CS-477

Reinventing Interactive Systems

Instrumental Interaction and Co-Adaptive Systems

Course 3: Learning

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Course Outline

	Topic	Exercises
1 April	Instrumental interaction and co-adaptive systems	Deconstructing interaction
8 April	Designing instruments	Idea generation
15 April	Learning	Design ideas & scenarios
22 April	User innovation	Video prototyping
29 April	Collaborative interaction	Generative walkthroughs
6 May	Instrument architectures	Function-interaction tables
13 May	Ubiquitous computing	Alternate scenarios
20 May	Tangible interaction	Alternative video prototypes
27 May	Shifting the design paradigm	Final Presentations
3 June	Final presentations	

What we've done so far

Defined the concept of "instrumental interaction"

- deconstructed interaction
- identified design principles:
  reification, polymorphism and re-use
- brainstormed ideas for instruments

Encapsulating interaction

Encapsulating interaction involves three basic principles:

Reification take an action and turn it into an object that can be manipulated.
Example: action of scrolling can be turned into a scrollbar.

Polymorphism let interactive objects perform coherently with different inputs
Example: copy-pastse object that can handle text, graphics and video.

Reuse capture previous interaction sequences & turn into reusable objects
Example: capture series of paragraph settings, turn them into reusable style

What we'll do today

Define 'co-adaptation' and discuss learning aspects

Discuss readings:

- Kirsh: Interactivity and multimedia interfaces
- Bau & Mackay: OctoPocus: Dynamic Guide for Learning Gestures

Choose three instruments to prototype

- Create initial scenarios

Homework:

- Develop initial storyboard

Three interaction paradigms

Computer as **tool**

First person interfaces

Empower users

Human-Computer Interaction

Three interaction paradigms

Computer as **tool**

First person interfaces

Empower users

Human-Computer Interaction

Computer as **servant**

Second person interfaces

Delegate tasks

Artificial Intelligence

Three interaction paradigms

Computer as **tool**

First person interfaces

Empower users

Human-Computer Interaction

Computer as **servant**

Second person interfaces

Delegate tasks

Artificial Intelligence

Computer as **medium**

Third person interfaces

Communicate

Social media Multimedia

Example: Gesture recognition

AI approach:

Smarter algorithms to recognize gesture, regardless of context

HCI approach:

Better gesture set design so users execute them correctly

Partnership approach:

Users and computers progressively reveal their intent,
back and forth, over time

Human-computer partnerships

Co-adaptive systems

Users *adapt* to a new system
they **learn** to use it

Users *adapt* the new system to their own needs
they **appropriate** it and change it

Co-adaptive phenomena

Similar to the concept of biological **co-evolution**
… but without the DNA

Anaerobic bacteria react to but also change the atmosphere
making it possible for aerobic bacteria to emerge

Users react to but also change spreadsheets
from a simple addition tool
to a tool for exploring 'what if' scenarios

Learning issues

User knows there's a problem?

User knows how to ask?	Yes	No
Yes	Reference material	Tutorial
No	Scripted instruction	???

Today's readings

Kirsh, D. (1997)
Interactivity and multimedia interfaces.
Instructional Science 25: 79–96.

Bau, O. & Mackay, W. (2008)
OctoPocus: A Dynamic Guide for Learning Gesture-Based Command Sets.
In *UIST'08, Proc. ACM Symposium on User Interface Software and Technology* pp. 37-46.

Kirsh, *Instructional Science*, 1997

Interactivity and multimedia interfaces

Learning via exploration vs. following a script

Types of interactivity

- object ⟷ object
- person ⟷ system
- person ⟷ object
- person ⟷ person

Plan-based decision cycle vs. situated learning

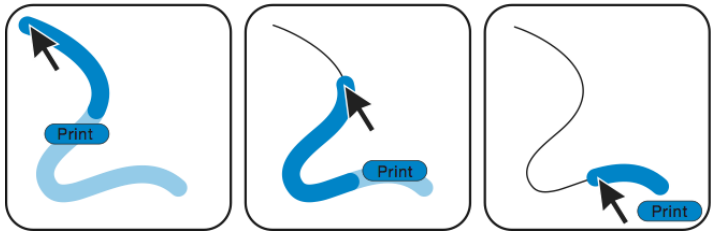
- Preparation (seeding opportunities)
- Maintenance (addressing clutter)
- Complementary actions (reconstruction)

Bau & Mackay, *UIST* 2008

OctoPocus: A Dynamic Guide for Learning Gesture-based Command Sets

Dynamic partnership:

Progressive algorithms that reveal intermediate recognition



Bau & Mackay, *UIST* 2008

OctoPocus: A Dynamic Guide for Learning Gesture-based Command Sets

Interaction streams and dynamic guides

Feedforward User's current options:
How to draw gestures and commands

Feedback User's recent actions
How system interpreted current input

Designing co-adaptive systems

That help users to **learn** new technology
… by adding dynamic feedback
… by adding in-context feedforward

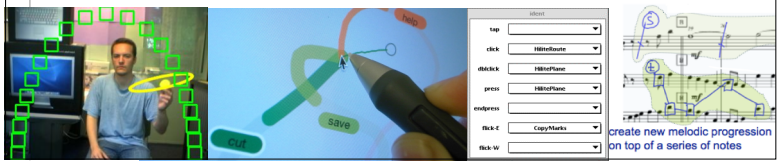
That help users to **appropriate** new technology
… by providing hooks for customization
… by providing flexibility in the face of change

How to help users to better „„

understand what the computer is doing

communicate what they want

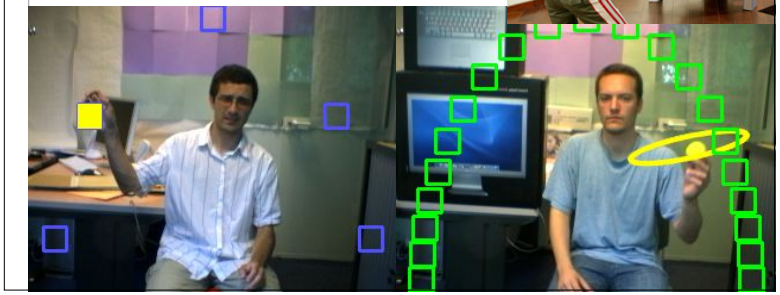
modify how the computer reacts



Object tracker: Gesture recognition

Sony's Eyetoy

Provide users with real-time feedback
User helps guide recognition
by the computer



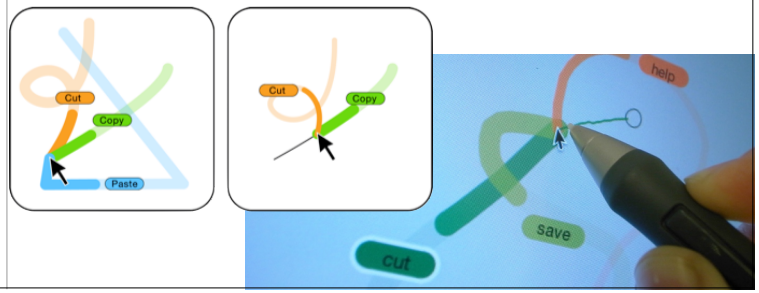
Octopocus: Learning complex gestures

Experts *just do it*

Novices *hesitate* … which activates

feedback to show what the recognizer sees

feedforward to show current available gestures

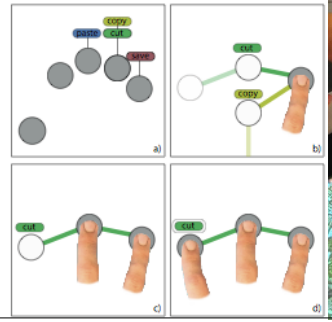


Arpege : Learning chords on a multi-touch surface

Beyond one- and two-finger gestures :

novice to expert transition

feedforward and feedback



Exercises

Previous exercises:

Design notebook	Record instances of observed interaction: yours and others
Deconstruct interaction	Break down interaction into components
Design principles	Encapsulate interaction via reification, polymorphism, reuse
Brainstorming	Generate maximum ideas in limited time, avoid criticizing
Paper prototype	Create tangible example and show interaction
Video brainstorming	Video interaction ideas, one director, theme & variations
Today:	Choose three co-adaptive instruments
Design space	Categorize ideas along dimensions, populate with ideas
Design scenario	(Extreme) characters in a series of real-world actions using new technology. Positive and negative results
Storyboard	Illustrate scenario, step-by-step, for video prototype

Course exercise

Video prototype a co-adaptive instrument (or suite)

for real users

range of expertise, within and across users

on different platforms

multi-surface, tangible

addressing different situations

collaborative

distributed

Video Prototype three co-adaptive instruments

Sample instruments to explore:

1. Creativity: Help musicians express musical ideas
2. Navigation: Help dislexics find and spell words
3. Procedures: Help emergency staff follow checklists
4. Communication: Help people stay in touch

Creating scenarios

Create a realistic account,
ideally grounded in real-world observation of users,
of a series of activities that
illustrate and challenge the use of a new tool

Goal: to help you think through interaction issues
NOT to 'sell' the prototype

Techniques:
Extreme users
Theme and variations
Breakdowns

Homework

Next week's readings:

Tsandilas, T., Letondal, C. and Mackay, W. (2009)
MusInk: Composing Music Through Augmented Drawing.
In *CHI'09, Proc. ACM Human Factors in Computing Systems*, pp. 819-828.

Nardi, B. and Miller, J. (1991)
Twinkling lights and nested loops: Distributed problem solving and spreadsheet development
International Journal of Man-Machine Studies 34: 161–184.

Activity:
Create a full scenario for a basic instrument