



Interaction styles

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What is an interaction style?

The interaction loop:

Human: perceive/think/act

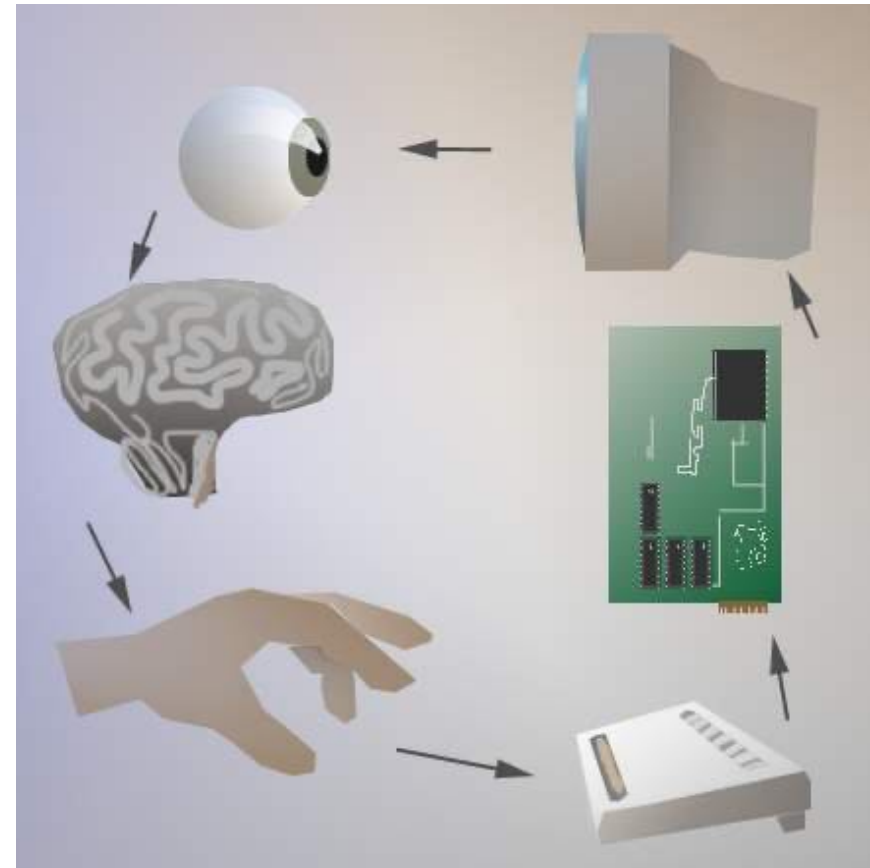
Computer: input/compute/output

Interaction style:

What input is captured?

How is output presented?

What are the internal objects
referenced by input
and presented in the output?



Interaction style: Conversational interaction

Command line interface

Input: Command language

Output: Text

Objects are referenced by name

Example

```
grep -i HCI class.txt | sort | uniq
```

Advantages

Powerful (create new commands)

Fast for experts

Drawbacks

Hard to learn

Dialog imposed by the system



Teletype model 33
(Computer Museum)

Conversational interaction

Renewed interest with natural language interfaces



How are you today, ChatGPT?



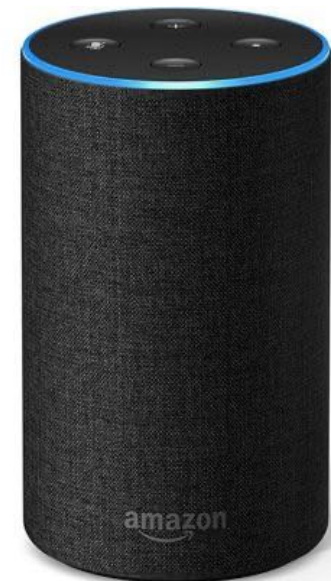
As a language model trained by OpenAI, I don't have the ability to experience emotions like a human would. I am designed to assist with providing information and answering questions to the best of my ability. Is there something specific you would like to know?



What is the Capital of the Klingon homeworld, Qo'noS?



In the fictional Star Trek universe, the Klingon homeworld is called Qo'noS and its capital is called First City. It is the political and cultural center of the Klingon Empire and the location of the Klingon High Council. It is a city of great size and importance in Klingon society.



Alexa

Interaction style: Menus and forms

Guided interaction

Input: select items, enter data in fields

Output: result of command (or other form)

Objects are selectable items
or the results of queries

Most often used to query a large database

Advantages

Guides the user

Easy data entry

Drawbacks

Dialog imposed by the system

Repetitive entry

The screenshot displays the trainline.com search interface, which is a guided interaction form. It features a dark blue background with white text and form elements. At the top, there are two input fields: 'From' with the placeholder 'Enter origin station...' and 'To' with the placeholder 'Enter destination station...'. Below these is a 'Via / Avoid' section with a small icon and a text input field. The next section contains three radio buttons for 'One Way', 'Return', and 'Open Return', with 'One Way' selected. Below the radio buttons are two columns of date and time selectors. The 'OUT' column has a date selector for 'Today' (11-Sep-23) and a time selector for 'Leaving at' (23). The 'RETURN' column has a date selector for 'Tomorrow' (Same day) and a time selector for 'Leaving at' (00). Below these are two more date and time selectors for 'Same day' and 'Next day'. At the bottom, there is a dropdown menu for '1 adult (16+)' with the option 'Add railcards' visible. A large green button at the bottom right says 'Get cheapest tickets' with a right arrow.

[trainline.com](https://www.trainline.com)

Interaction style: Navigation

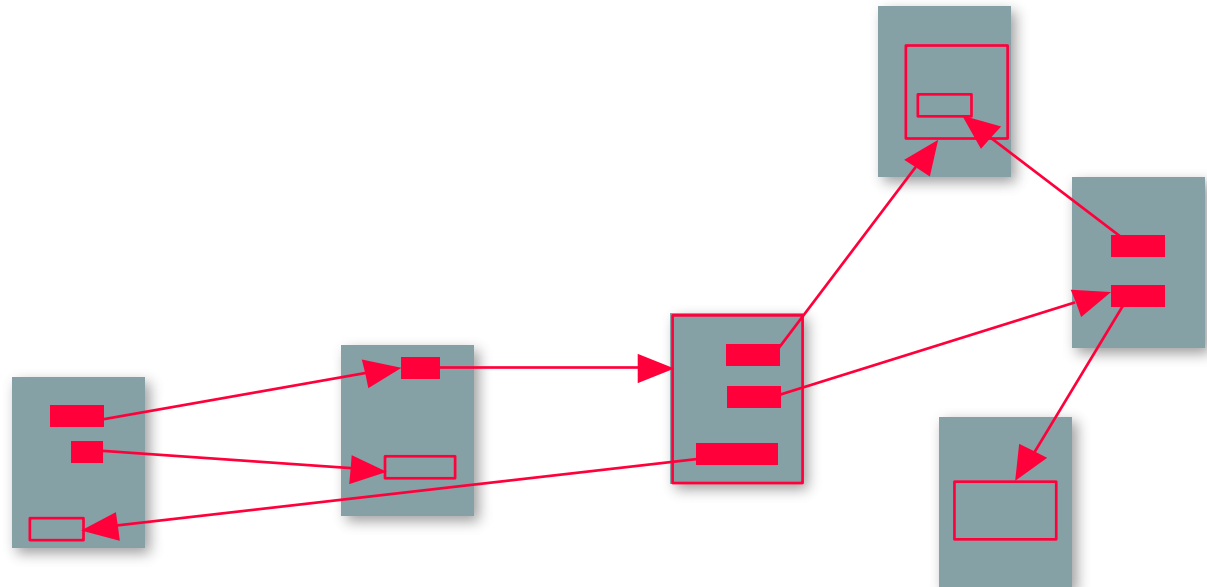
Hypertext / Hypermedia

Input: select link anchor

Output: node (or page)

Objects are the nodes

Example: the Web!



Advantages

Progressive access to large amount of information

Information organized into nodes

Drawbacks

Lost in hyperspace

Where am I? What have I missed?

Navigation

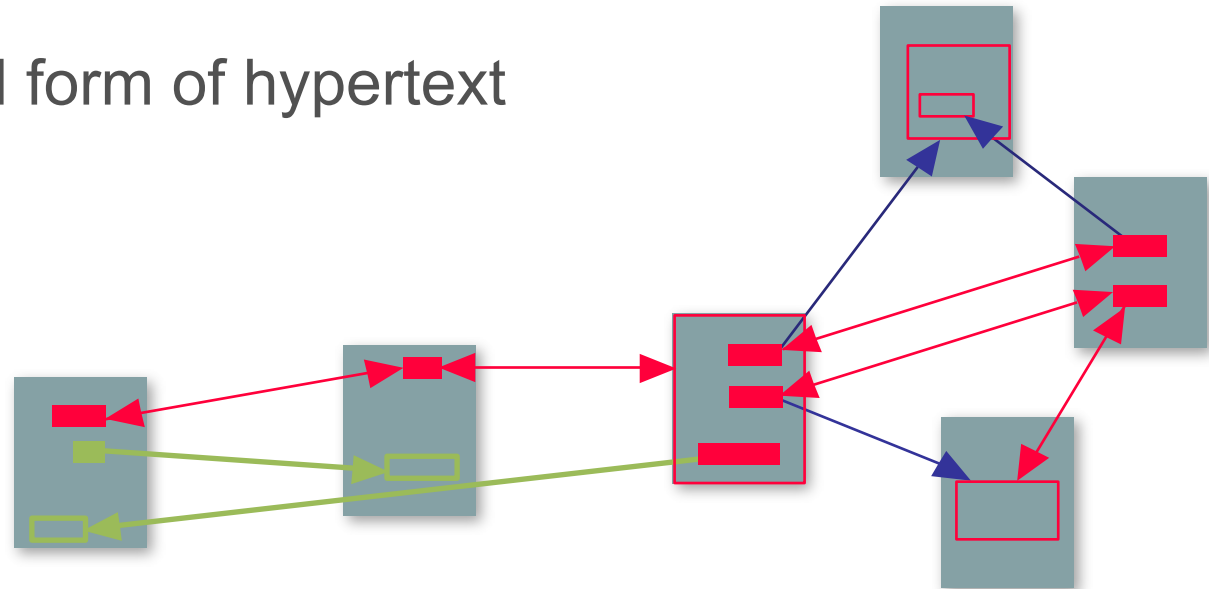
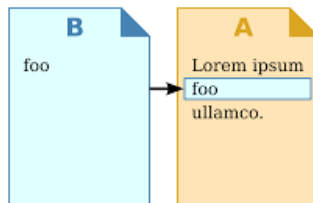
The web is a very limited form of hypertext

Single type of link

Links are unidirectional

No transclusion:

include the content
of the target node
in the source node



Many interfaces combine Menus, Forms and Navigation

Menus and forms to specify a query

Navigation to browse the results

Interaction style: Direct manipulation

Direct manipulation

Input: point-and-click, drag-and-drop objects

Output: objects change state

Objects are represented graphically

The dominant form of interaction

Advantages

User is in control

Builds on physical skills

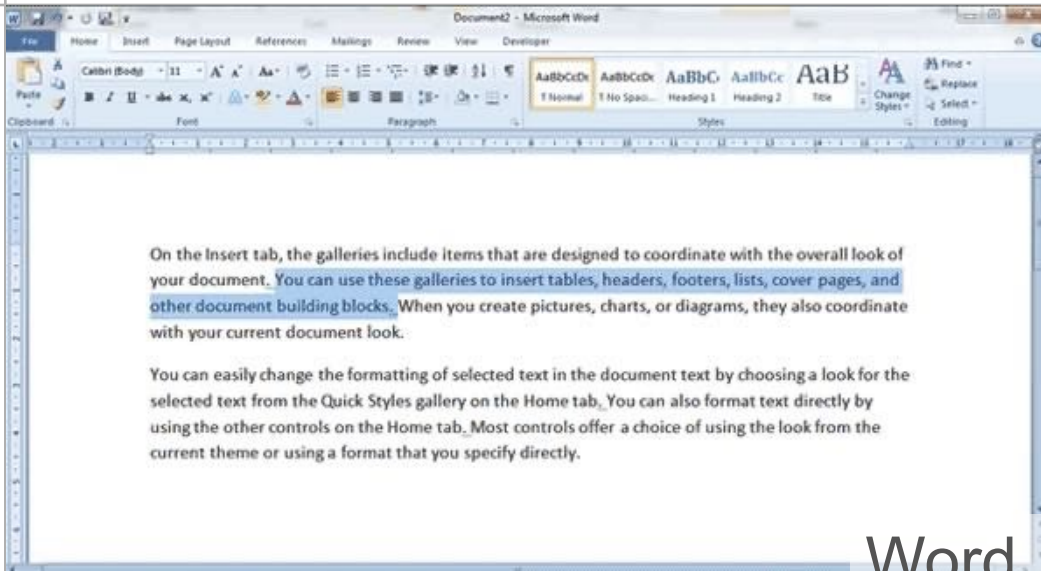
Drawbacks

Can be slow

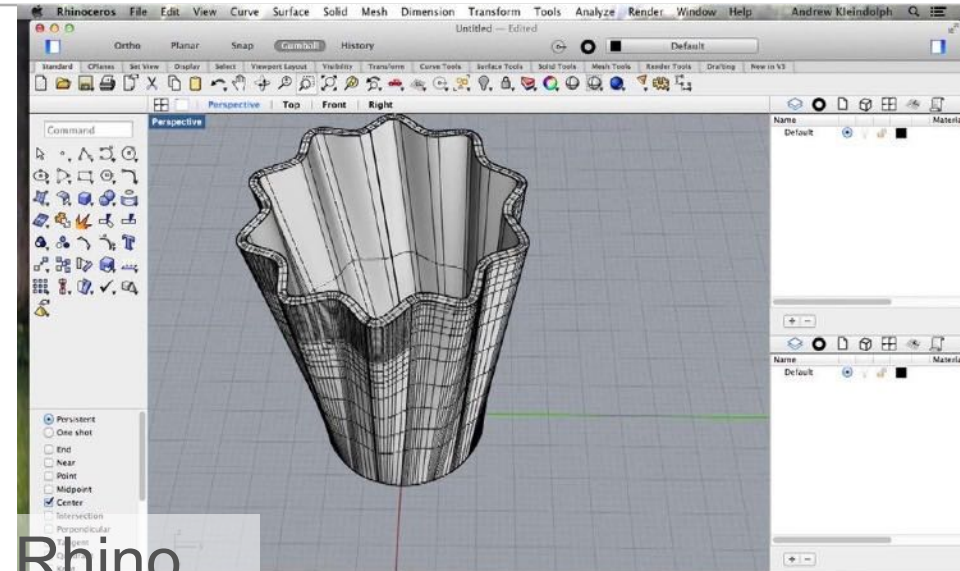
No power of abstraction



WYSIWYG: What You See Is What You Get



Word
Finale



Rhino
Resolve



Direct manipulation

Shneiderman (1983)

Four principles

1. Continuous representation of the objects of interest
2. Physical actions rather than complex syntax
3. Quick, incremental, reversible operations whose effect on the objects of interest is immediately visible
4. Layered approach to facilitate learning

WIMP interfaces: the current standard

Presentation

Windows

Icons (and other graphical representations)

Interaction

Menus,

Dialog boxes, Input fields, Scrollbars, etc.

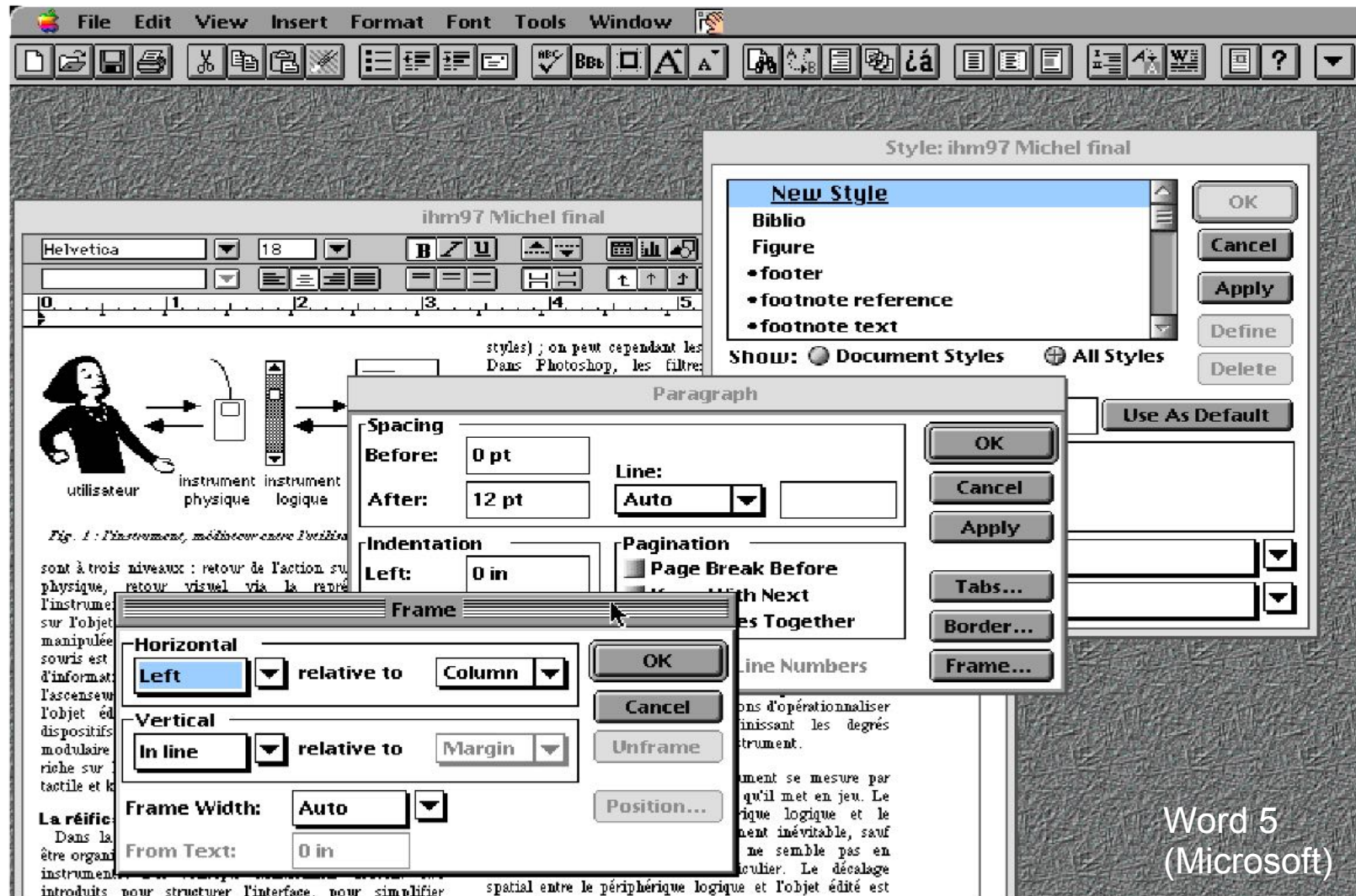
Input

Pointing, Selection, Gestures

GUI - Graphical User Interface

Menus + Forms + Navigation + Direct Manipulation

WIMP interface: direct + indirect manipulation



Gesture input

Richer input for direct manipulation

Marks traced on a surface vs. mid-air gestures

Literal input (a drawing) vs. interpreted symbol

Different types of gestures

Advantages

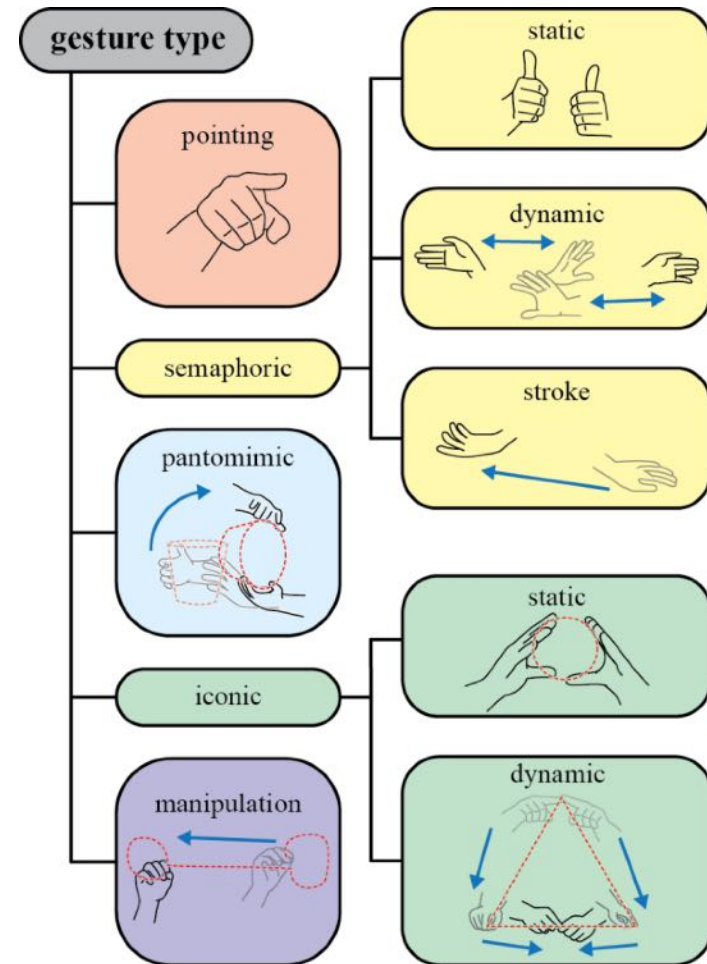
Fast

Expressive

Drawbacks

Hard to discover

Can be ambiguous



Aigner et al.

Interaction style: Gesture-based interaction

Pen-based



PDA (Palm Pilot)



TabletPC (HP)



Whiteboard(Smart)

Touch-based



PLATO (CDC, 1972)



Multitouch (Jeff Han)



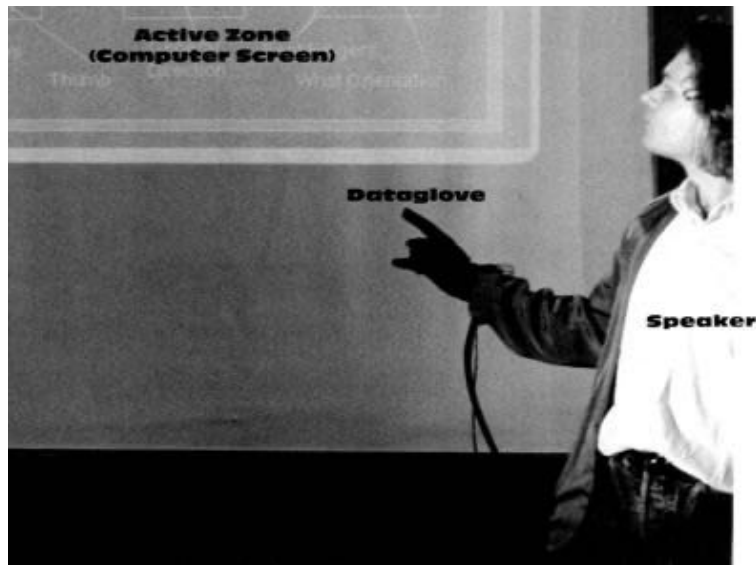
iPad (Apple)

Gesture-based interaction

3D or mid-air gestures



VideoPlace (Krueger, 1983)



Charade (Baudel, 1993)



Kinect (Microsoft)

VideoPlace (Krueger, 1983)



Recognition vs. Recall

Recognition-based interface:

Provides information (feed-forward) about available commands, so the user can recognize them

Example : menus, icons, toolbars, ...

Recall-based interface:

Relies on the user having learned and memorized the commands and/or how to input them

Example : gesture-based interface, language-based interface (speech, natural language, command language)

Interaction style: Multimodal interaction

Combine speech + gesture

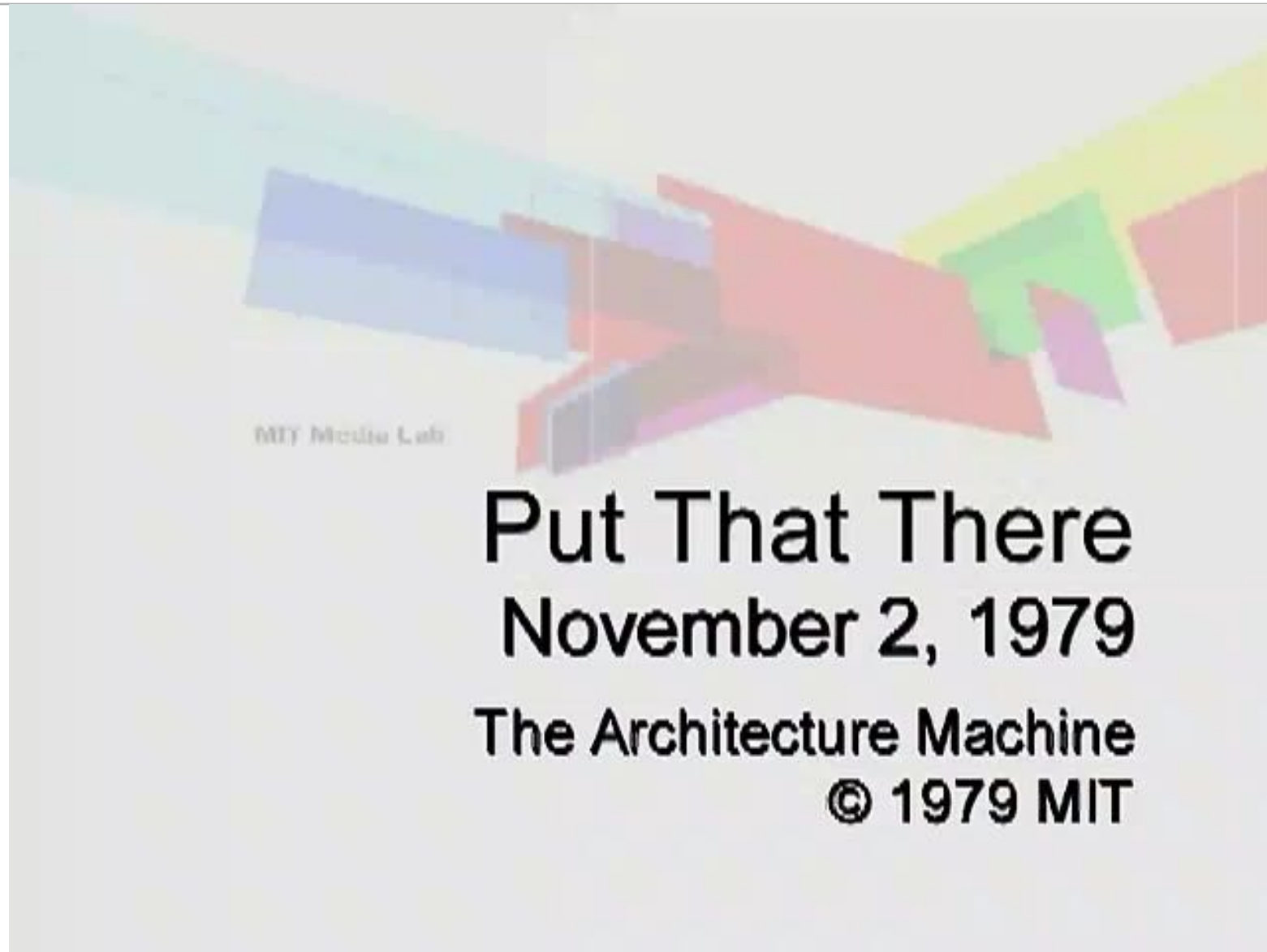


Put-that-there (Bolt, 1980)



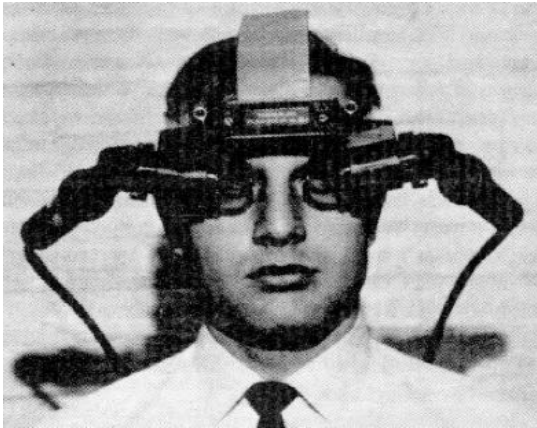
Minority Report (movie)

Put-that-there (Bolt, 1980)

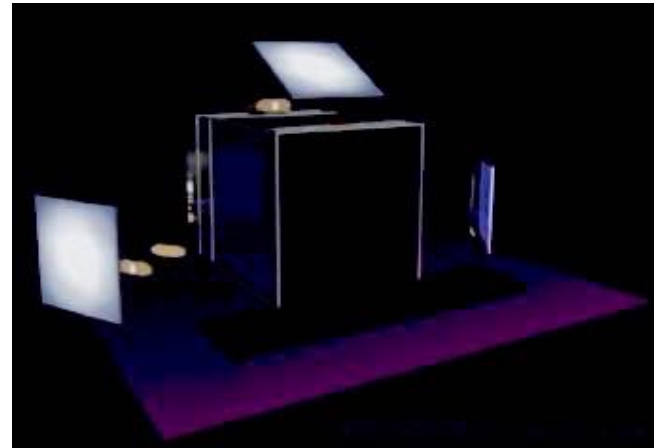


Interaction style: Virtual reality

Immersion of the user



Sutherland (1968)



HTC Vive



CAVE

Interaction style: Mixed and augmented reality

Augmented reality (later renamed Mixed reality):

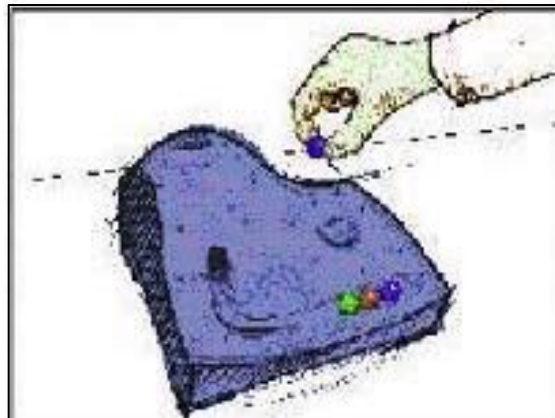
Augment physical object with computational capabilities

Tangible interaction:

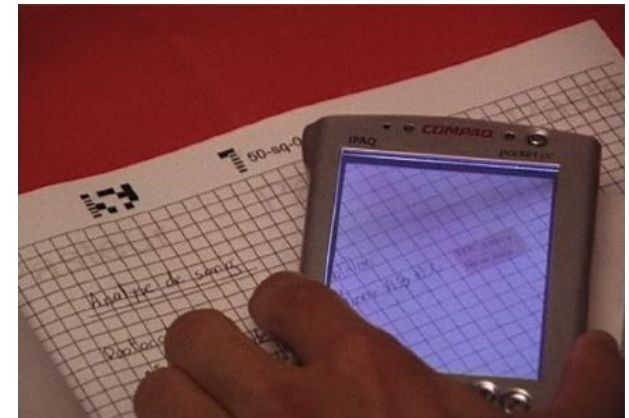
Use physical objects for interaction



Digital Desk
Pierre Wellner



Marble answering machine
Durrell Bishop



A-book
Wendy Mackay

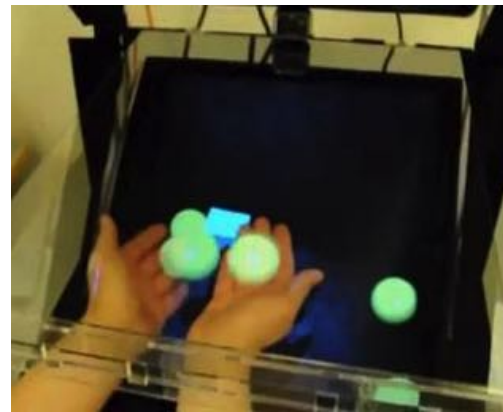
DigitalDesk (Wellner, 1993)



Augmented Reality / Mixed Reality



Wearable group / Thad Starner (1995, MIT)



Holodesk (2012, Microsoft)



ARKit (2017, Apple)

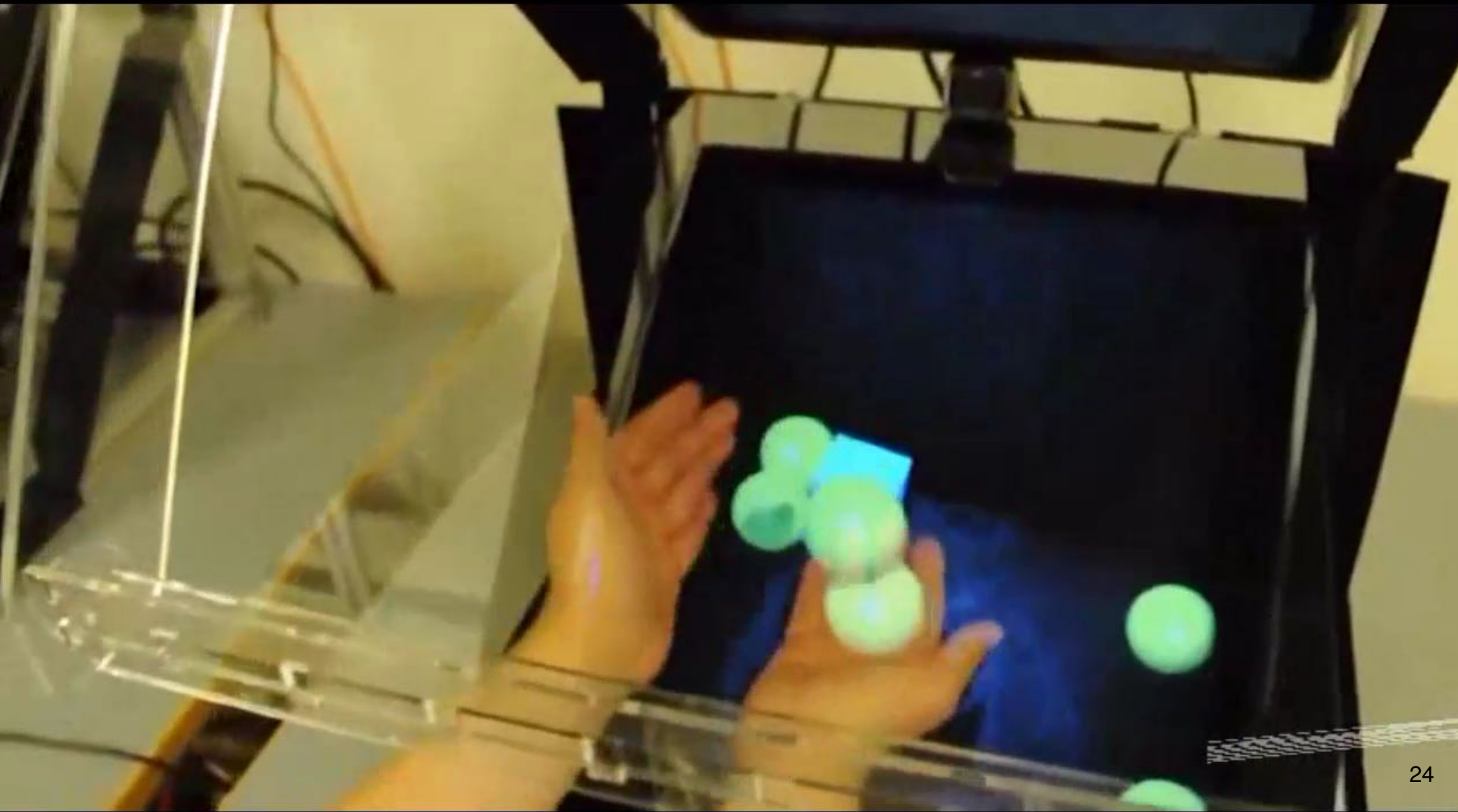


Google Glass (2010)



Hololens (2015, Microsoft)

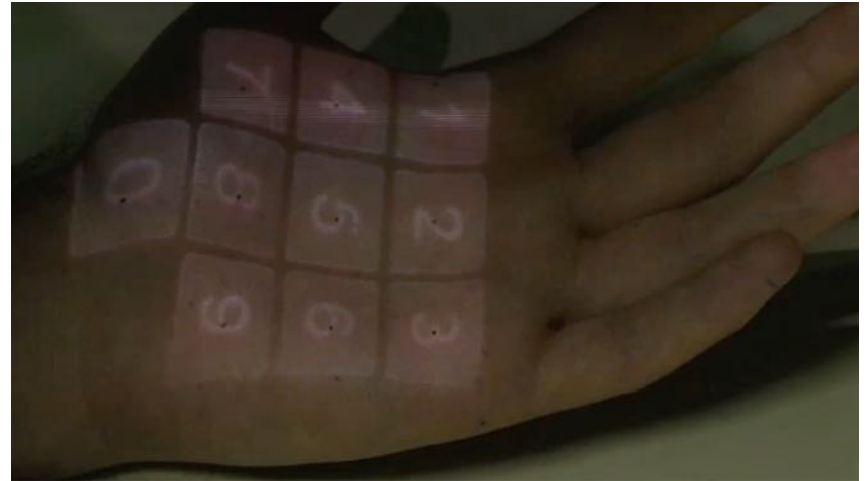
Holodesk (Microsoft, 2012)



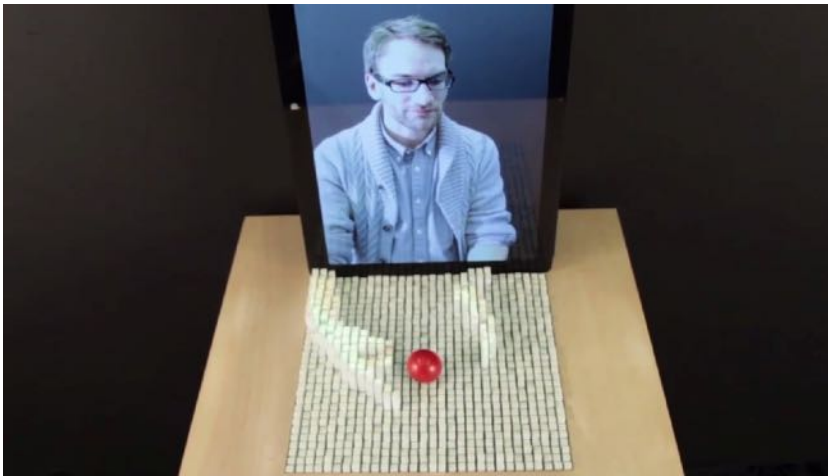
Embodied and Physical interaction



RomAlive (2014, Microsoft)



Skinput (2016, CMU)



InForm (2013, MIT)



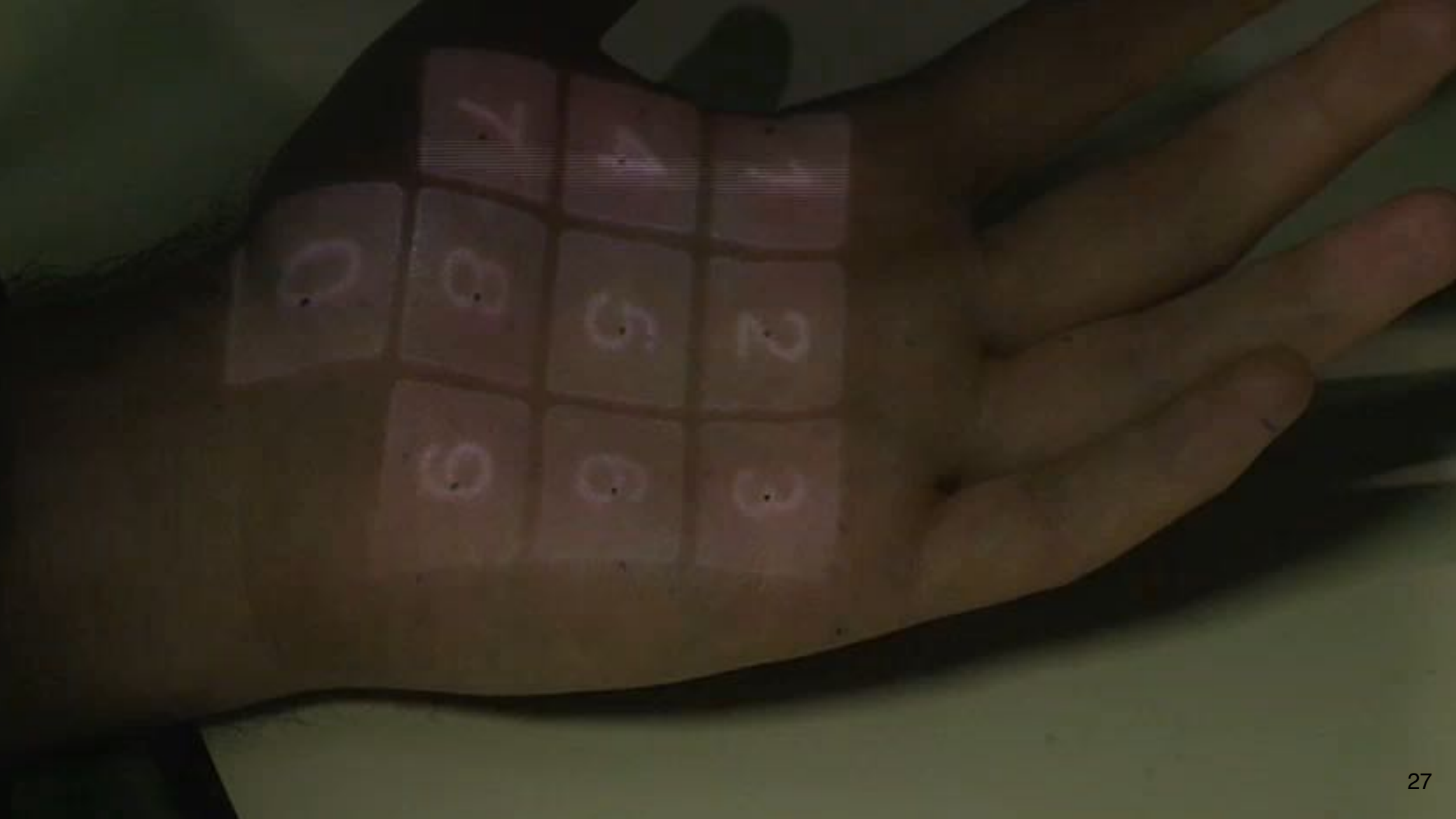
Zoids (2017, Inria)

RoomAlive (Microsoft, 2014)



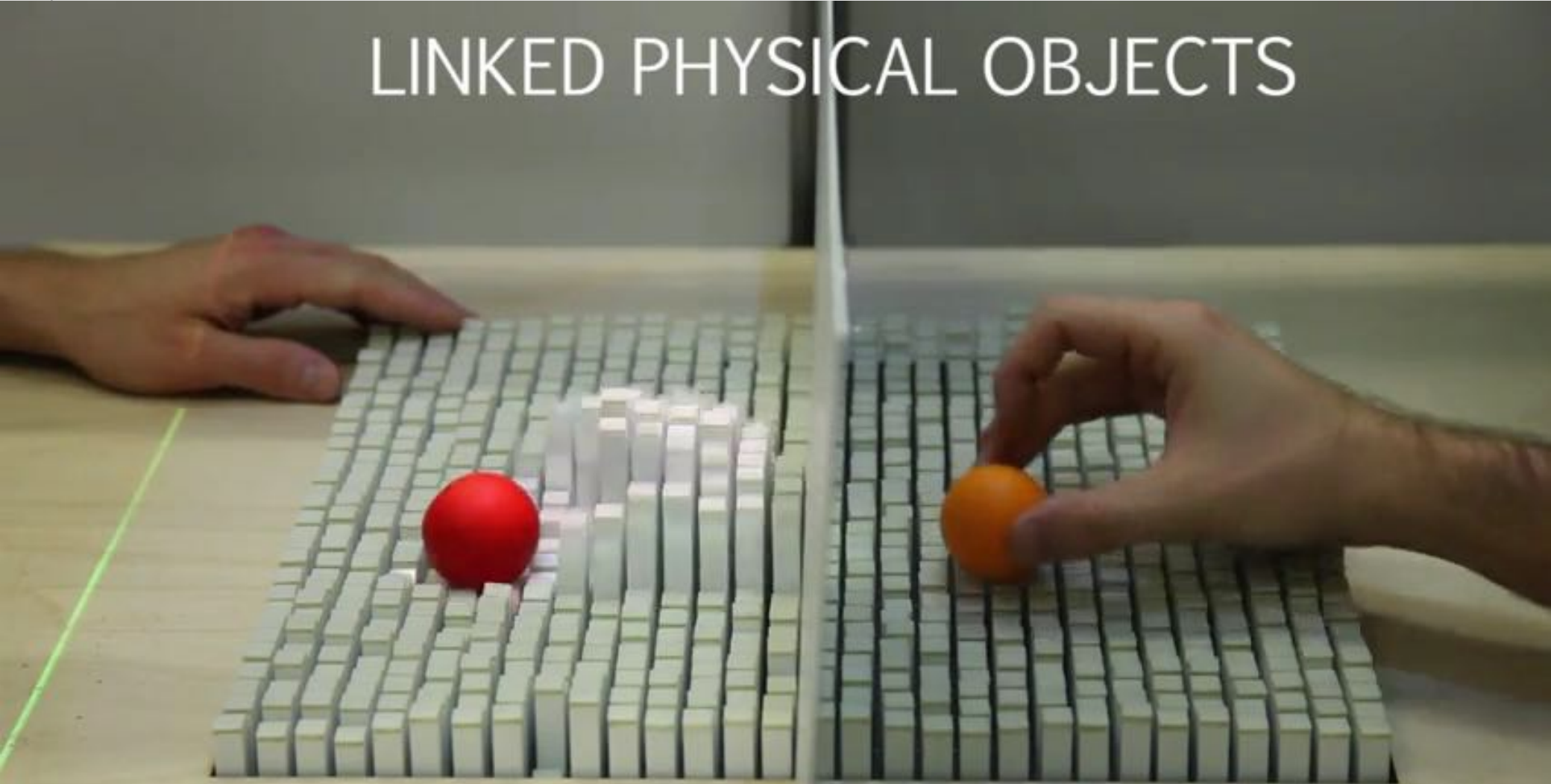
With RoomAlive, users can touch, shoot, and dodge augmented content.

Skinput (CMU, 2016)



InForm (MIT, 2013)

LINKED PHYSICAL OBJECTS



Zooids (Inria, 2017)



Zooids: Building Blocks for Swarm User Interfaces

Mathieu Le Goc^{1,3,4}, Lawrence H. Kim², Ali Parsaei², Jean-Daniel Fekete^{1,4}, Pierre Dragicevic^{1,4}, Sean Follmer²

¹ Inria, ² Stanford University, ³ Université Paris-Sud, ⁴ Université Paris-Saclay

What next?

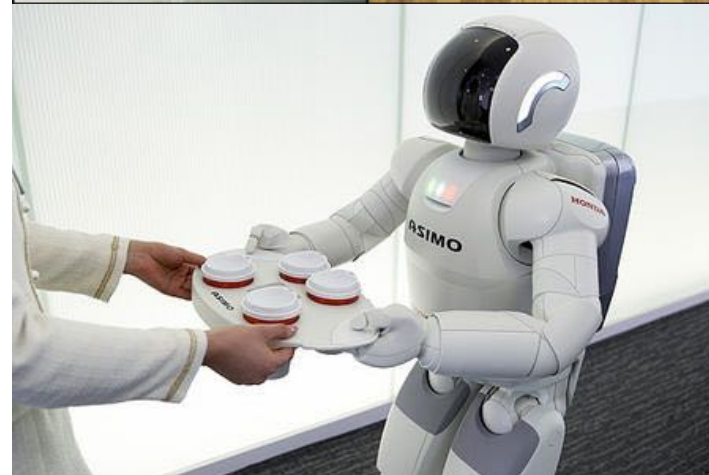
Brain-computer interfaces?



Emotional agents



Robots



Your idea?

What future do you want?



What future do you want?

