

Tangible Interfaces

CSI 60: User Interfaces
John Canny

Project/presentation

Interactive Prototype (due Dec 3rd)

- Redesign interface based on last round of feedback
- Create working implementation
 - Can include Wizard of Oz parts where justified
 - Can include pre-built (canned) functionality where justified

In class Presentations (Dec 6th)

- 5 min slide presentation (be careful about timing)
- Focus on showing prototype

Final Presentations/Posters

Next Monday Dec 6th in the Wozniak Lounge, 4th
floor Soda Hall, 2-5pm

TeamDeca

Jon Stewart Appreciation Club

G7

No Name

Cave Jihad

Education @ Cal

ZooTrippers

The G-12

Bet Intruders

CalVegan

Boom Tho

JohnCannyAppreciationClub

A.R.B.S.

Topics

- **What is a tangible interface?**
- Motivation for Tangible Interfaces
- Examples
- A Taxonomy

What is a tangible interface?

Making bits visible and manipulable

- Ishi

“a user uses their hands to manipulate some physical object(s) via physical gestures; a computer system detects this, alters its state, and gives feedback accordingly”

- Fishkin

Examples we already saw?

Holotoy



Slap Widgets



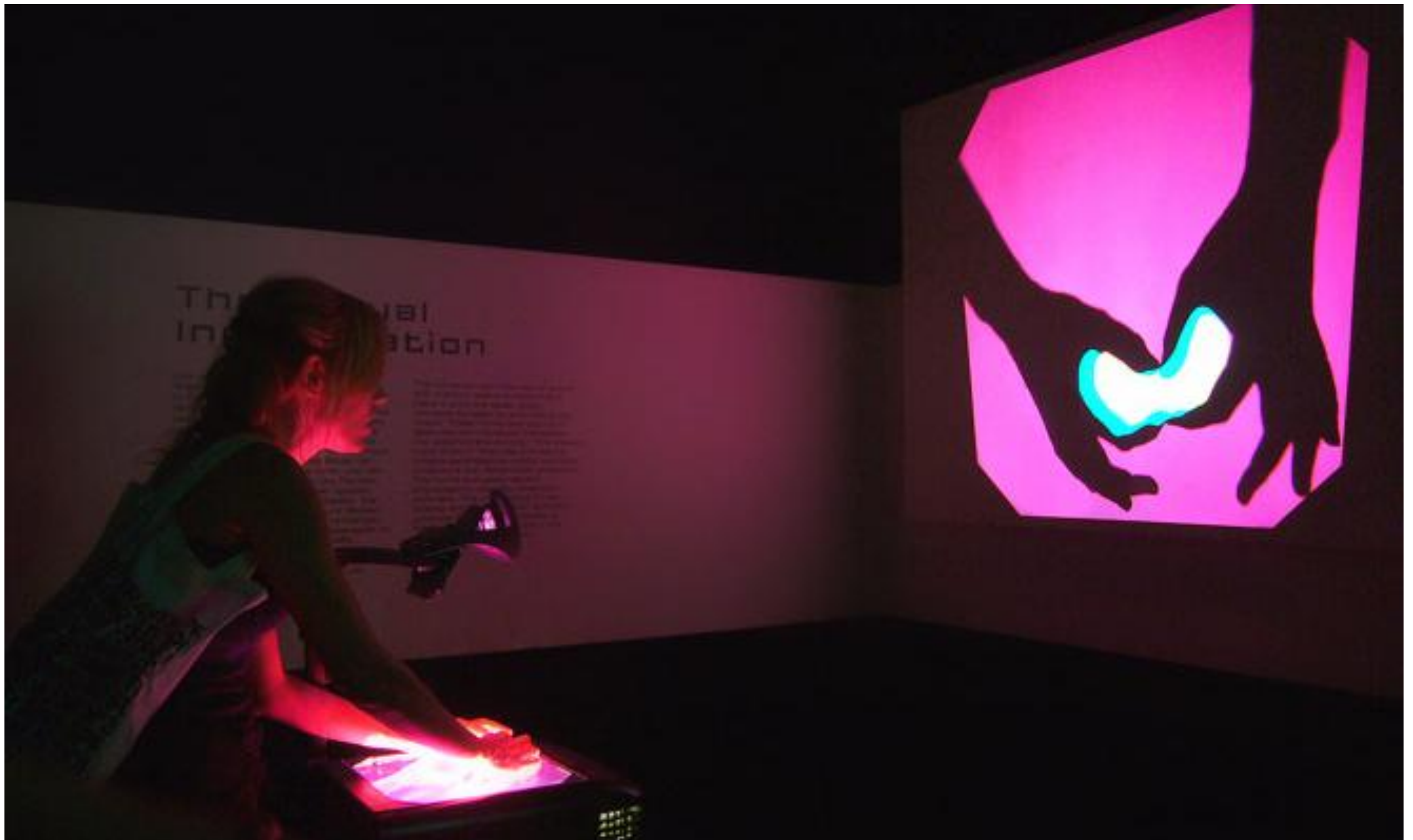
Final Scratch



Tivoli Radio?



Negdrop?



Golan Levin, Zach Lieberman – The Manual Input Sessions Workstation

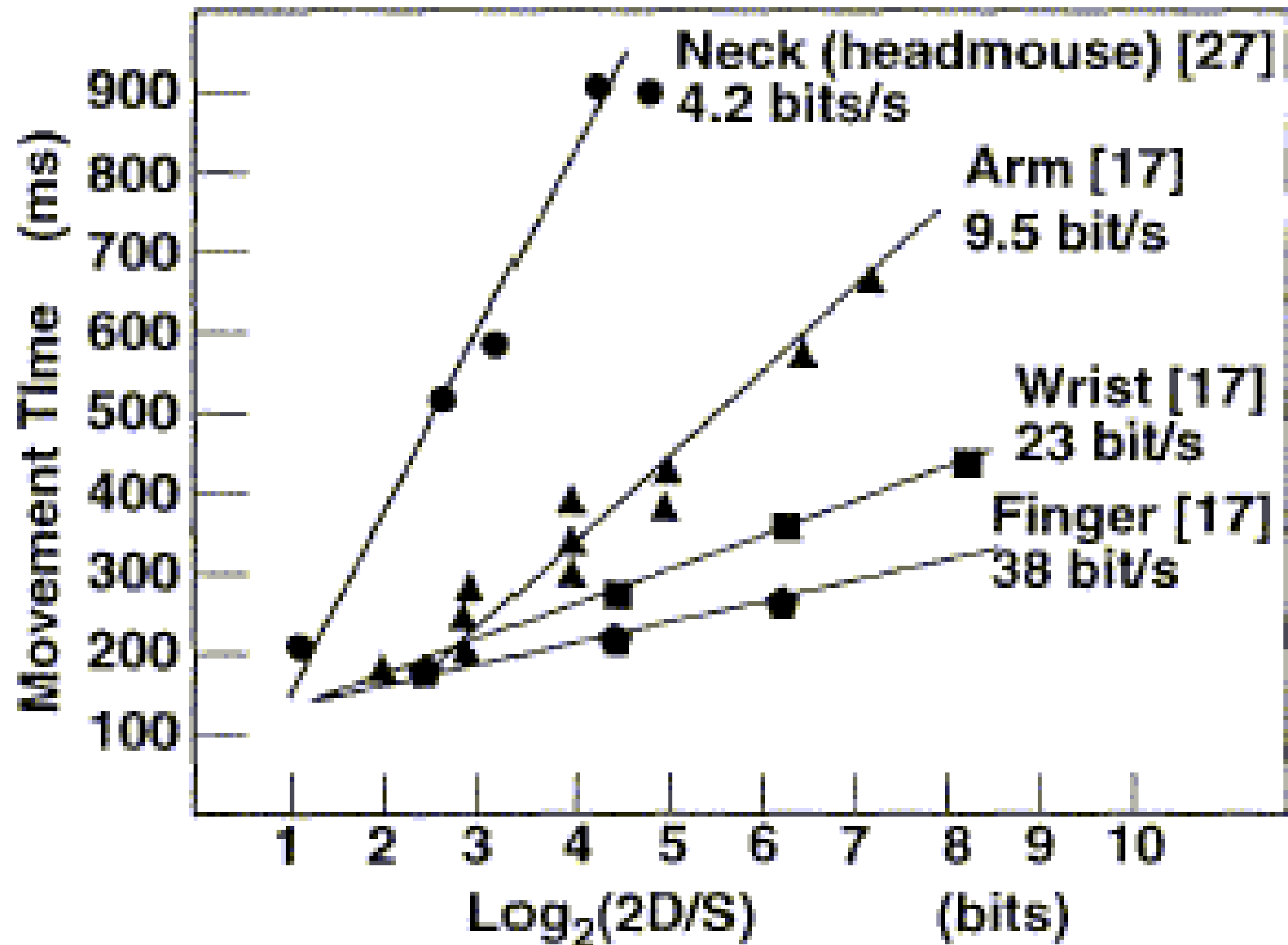
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Topics

- What is a tangible interface?
- **Motivation for Tangible Interfaces**
- Examples
- A Taxonomy

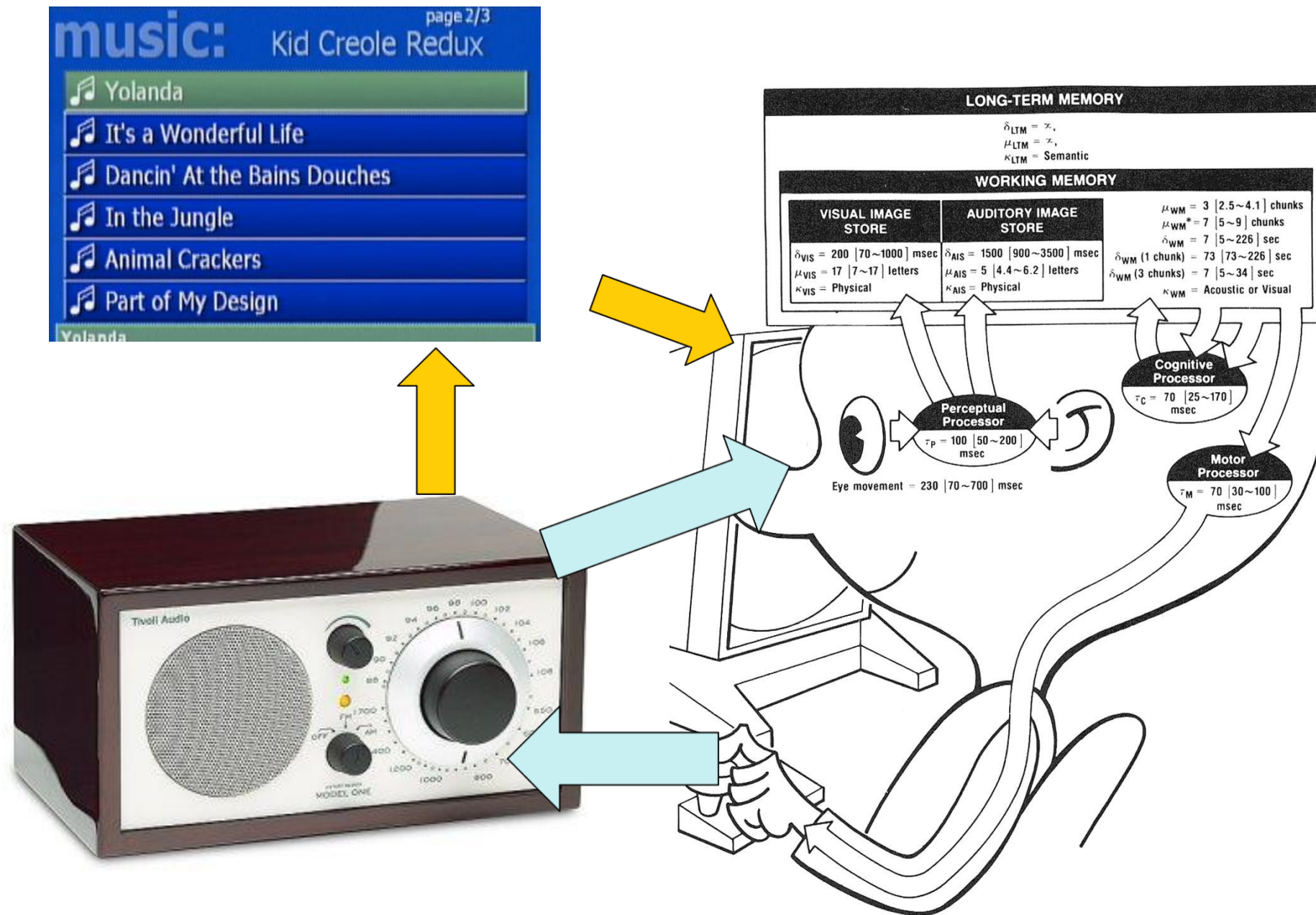
Bandwidth of Human Muscle Groups



Sensori-motor map



An ideal TUI



Abstracting Craft -McCullough

Media that allow direct manipulation + accumulation of experience (craft) are very powerful.



Topics

- What is a tangible interface?
- Motivation for Tangible Interfaces
- **Examples**
- A Taxonomy

Examples

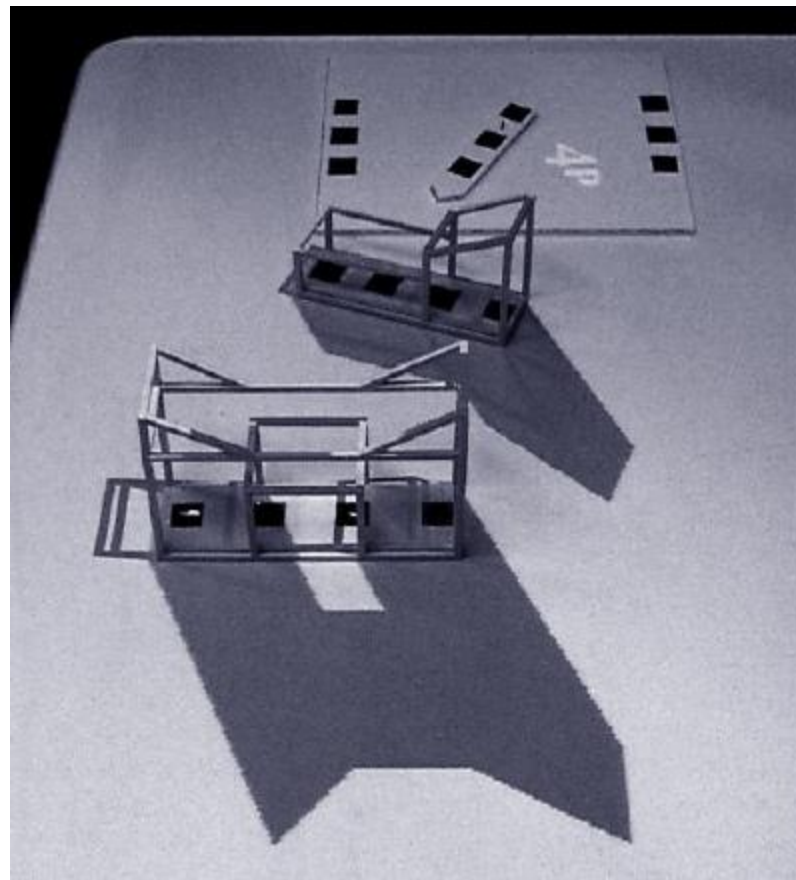
Doll's head (1994)

Manipulation of a virtual head with a physical model:



Examples

URP – manipulation of architectural models (1997)
Lighting source controlled as well to simulate time-of-day.



<http://tangible.media.mit.edu/projects/>

Examples

BitBeads (1998): CPU + LED + communication in each bead.

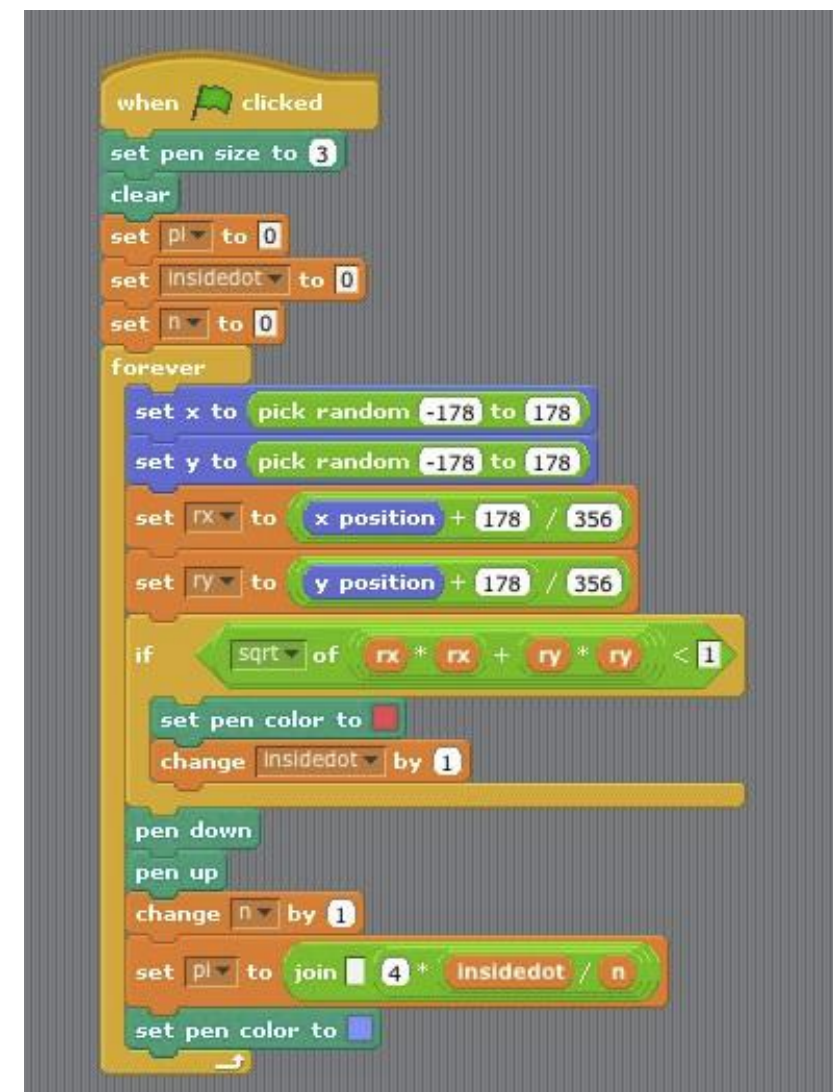
Beads have default behavior and can be strung together to make dynamic patterns.

They can also be programmed to do more complex tasks as a 1D cellular automaton.



Digression

Work on composition of beads and blocks led to Lego Mindstorms and was an influence on “Scratch”.



Examples

Metadesk (1997) – tangible tools and tokens



Examples

Mediablocks (1999)

- Recording, transport, playback and editing of media
- Tangible containers



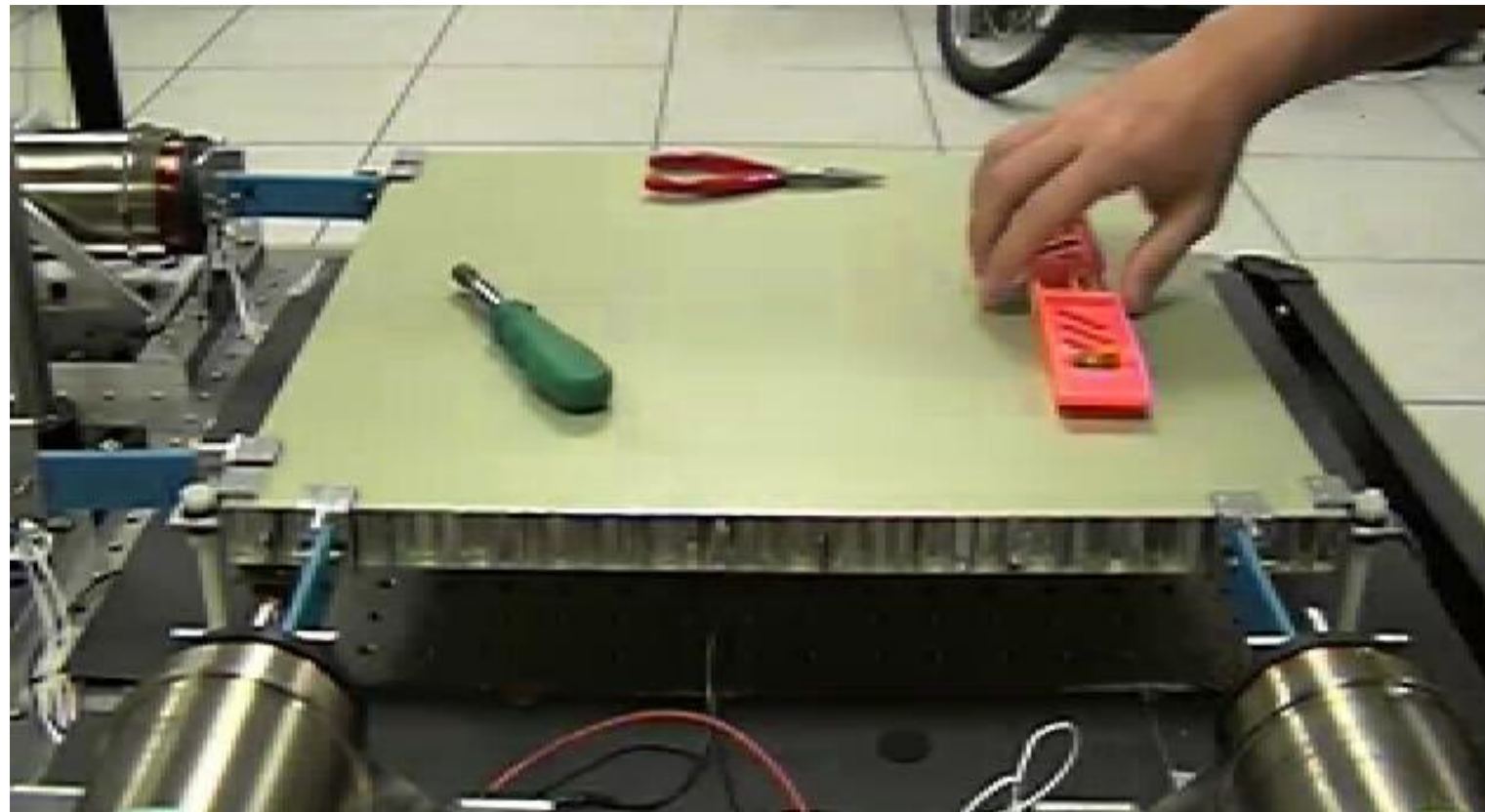
Examples

Actuated Workbench (2002) – tangible tokens

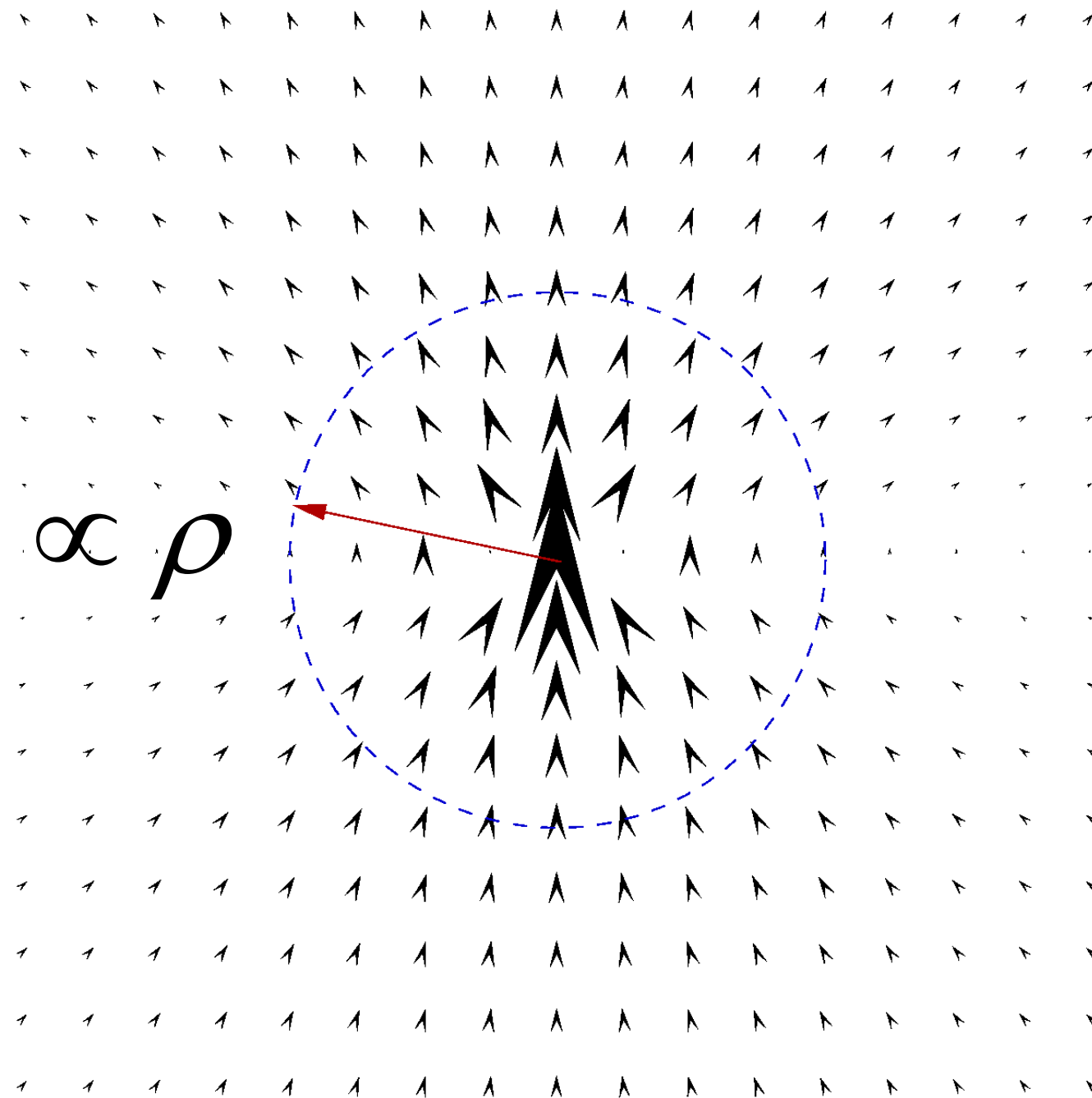


Examples

UPM (Universal Planar Manipulator) 2000

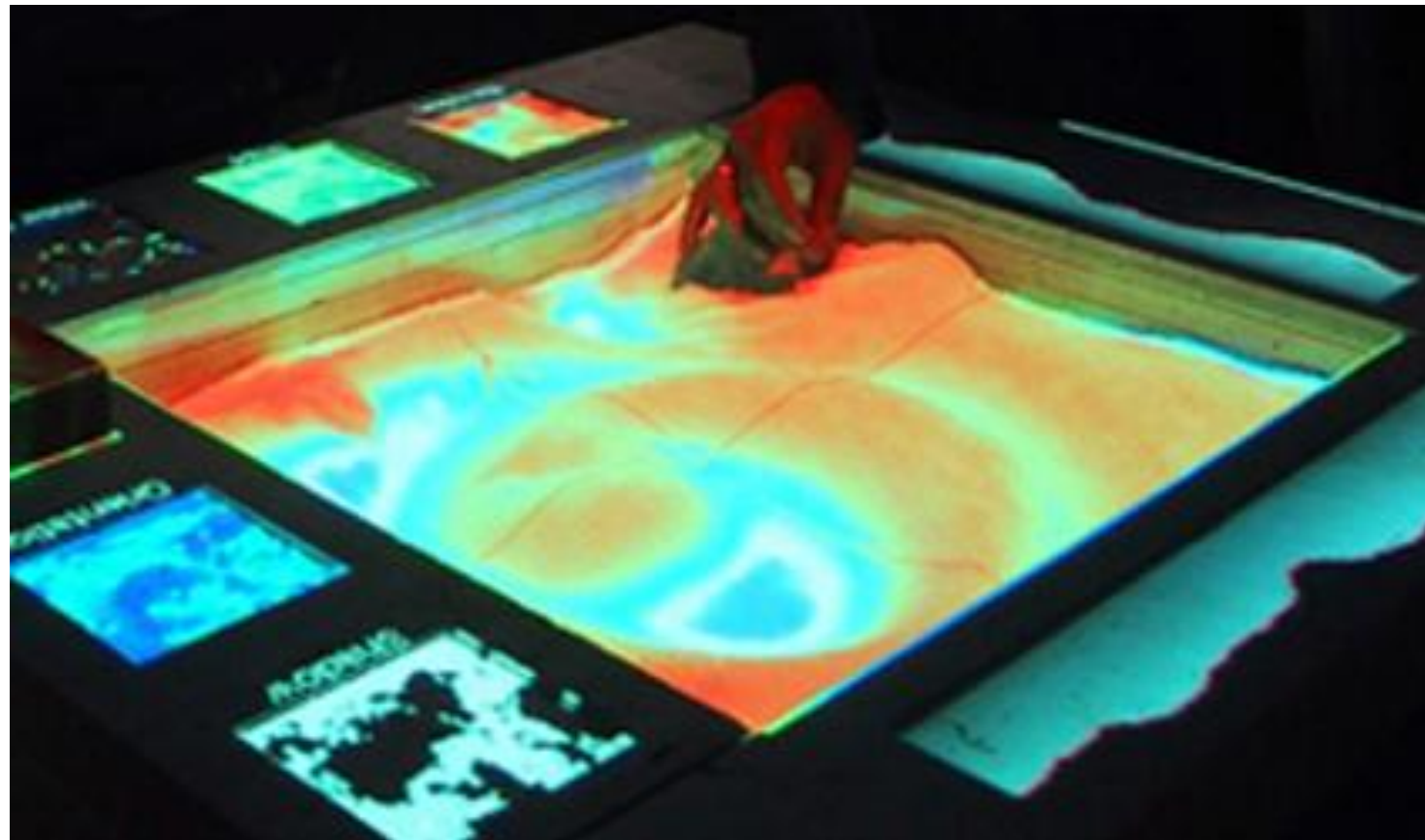


Localized force fields



Examples

Sandscape (2002) – formable shapes



Examples

Topobo (2004)



Examples

I/O Brush (2004)



Disadvantages?

Disadvantages

- Complexity – may need many objects for tokens/containers and even tools.
- Solution?: overload a few objects with different behaviors – like slap widgets.
- Cost – need a lot of functionality in each unit – specialization makes it hard to keep cost down.
- Solution?: leverage other commodity technologies – cell phones, mp3 players, wiimotes etc, and “reskin” them.

Topics

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- Examples
- **A Taxonomy**

Taxonomy

Metaphor Embodiment	None	Noun	Verb	Noun and Verb	Full
Full					
Nearby					
Environ- ment					
Distant					

Embodiment

To what extent is the object's behavior fully “embodied” inside the physical object?

Full

Nearby

Environment

Distant

Metaphor

What does the physical object represent, a thing or an action?

None

Noun

Verb

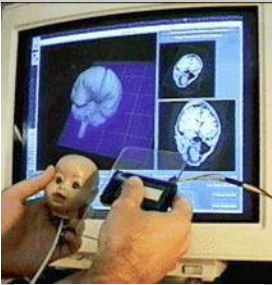
Noun and Verb

Full

Taxonomy



Doll's head

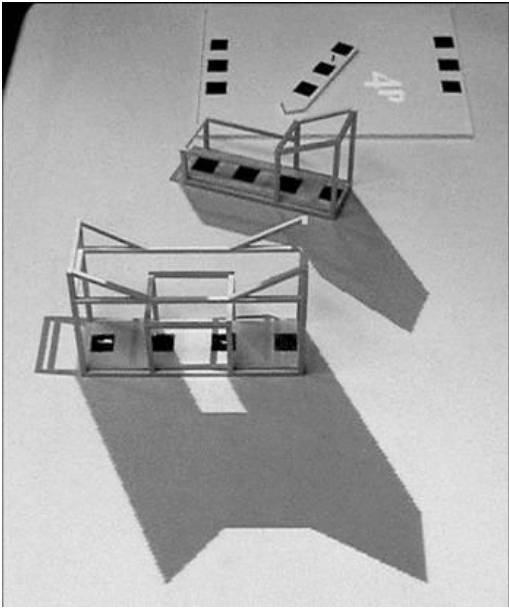
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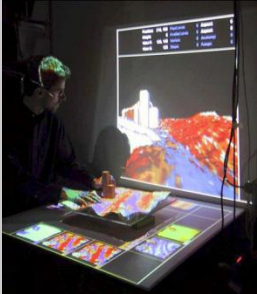
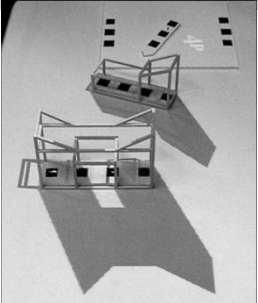
Illuminating clay

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URP

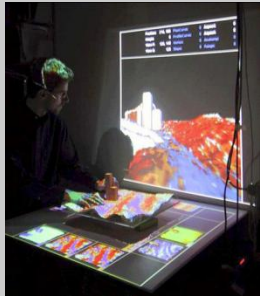
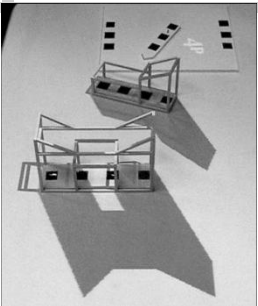
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Taxonomy



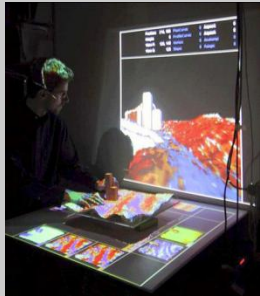
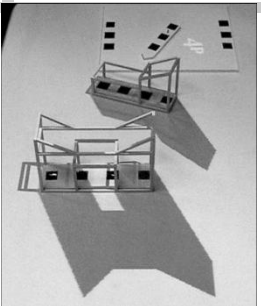
Gummi

Metaphor Embodiment	None	Noun	Verb	Noun and Verb	Full
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Taxonomy



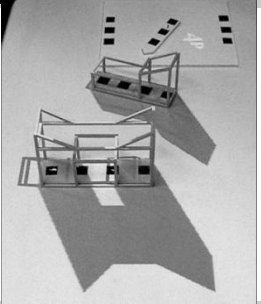
Toontown

Metaphor Embodiment	None	Noun	Verb	Noun and Verb	Full
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Taxonomy



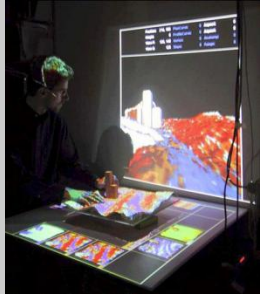
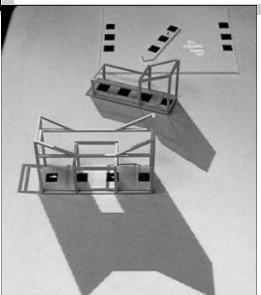
Shakepad

Metaphor Embodiment	None	Noun	Verb	Noun and Verb	Full
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Taxonomy



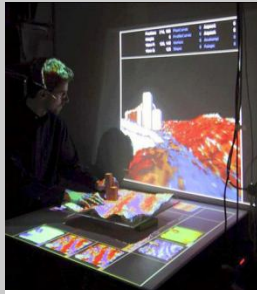
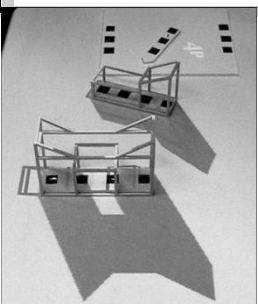
Bitbeads

Metaphor Embodiment	None	Noun	Verb	Noun and Verb	Full
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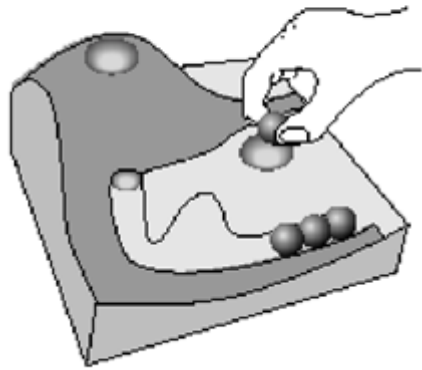
Taxonomy



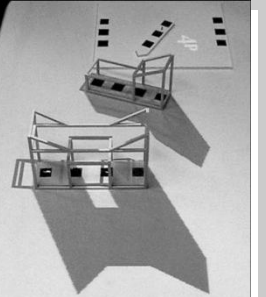
I/O Brush

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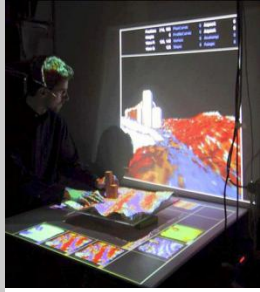
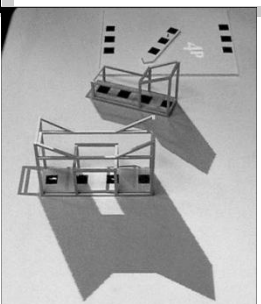
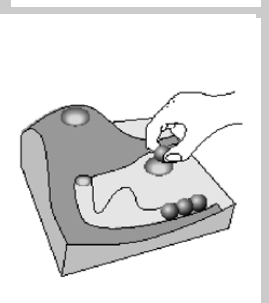
Marble
answering
machine

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Wii

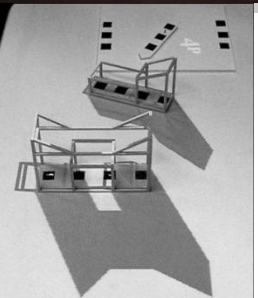
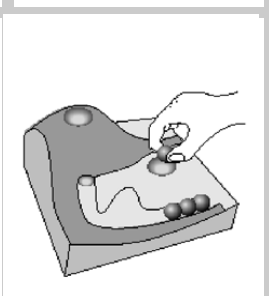
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Curlybot

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Abstracting Craft -McCullough



Summary

Tangibles aim to fully leverage the hand-eye capabilities of people.

TUI designs can be extremely simple to learn and use.

Cell phones are capable of many tangible behaviors (using motion sensing, camera, sound).

But for more complex tasks there is a complexity problem – too many gadgets are needed.

Best examples?