Examining User Experience in Multi-Display Environments

Teddy Seyed
Agile Surface Engineering Lab, Interactive Reservoir Modeling and Visualization Group
University of Calgary
Overview

1. Background
2. Motivation
3. Research Goals
4. Elicitation Study
5. Discussion
6. Contributions
Multi-Display Environments

“...A spatially aware environment where interaction is distributed over several different devices...”
Interaction Approaches

Physical Approaches

Gestures & Proxemics

GUI-Based
What does this all mean for UX professionals?

• Lots to draw upon for interactions/new systems, however...
What is UX about?

- Building **usable** and **efficient** systems and interactions
- Examining how users use a system, mental state when using it, as well as its utility
- Techniques used include **prototyping**, usability testing, interviews
Challenges for UX

• What tasks are suitable for multi-display environments?
• How should applications, tasks, content be distributed among and across the different displays?
• How should users move applications and content across different displays and devices?
Motivation

Lots of prior research into multi-display environments and interactions, but conceptual models of interaction don’t necessarily match user mental models.
Mental vs. Conceptual Model
Mismatch challenges

- Interactions can be difficult to learn or understand
- Different users can have different mental models, so conceptual model must be accommodating
- Interactions designed in a constrained system or without regard to mental models is problematic
Content Transfer Interactions

- Extremely common task in multi-display environments
- Having a match between the models is important in improving usability and efficiency
Research Goals

• A set of interactions for content transfer tasks
• Guidelines based on the diversity possible in multi-display environments (includes distance and device type)
Elicitation Study
Elicitation Study

Data Collection
(Gestures, Video/Audio, Questionnaires)

Analysis
(Qualitative, Quantitative)
17 participants, 6 female, 11 male
11 students and 6 from industry
Apple iPads

MS Surface 2

SMART Board

Custom Software

Apparatus
Procedure

Step 1 - Study Background

Step 2 - Task Explanation

Step 3 - Tasks Performed
Study Tasks

- Transfer Direction
- Source and Destination Devices
- Distance
Setup

• Total of 20 different tasks
• Tasks involved transferring single or multiple images at varying distances
Results

- 817 gestures collected (17 participants x 16 tasks x 3 gestures)
- Low agreement score of 0.16, resulted in the creation of a metaphor set
Metaphors

Close Contact

Moving Objects

Borrowed Interactions

Selection
Impacts

• **Close Contact** affected by device type and distance (negatively)

• **Borrowed Interactions, Non Gestural** are impacted by distance (positively)
Recommendations

1. Alias Gestures
2. Different gestures for distance and device
3. Use conceptual themes as a guide
Limitations

• Lots of influence from technologies/experiences
• Wider range of participants
• Multi-Display environment was extremely specific
Future Work

- Evaluate the metaphor set
- Performance measures
- Examining impact of multiple users and collaboration on the metaphor set
Contributions

- An up-to-date picture of the research space (details in thesis)
- A set of interaction metaphors
- Recommendations for spatially-aware multi-display environments