iPod Party
Designing an Application to Explore the Possibilities of the Combination of a Tabletop Display with One or More Handheld Displays

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Introduction

• Related Work
• Research Goals
• Concept Of Interaction
• Implementation
• Conclusion
Multi-touch is advancing to everyday life
• first commercial products released shortly:
  – Microsoft Surface™
  – Apple iPhone/iPod touch
• two major groups of devices: handhelds vs. tabletops
• handhelds: small, mobile and personal
• tabletops: big, stationary and public
• question: is it possible to accentuate advantages of both devices by combining them?

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Related Work

Tracking on Tabletop Devices/Superimposing Handhelds

- Ka-Ping Yee. *Peephole displays: pen interaction on spatially aware handheld computers.* CHI 2003
- Alex Olwal et al. *Spatially Aware Handhelds for High-Precision Tangible Interaction with Large Displays.* TEI 2009

Audio Visualization

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Comparison of Multi-Touch Handheld with Multi-Touch Tabletop Devices

Tabletop Displays

- large dimensions
- low spatial display and input resolution
- many people can see all details at the same time

Handheld Displays

- tiny dimensions
- high spatial display and input resolution (2 to 32 times higher than tabletops)
- single-person
Development of an Application to Analyze the Combination of Multi-Touch Tabletop and Handheld Displays

- bring up problematic issues of both devices to test if the combination can neutralize them
- display lots of information
- information should be rich in detail
- high touch precision should be needed
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Basic Input Elements
Push‘n‘Drag Buttons
• simple circles
• can be pushed or dragged
Multi-Touch Handheld Device
• position is always known
• actions can be performed on the multi-touch display

Four Different Interaction Modes where Invented
• handheld as magnifying glass, handheld with magnifier arm, direct magnifier and magnifier arm
Mode 1 - Handheld as Magnifying Glass

• magnifies underlying information
• magnification level can be altered with a two finger zoom gesture

Mode 2 - Handheld with Magnifier Arm

• magnification area can be placed anywhere on the tabletop
• every position on tabletop can be reached
Mode 3 - Direct Magnifier
- like Mode 1 but magnification area is moved with fingers
- handheld is held in hands

Mode 4 - Magnifier Arm
- magnification area can be placed anywhere on the tabletop
- handheld is held in hands
Switching Between Interaction Modes

- switching between on-table and detached modes by lifting/putting back the handheld
- switching between modes 1/3 respectively 2/4 with the "ears"-element by pulling out/pushing back the magnifier arm

The Occlusion Problem
- occluded icons are translated to the handheld’s border to stay visible
- has a nice "float"-effect
Structure

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iPod Party

- audio browsing application
- songs (albums) arranged by similarity
Hardware Setup

Tabletop
- FTIR multi-touch table
- 125 cm diagonal
- display resolution: 1024x768 pixels (4ppi)
- input resolution: 640x480 touch points (2.5tppi)

Handheld
- Apple iPod touch
- 8.9 cm diagonal
- display and input resolution: 480x320 (163ppi)
Tracking

- iPod produces unique pattern of three touch points
- pattern is recognized and identified by the server
- position and orientation information are calculated
- pattern is produced by tracking carriages
- calibration process is needed
Look and Feel

- bright and friendly-looking design
- colorful symbols
- light direction matches the light direction in the room where the tabletop is located
Visualization of the Audio Library

- songs are placed in a Self-Organizing Map (SOM)
- (pseudo-) similarity information are gathered from ID3-tags
- spring algorithm is applied, that relaxes the layout and groups icons by albums
Client/Server Communication

- client (iPod) and server (tabletop) communicate via TCP/IP-sockets and a simple message-sending protocol: tabletop listens to messages from the iPod
- the iPod connects to the tabletop via WLAN
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Summary

- task was to design an application that uses the benefits of multi-touch tabletop and handheld devices
- iPod Party was created
- multi-user application, that can be used to evaluate the combination of the two display types
- written in C++ (tabletop) / Objective C (iPod) using OpenGL (ES)
Lessons Learned

• ears GUI element: could be used more intense (moving magnification area)

• communication: should be redesigned to be more perform better

• interaction on iPod touch: more interaction should take place

• information on iPod touch: more information should be displayed on iPod (song titles, related songs, etc.)
Future Work

- remove issues mentioned before
- enhance multi-user support (embed interaction between the single iPods)
- design and evaluate a user study on iPod Party
- invent additional scenarios (not only music browsing)