Invention?

Tools for both Picking up and Painting



Tools for both Picking up and Painting



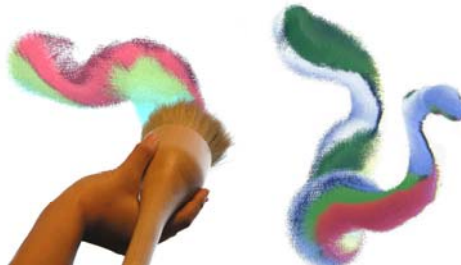
Design Process?

Design Evolution of the I/O Brush system

fall 2003



summer 2004



current



I/O Brush Modes

Texture



Color



Movement



I/O Brush Modes

Texture



Color



Movement



I/O Brush Modes

Texture



Color



Movement

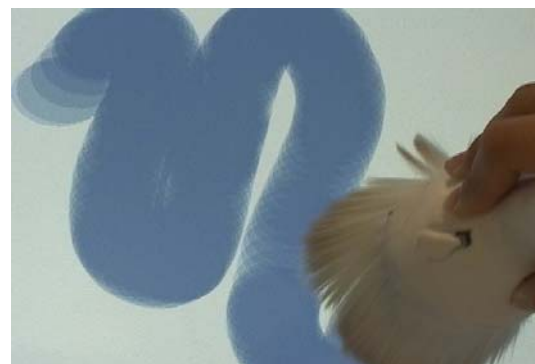


I/O Brush Modes

Texture



Color



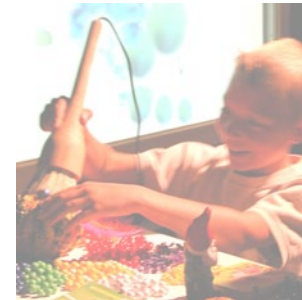
Movement



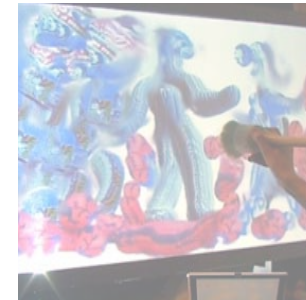
1st I/O Brush at Kindergarten



2003



2004



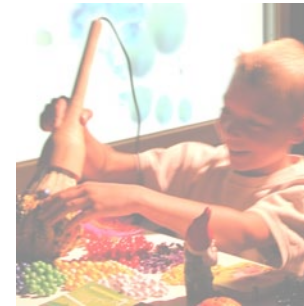
current



1st I/O Brush at Kindergarten



2003



2004



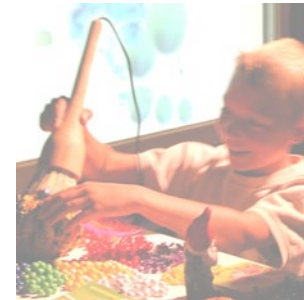
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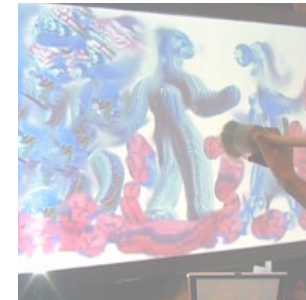
1st I/O Brush at Kindergarten



2003



2004



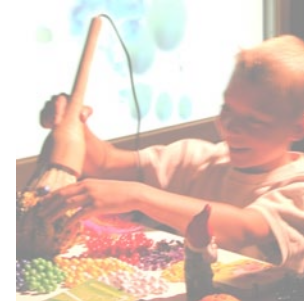
current



1st I/O Brush at Kindergarten



2003



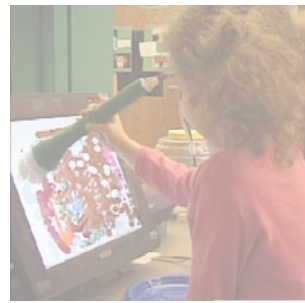
2004



current



2nd I/O Brush at Ars Electronica



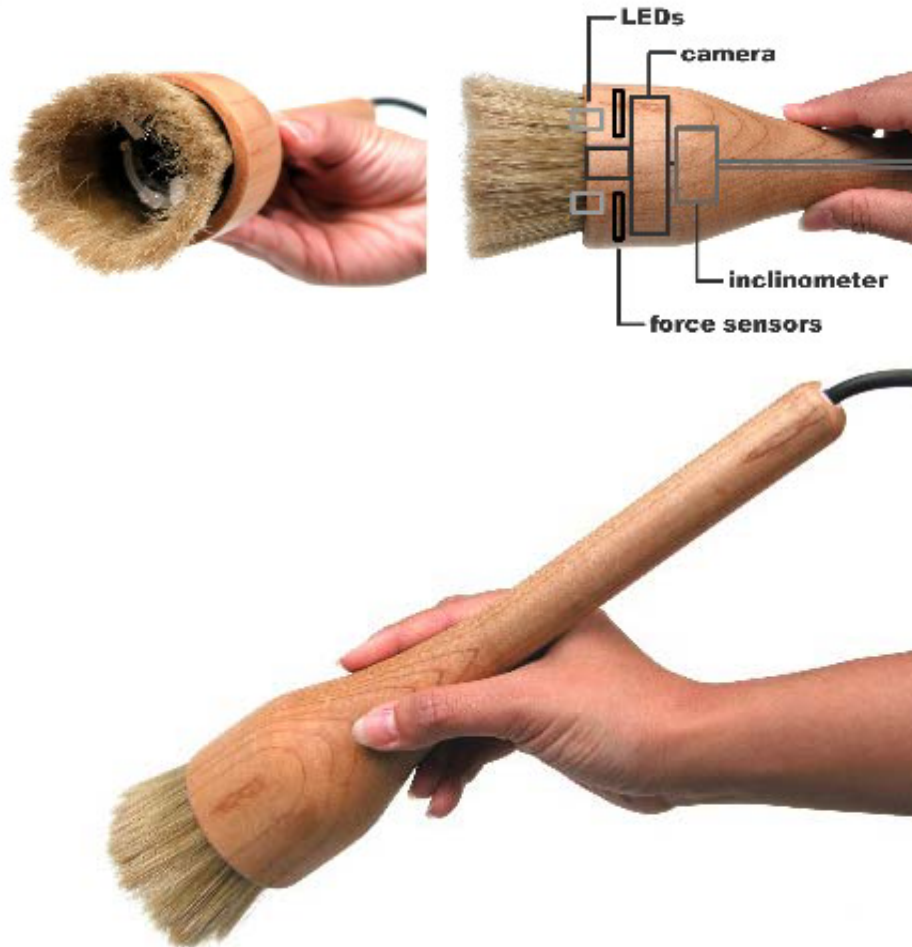
2003



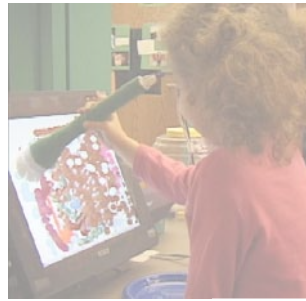
2004



current



2nd I/O Brush at Ars Electronica



2003



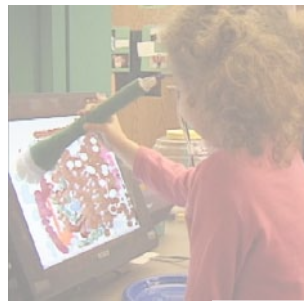
2004



current



2nd I/O Brush at Ars Electronica



2003



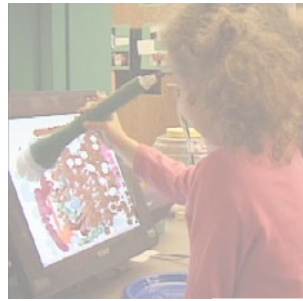
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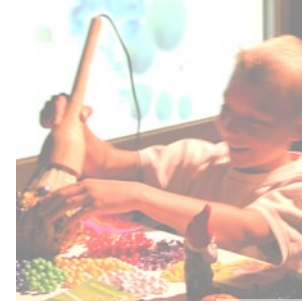
current



Final Design I/O Brush System



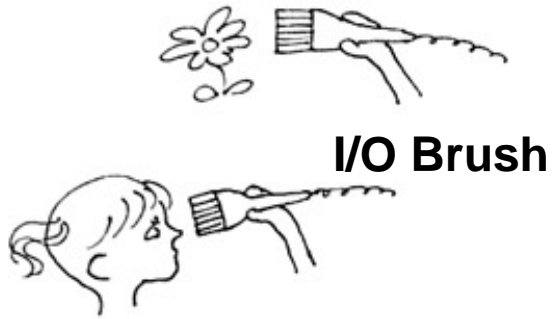
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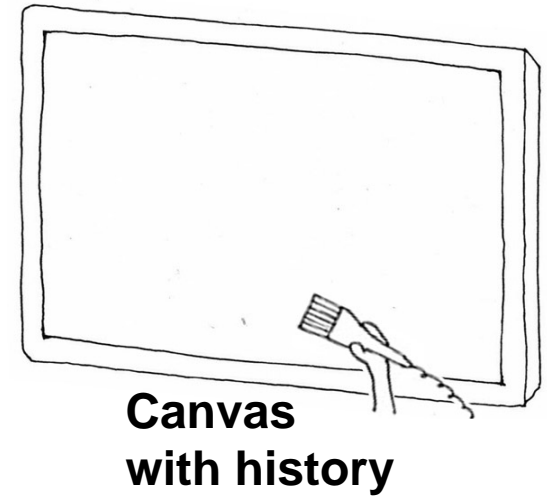
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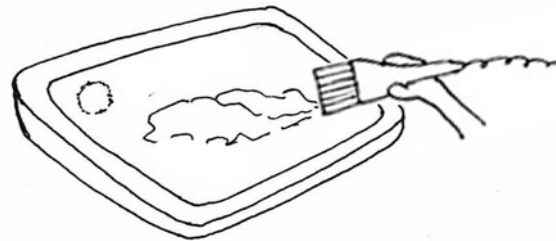
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I/O Brush

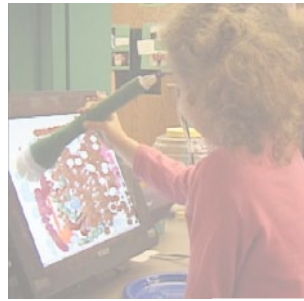


**Canvas
with history**

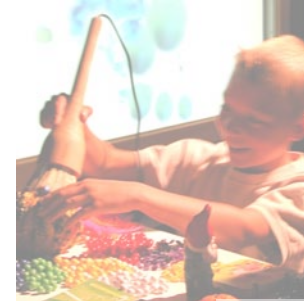


Palette

Final Design I/O Brush System



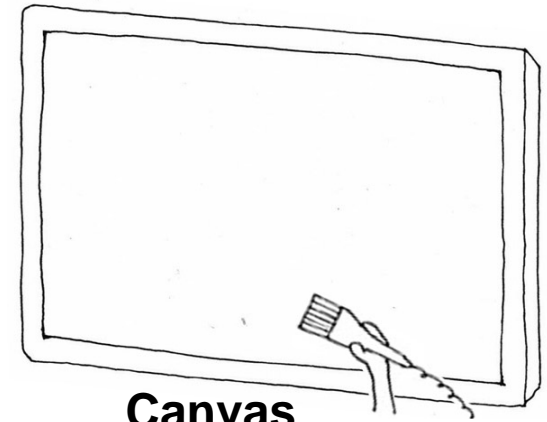
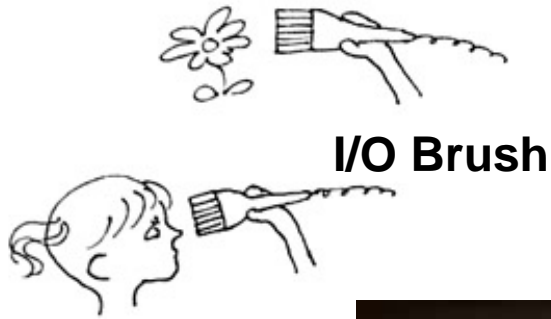
2003



2004

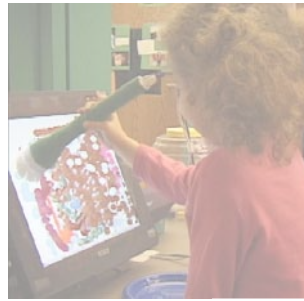


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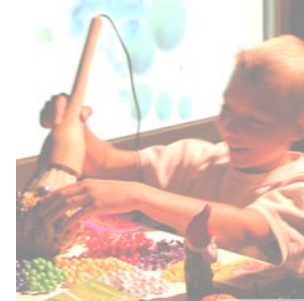


Palette

Final Design I/O Brush System



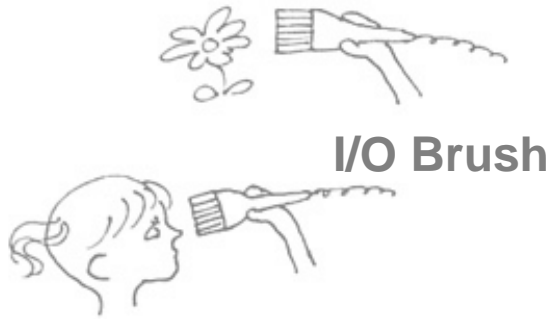
2003



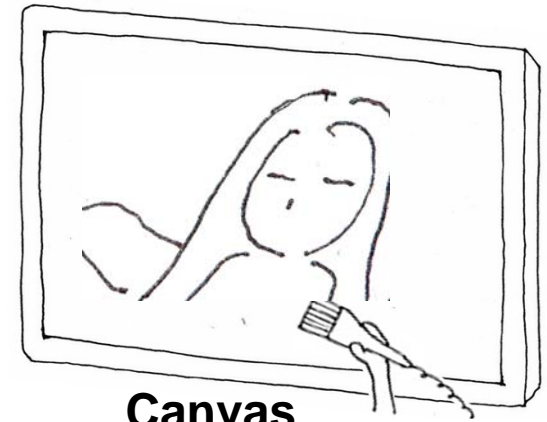
2004



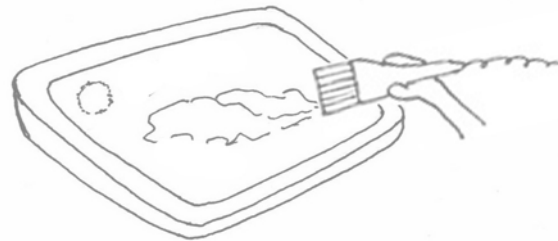
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I/O Brush

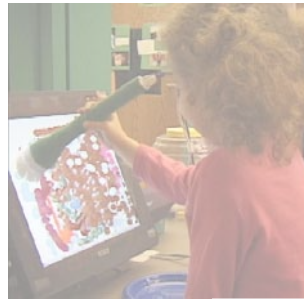


Canvas
with history

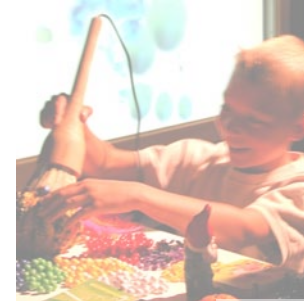


Palette

Final Design I/O Brush System



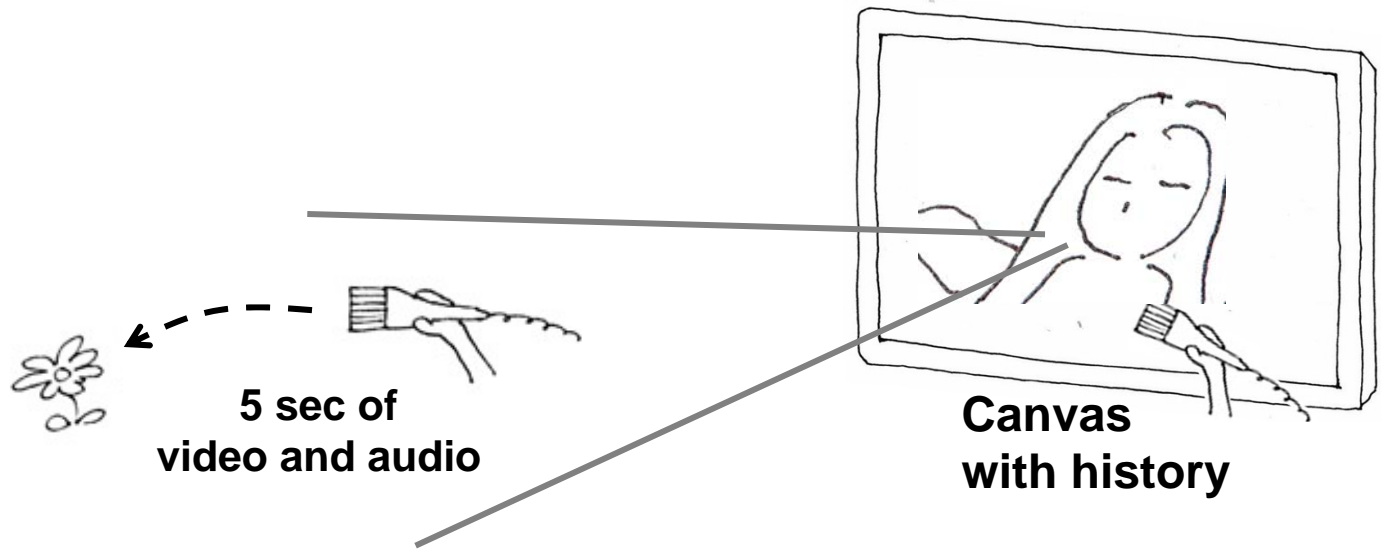
2003



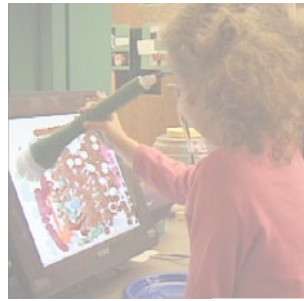
2004



current



Final Design I/O Brush System



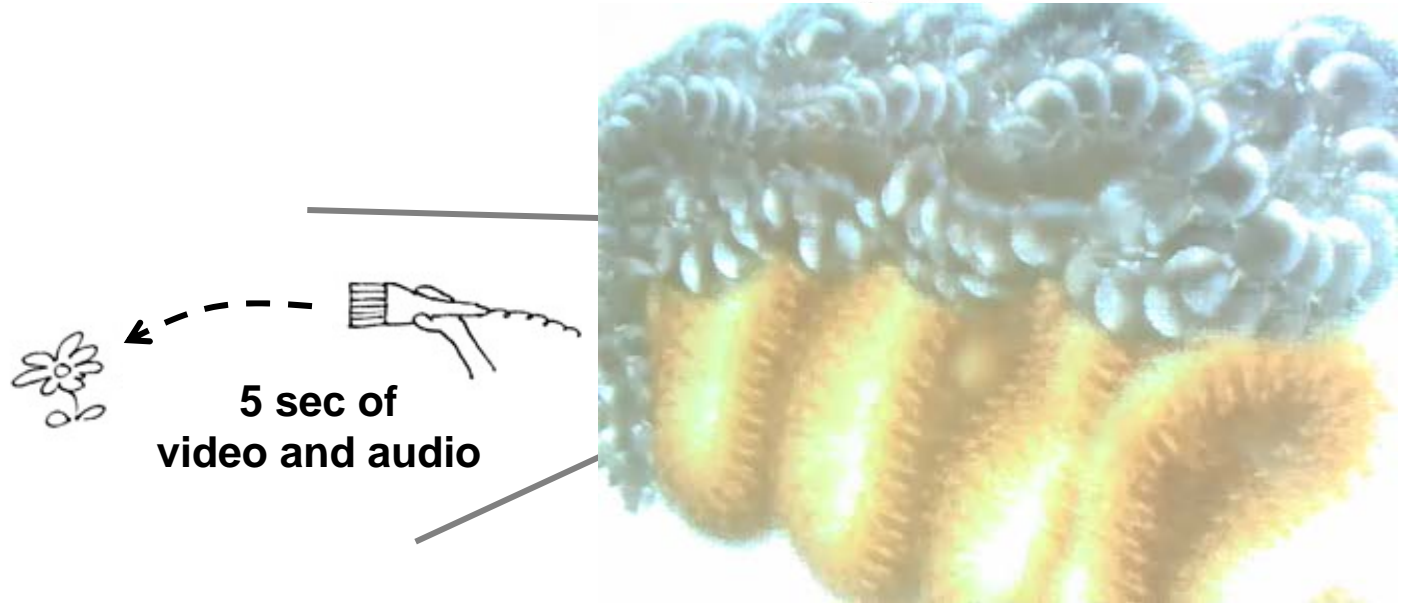
2003



2004



current



5-week study in kindergarten classroom

- How do children use the tool for their creations?
- How do children's expressions change over time?
- How does the tool influence the way they interact with the world?



19 children (10 in I/O Brush group, 9 in control group), age 5 to 6

Mastery of Tool?

Mastery of Tool



Mastery of Tool



Mastery of Tool



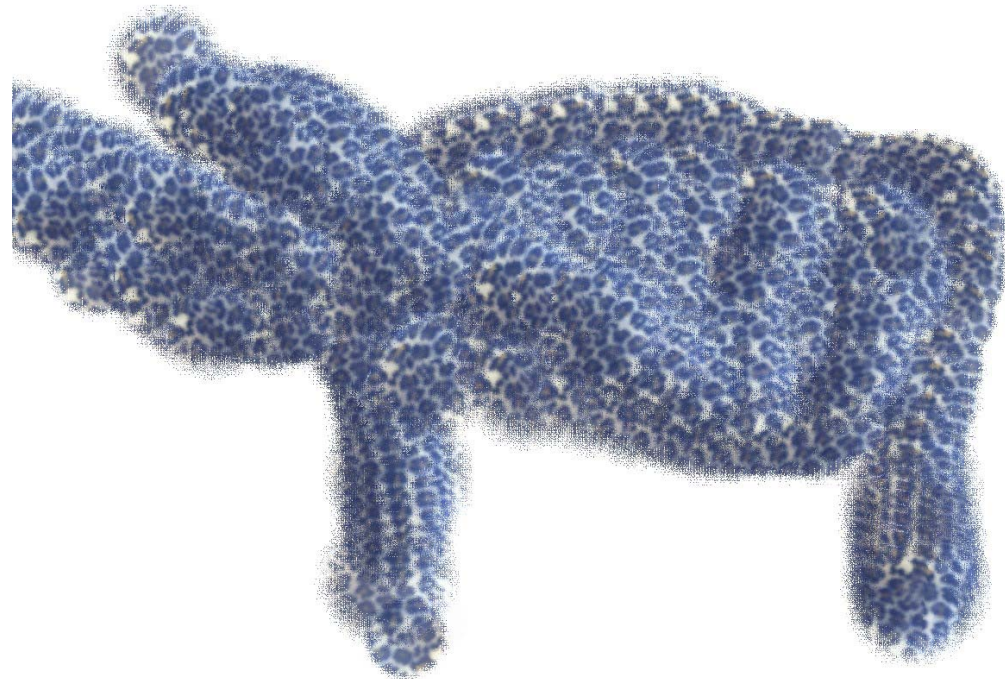
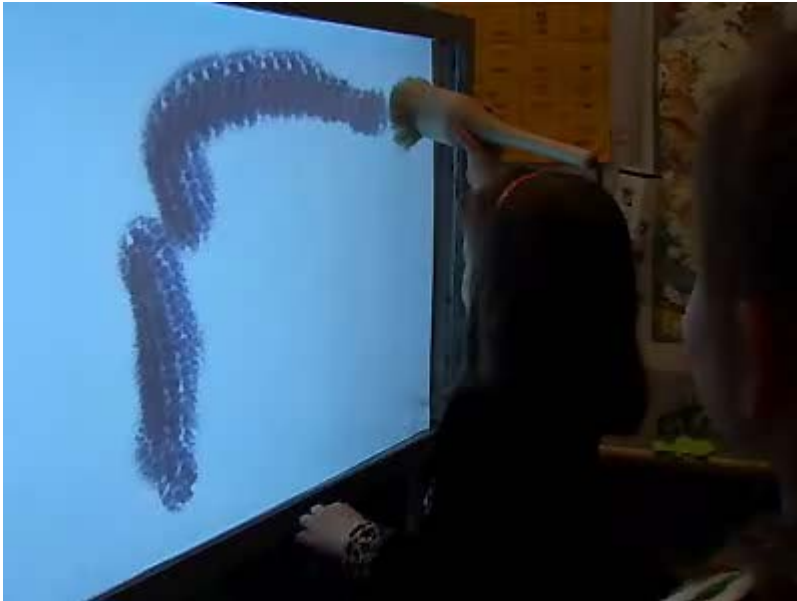
Open to Multiple Interpretations?

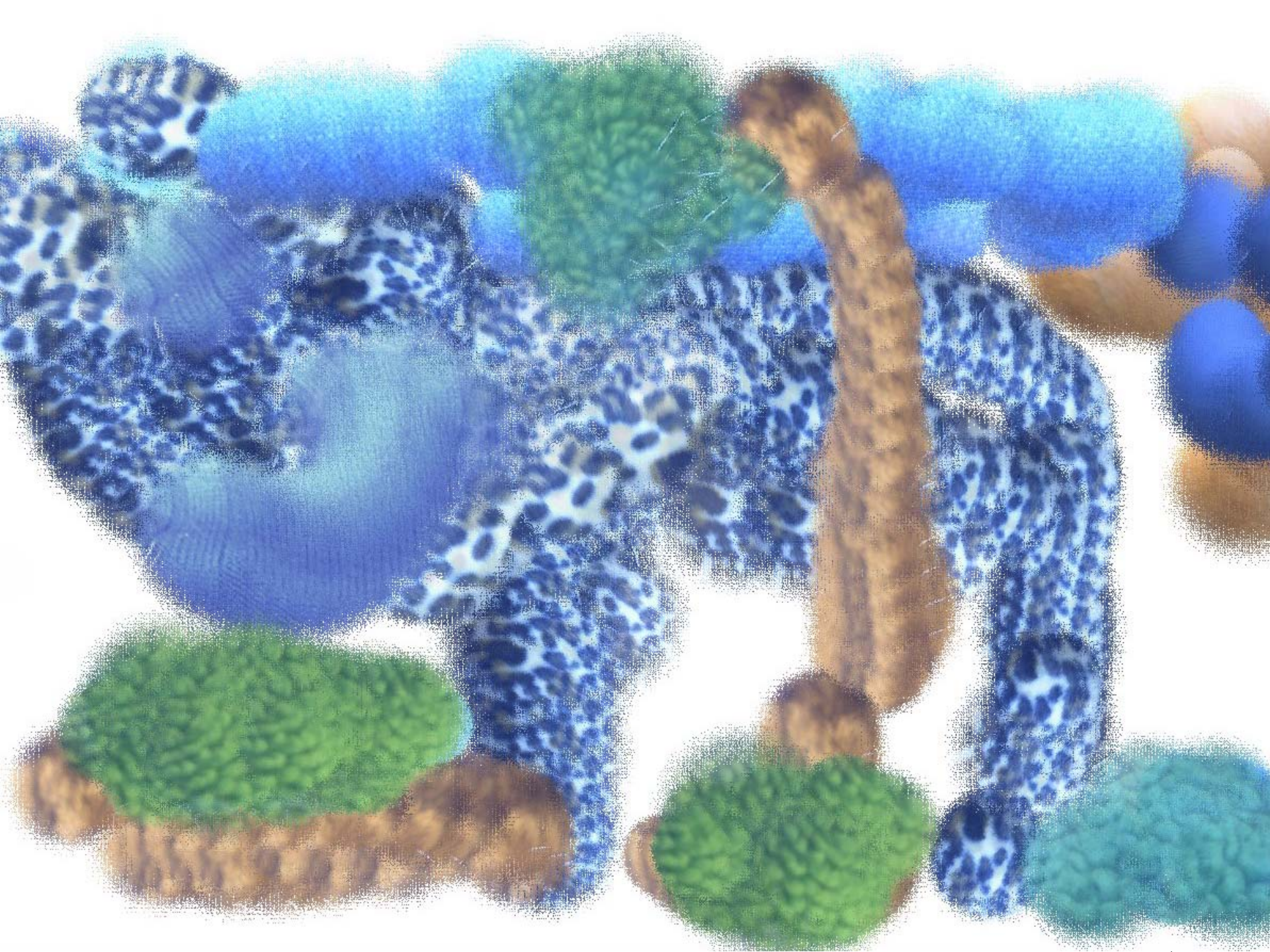
Multiple Interpretations



Multiple Interpretations

Supporting different styles – “Visualizers” [Gardener, 1982]





Multiple Interpretations

Supporting different styles – “Dramatizers” [Gardener, 1982]



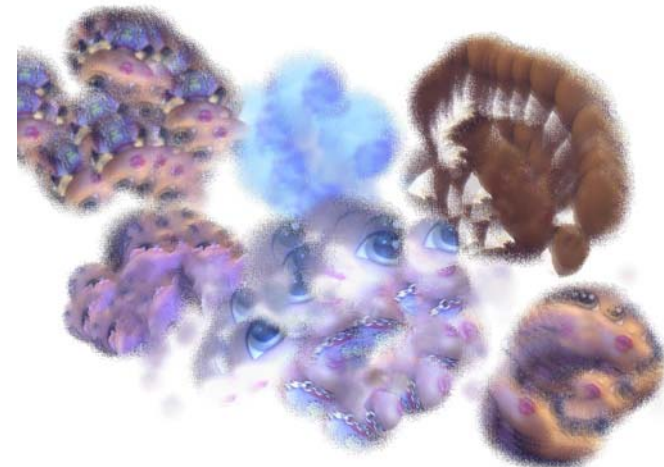
Multiple Interpretations

Supporting different styles – “Dramatizers” [Gardener, 1982]



Multiple Interpretations

Supporting different styles – “Dramatizers” [Gardener, 1982]

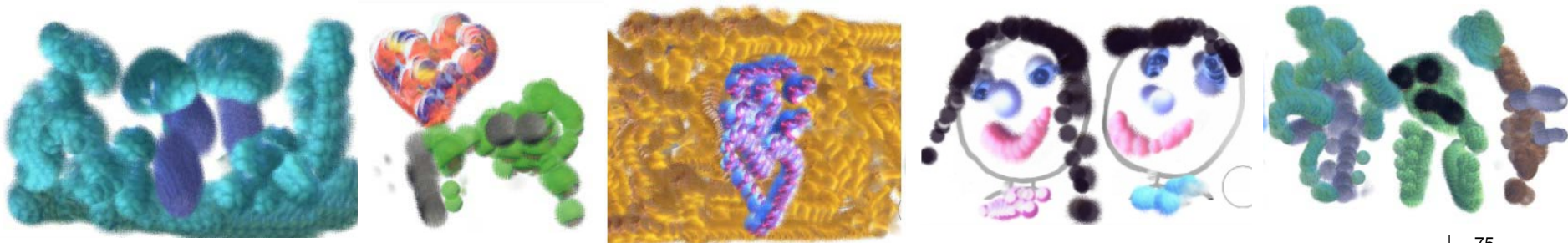


Exploring the Environment



Evaluation with Kindergarteners

- Mastery of tools
- Sharing and explaining their work with peers
- Supporting various styles of expressions (e.g. “visualizer,” “dramatizer”)



Summary

- Consideration of multiple heterogeneous interpretations, as opposed to a single authoritative interpretation.
- Evaluations sensitive to people's interpretations could take a long time. It is an iterative process of observing, designing, testing, and redesigning.
- Use these criteria as lenses that guide you in evaluating the success of your design.

Your Final Project

- Your final project write up (4-6 pages) in ACM SIGCHI Extended Abstract format:
<http://www.chi2008.org/chi2008extendedabstracts.doc>
- Your final project presentations on Thursday December 6th and Tuesday December 11th.
- We are available during our office hour and by appointment.
- Please ask early about resources.

Thanks!