Improvisation and Tangible User Interfaces
The case of the reacTable

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Who am I?

• Originally from Southern Switzerland (Ticino)

• BSc. and MSc. in Computer Science and Engineering from ETH Zurich (Switzerland)

• PhD. in Computer Science (2009) from ETH Zurich

• Postdoctoral Fellow at UCSD in Cognitive Science and Computer Science since 2009
Currently at home in Cognitive Science

Distributed Cognition and Human-Computer Interaction Lab

Affiliated with Computer Science and Engineering

Ubiquitous Computing and Social Dynamics Research Group

Collaborations with Calit2, Communication, School of Medicine, Political Science, Psychology, and many universities in the US and Europe
My HCI Research
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Modular Synthesizers
Modern Hardware Synthesizer

Sequential Circuits Pro-One, by Marko Ettlich
Multitouch Synthesizer

Magellan for iPad
Tangible Synthesizer

reactTable, by S. Jordà and M. Kaltenbrunner
What is Different?
reactTable and Björk
What is really amazing about the reacTable is how intuitive and visceral it is. The completely free way that I could access those different aspects of sound and synthesis were unlike anything I had ever experienced before or since.

Demonstrating these capabilities to people who weren’t as geeky as me was brilliant; they could grasp straight away the effects of what they were doing even if they didn’t understand the theory.

Performing with the reacTable allows a different part of the brain to take over, and I found this more primal level of thought constantly led me to find new sounds, textures and experiences over and over and over throughout the whole tour.

The reason Björk wanted the reacTable with us was because it allows the audience to experience and understand electronic music and its performance on a whole new level.

The reacTable somehow allowed me to experience the audience and their response in a very different way to the other instruments in my live rig.

Damian Taylor, live performer in Björk’s 2007-2008 Volta tour
The reacTable
reacTable controls

A: sample player, sounding alone
B: frequency modulator
C: resonant filter, filtering the output of modulator B
D: step-sequencer controlling modulator B
E: sine wave oscillator modulating filter C
F: metronome (only affects A)
G: tonalizer (global), corrects the notes generated by A and B
Demo
reactTable iPad App
Tangible User Interfaces
• Physical representations are computationally coupled to underlying digital information

• Physical representations embody mechanisms for interactive control

• Physical representations are perceptually coupled to actively mediated digital representations

• Physical state of tangibles embodies key aspects of the digital state of a system

• **Tangible Bits:** giving physical form to digital information, making bits manipulable and perceptible.

Hiroshi Ishii, MIT Media Lab, 1997
TUIs affordances

- Social interaction
- Collaboration
- Ludic interaction
- Combine control and representation within a single physical artifacts
- Visualization capabilities enable shared experiences
Direct Manipulation
• Direct Manipulation is defined by the **information processing distance** between user’s intentions and interface facilities

• Directness is a property involving a **relationship** between the user and the task

• Directness is based on the **qualitative feeling of engagement** of effectively manipulating the object of interest

Ed Hutchins, Jim Hollan, Don Norman, UC San Diego, 1985
Ben Shneiderman, University of Maryland, 1982
Direct Manipulation Virtues

- Novices can learn quickly
- Experts can work extremely rapidly
- Error messages are rarely needed
- Users immediately see if their action further their goal
Distributed and Embodied Cognition
• **Conceptual frameworks** that helps understanding interaction between human and the world (e.g. computers and interfaces)

• Extends cognition **beyond the individual** to encompass interaction with other **people, materials and resources** in the environment

• Cognition is delimited by the **functional relationship** among the elements that participate in it, rather then their spatial colocation.

• Cognition is embodied since it arises from **bodily interactions with the world**, and depends from **perceptual and motor capabilities**

• Cognition can not be separated by the **cultural environment** that an individual lives in, which shapes his/her **experiences**

Ed Hutchins, Jim Hollan, David Kirsh, UC San Diego, 1995-2000

A. Clark, University of Edinburgh, 1997
Distributed and Embodied Cognition processes

- Cognitive processes may be distributed across members of a social group
- Cognitive processes may involve coordination between internal and external structures
- Processes may be distributed through time, in such a way that earlier events can transform later events
Improvisation?
References


- B. Shneiderman, "The future of interactive systems and the emergence of direct manipulation", Behaviour & Information Technology, 1(3):237-256


Further Resources

• TEI Conference (Tangible, Embedded and Embodied Interaction): Barcelona, Feb 10-13, http://tei-conf.org (chair is S. Jordà...!)

• Studios Submissions, Student Design Challenge


• MIT, Tangible Media Group: http://tangible.media.mit.edu

• UPF Barcelona, Music Technology Group: http://www.mtg.upf.edu

• These slides: http://hci.ucsd.edu/weibel/talks/mus116_s12.pdf
Björk - Declare Independence