Shared interactions beyond the desktop

How new interface types can support sociable user experiences

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How can novel interfaces and interface technologies support social and shared experiences?
Overview

• Background: Developing a Framework/Model for Shareability
  – Embodied Facilitation (TI framework CHI'06)
  – Shareability - access and entry points (DPPI '07)

• Case Studies
  – Tabletop study: Effects of Access Points on Awareness and Equity of Participation
  – Case Studies of Shareable Interfaces (and more background theory)
    • Museums, Musical Improvisation, Urban Media-Façade Interventions
Shareability

A design principle

how a system, interface or device engages a group of co-located users in shared interactions around the same content (or object)

(abstracts from specific technology)

Need for knowledge on how to support sharing

Shareable Interfaces

provide multiple inputs and support interaction by a group of users

support people working, learning, playing, and discussing together, focusing on the same content while physically co-located and co-present
Entry Points
Invite people into engagement with group activity and entice to interact

Access Points
Enable users to actually interact and join a group’s activity

Diagram:
- Entry:
  - Honeypot Effect
  - Minimal Barriers
- Access:
  - Perceptual Access
  - Manipulative Access
  - Fluidity of Sharing
- Overview

Intersection:
- Overview
  - Perceptual Access
Honeypot & Progressive lures
Drawing people in
Series of promises and rewards
Observing other people acting
congregate in vicinity
Stages of engagement

Points of prospect and overviews
See what space contains. What
can you do? (and why?)
Visibility in context and from
distance

Minimal Barriers
Physical, aesthetic barriers, illegibility ...
 Appropriateness for user group, time and opportunity to interact
Perceptual Access
Cues: body movement, feedthrough, object changes....
Observability & Legibility

Manipulative Access
Who can interact and when?
Number & type of input
Location of input, Size and form
Ease of acting

Fluidity of Sharing
Ease of switching roles or interleaving actions - handovers (of object, action, control), shared ownership
Stages of Interaction - 3 step approach
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Shareable Interfaces – Part of a longer standing research agenda
Shareability – builds on TI framework on physical space and social interaction

- Tangible Manipulation
- Spatial Interaction
- Embodied Facilitation
- Expressive Representation

Hornecker & Buur, CHI 2006
Relevant Themes

• Spatial Interaction
  - spatial nature of tangible interaction setup, consequences of interaction occurring within space, ability to engage in full-body interaction

• Embodied Facilitation
  - highlights how physical, spatial, and programmed configuration of system affect group interaction patterns
  - Physical (and software) design defines structure that facilitates, prohibits or hinders actions, allowing, directing, and limiting behaviour
Spatial Interaction

Can everybody see and follow what’s happening?

Perceptual Access

Can you use your whole body?
Bodily interaction is enlivening, expressive, observable, performative.

Can you communicate through your body movements while doing what you do?

Flip: ‘Actors enhancing legibility of actions for other’s perceptual access

Are actions publicly available?
Embodied Facilitation

Can all users get their hands on the central objects of interest?  
Can you hand over control anytime, and fluidly share an activity?  
Access points!  Fluidity of sharing

Does the representation build on users’ experience and connect with their skills?  
What is the entry threshold for interaction?  
(Can you provide a simple syntax of interaction regardless of the semantics?)

Embodied Facilitation > (Multiple) Access Points
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Embodied Facilitation > Tailored Representations
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Embodied Facilitation

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Embodied Facilitation

Related to Honeypot effect + Perceptual Access (F-formation idea)

Does the physical set-up lead users to collaborate by subtly constraining their behavior? 

Is there a physical focus that draws the group together?
Relation of the two frameworks/models

- TI framework focuses on representations and interaction modalities
- Entry & Access Points model ignores these, focus is on the trajectory of interaction
  - But includes some aspects from TI framework (multiple access points, lightweight interaction, visual/perceptual access)
- TI Embodied facilitation theme includes enforcing collaboration
- E&A model concerned with encouraging and enabling collaboration
Generating more detailed research questions

How do number and type of access points affect group interaction?

What exactly are the effects?
Can we operationalize access points?

Tabletop study with varying input conditions

Device: MERL multitouch table

allows multiple touches and distinguishes people

TASK:
Floor plan seating allocation
Mice
Effects on perceptual access (visibility, legibility)?
Different type of manipulative access
How to measure Awareness?

Comparative Experiment (Multi)Touch vs. (Multi)Mice

3 types of Awareness Indicators

• Positive: Awareness presence
  – Awareness helps achieve coordination, anticipation, mutual help

• Negative: Awareness absence/lack
  – Breakdowns of coordination:

• Or people investing effort to maintain awareness!
  – Awareness work
Fluid interaction
handover without words
Fluid interaction
handover without words
Fluid interaction
handover without words
Fluid interaction
handover without words
Negative awareness indicators
1. negative interference between users' actions
Findings

Unexpected
  Negative Indices: more interference w. touch
  More effort: more verbal shadowing w. touch

As Expected: Positive Indices
  More implicit reactions/assistance w. touch
  More handovers w. touch

How to reconcile?
Re-analysis and Re-coding

1. Interferences result only in slight glitches and are quickly resolved (often nonverbal)
2. Most groups resort to sequential interaction with mice
   Touch encourages more dense interactions

-> notion of fluidity of interaction
   Fluid role swapping and shifting of control
   Simultaneous activity, people do not try to avoid interferences but just do it...
Manual Equity of Participation

Do more access points and touch interaction ease access and increase participation?

Index of inequality (Hiltz et al.)

0 = optimal equity, 1 = absolute inequality

[Graph showing mean index of inequality for Single Mouse, Multiple Mice, Single Touch, Multi-touch]
Case Studies of Shareable and less shareable Interfaces

- How the physical structure of the body and the orientation of multiple bodies in a collaboration interact with the technology set-up
- Differences in interaction patterns and user experience that result from physical setup and interaction mechanisms with identical content
- Rich ecologies of (social) interaction around 'open systems'
- Limited access points are not always negative
- Role of tangible access points for negotiation of control
- Interaction and Spatiality
- Moveable versus static input interfaces
But what role does the body play?
Early Study: Technical Museum Vienna

Groups vs. solitary usage
Sharing activity

Like being active (not info push)
Creative appropriation & challenge
F-formation Theory as Inspiration for HCI

Is there a physical focus that draws the group together?

Being able to
- surround the installation
- see what each other is doing
- have a shared focus of attention

Size of space affects potential size of group

Installation design can create this space
Theory Background: Adam Kendon on Spacing and Orientation: F-formations

O-space: shared space that all are oriented to, actively maintained

P-space: 'holding area' for bodies and objects

R-space: buffer zone
Kendon: Different types of configuration

Face-to-Face: relationship focused
(greetings, fights)

Side-by-side: shared focus in outside world
(compromise with attempt for mutual awareness in conversation)

L-Shape: disembodied, abstract topic

Use of F-formation theory in HCI

Tracking bodies and devices

F-formations in HCI ethnography and design

Tourist Office Study
- “Quick and dirty” scoping study
- Focus on joint decision making and information sharing

➢ Found very little joint decision making for groups larger than 2
➢ Influence of the physical environment!

Spatial Configurations

At the Counter
• No more than 2 talk to staff
• Others excluded, leave

Around the Center
• Groups split up and forage
• One person often goes to the counter
• reports back the plan
• Gathering around wall display
Designing FOR F-formations

- built and installed an interactive table software for the tourist information center for families to plan their day
- Placed in tourist office for several weeks in-the-wild study

Social Encounters in the Museum Space

- Investigating what makes good museum installations that engage visitors
- Museums a good testbed for understanding what makes interaction engaging and fun, what sparks conversation and understanding
  - Interesting setting: inherently social
  - Multiple, conflicting goals (entertainment, education, ... cognitive + emotional learning)
  - Often at forefront of utilizing novel interaction mechanisms in public spaces
Case Study: Jurascopes
compare differences in interaction patterns and user experience that result from the physical setup and interaction mechanisms.
Contextualized display – Carefully aligned, positioned, looking out over the skeletons
Immersive but solitary
Solitary immersion

- “more direct”
- being inside the story
- But – can’t be shared, no cues about what others see

Communication attempts unsuccessful, no reaction

Parents can’t facilitate children’s experience
(help, scaffold, explain)
essentially social and shared experience
Crowds – watching, commenting, scaffolding, negotiating selections
Some cross-group conversations
Children showing off their knowledge
Children interacting with dinosaurs
- teasing, play
"bite me, bite me"
Allosaurus animation starts.
Child3 recognizes it and comments: ‘Oh, cool, wicked’.
Dinosaur starts biting into a piece of meat (a thigh) on the ground.
Child3 expresses pity for dead animal: ‘the poor one’.
A man explains: ‘it feeds’
Child1 picks up theme of pity: ‘poor little dino’.
Allosaurus seems to discover the observers, approaches them and roars.
Child1: ‘Is it angry’?
Child 2: ‘the small one’?
Child1: ‘and now it eats us up’.
Child3 assures: ‘No’
Rich Ecology of Interaction
AROUND the system

Commenting, narrating, enacting scenes
Directing children's attention: ‘watch now'
Adults adding context, explaining, abstracting: ‘it defends its territory'
Verbal enactments ‘Yum'
Emotionalizing scenes: ‘Poor one'
Tangible Externalization of Control
Emerging Physical Configuration:
3D-half-circle – A honeypot effect attractor
Insights

Screens turned out to have richer ecology of interaction
  Supporting shareability and co-experience
Tangible and Embedded Interaction Design
  need to consider the overall setup to create rich interactions around the system
Interactivity a property of users (not systems...)
Tangible control supports negotiation of use
  (Limitation to ONE access point here useful)
The ARK- Painting Patterns for Nature (Loraine Clarke, University of Strathclyde)
Physical Resources for Planning Activities as a Parallel Process

Setup gave bystanders in group good visibility
Supports rest of group to discuss what to do next
Cards as a resource for discussion and negotiation
Painter undisturbed
Glen Douglas Steam Engine Installation, Riverside Museum Glasgow

Museum installation that cannot be used alone
- explicitly requires a group to coordinate action
- Realizing this is the point of the exhibit!
Not explicitly communicated, but people get it after failing to get the engine running...

Clarke and Hornecker. ACM CHI 2013 WiP
Spatial distribution of displays and manipulation elements

Station 1
Coal Display

Station 2
Pipes that light up
Pressure Display

Mechanical Physical Model

Non-interactive screen displays & audio output
Urban HCI

How spatial configurations effect experience and social interactions

With Patrick Tobias Fischer

Media façades
Urban behaviour patterns
Interplay with architecture & urban design

Fischer and Hornecker,
Urban HCI: Fostering ‘Shared Encounter’

[...] the interaction between two people or within a group where a sense of performative co-presence is experienced and which is characterized by a mutual recognition of spatial or social proximity (Willis 2010).

[...] a digital encounter is an ephemeral form of communication and interaction augmented by technology (Fatah gen. Schieck 2010).

A new agora
Street art style
Public messages
ReClaim the Screens
SMSlingshot as research instrument
Very First System Version: spread.gun

Split into 2 fixed stations: typing messages + shooting with canon

Effect: people line up, queue

SMSSlingshot aims: more flexible, guerrilla-like, smaller, portable, less static structures and with more expressive gestures
Selection of Situations

Madrid 2010
- LED Media Facade 14.5x9.5m
- Plaza Size 25x10m

Liverpool 2010
- Projection 21x13m
- Plaza Size 25x11m

Marseille 2011
- Projection 10x13m
- Plaza Size 30x18m

Media Facade Europe
Connected Cities
Music Festival
Plaza

- People have more time, want to relax
- Might need more narrative

Walkway

- Constant flow of people
- ad-hoc, shorter interactions
Potential Interaction Space
Potential Interaction Space
Social Interaction Space
Social Interaction Space
Media Façade

Activation Space

Comfort Space

Gap Space

Social Space

Interaction Space

Potential Interaction Space

Display Space
Physicality and Embodiment

- Untethered device – hand-overs
- Metaphor of slingshot easy to grasp
- Bodily experience of throwing
  - Slightly subversive, evokes feelings of unruliness, childhood play, playfool rebellion
  - Shooting is satisfying
- Typing is local, half-private
- Shooting is an expressive embodied action, public & performative
Concluding Thoughts

- Examples from variety of Activity Areas
- Museums, planning tasks, musical improvisation (jamming), Urban Art installation
- Adults and children

- HCI / Interaction Design needs to learn from (urban) sociology, architecture, urbanism, facilitation methods, kindergarden play methods etc.
- Lots of concepts and knowledge out there...
Need to learn about Spatiality

• Spatial configurations of technology and architectural design influence social interaction patterns
  – Is there ‘space’ for people (their bodies)?
  – Is there shared focus?
  – Is there space for more people? (Obstruction of line of sight)
  – Design with emerging configurations of people in mind!
• Rich (social) interaction can emerge around a simple system... design for interactive users!
• Human territoriality is fluid and self-regulated
  – do we need to automatize it?
Interaction Modalities Influence

- The visual access to ongoing activity
  - Easier/harder to join in
  - Effects on joint awareness – how fluid is collaboration, how fixed do roles need to be?

- Provide different affordances that affect amount of control (or how easy to negotiate control)
  - Where it is more difficult to remain in control, negotiation of control is harsher! (children)
  - Movable interfaces can support shifts of control (distribute activity, reduce threshold to interact)

- Physical interaction can increase performativity
  - Increased visibility (creates social control)
Questions?