LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

Final Presentation Project Theses

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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Structure

- **Introduction**
- Related Work
- Research Goals
- Concept Of Interaction
- Implementation
- Conclusion

Introduction

[1]

[2]

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?

[1] www.microsoft.com/surface, [2] www.apple.com/iphone

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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. *LightSense: Enabling Spatially Aware Handheld Interaction Devices*. IEEE and ACM ISMAR 2006
- R. Hardy et al. *Touch & interact: Touch-based interaction of mobile phones with displays*. MobileHCI 2008
- Andrew D.Wilson et al. *BlueTable: connecting wireless mobile devices on interactive surfaces using vision-based handshaking*. Graphics Interface 2007
- Alex Olwal et al. *Spatially Aware Handhelds for High-Precision Tangible Interaction with Large Displays*. TEI 2009

Audio Visualization

- Otmar Hilliges, et al. *Audioradar: A metaphorical visualization for the navigation of large music collections*. International Symposium on Smart Graphics 2006
- Matthias W. Schicker. *AudioPhield: Exploring Casual Collaborative Browsing of Large Music Collections*. Diploma-Theses, LMU Munich, September 2008

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Research Goals

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

Research Goals

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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Concept of Interaction

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

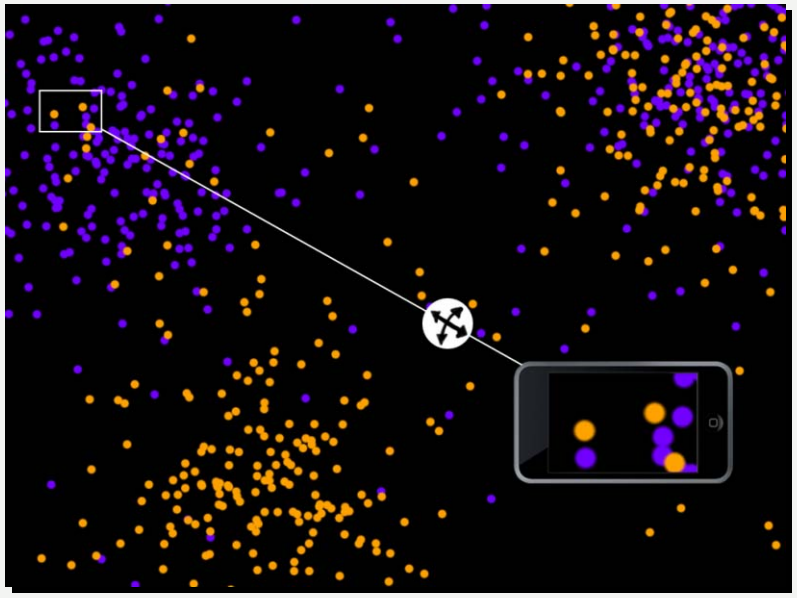
Four Different Interaction Modes where Invented

- handheld as magnifying glass, handheld with magnifier arm, direct magnifier and magnifier arm

Concept of Interaction

Mode 1 - Handheld as Magnifying Glass

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



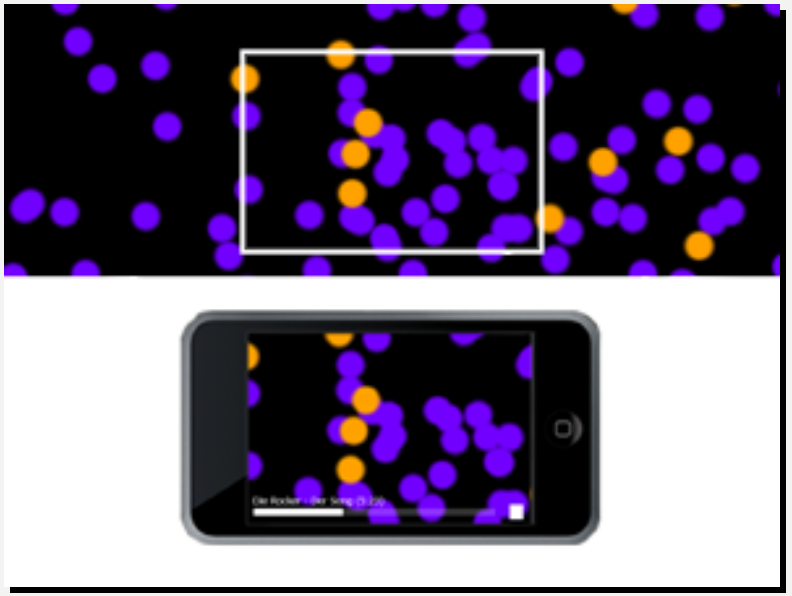
Mode 2 - Handheld with Magnifier Arm

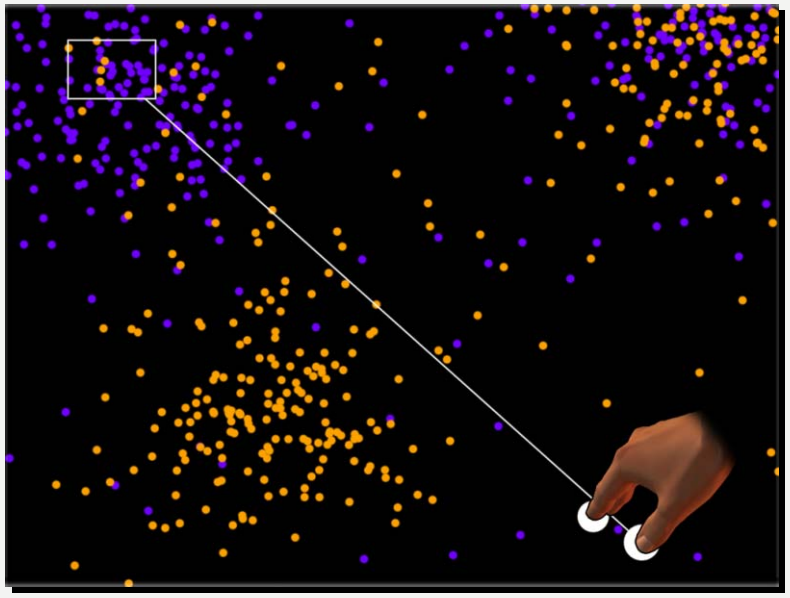
- magnification area can be placed anywhere on the tabletop
- every position on tabletop can be reached

Concept of Interaction

Mode 3 - Direct Magnifier

- like Mode 1 but magnification area is moved with fingers
- handheld is held in hands

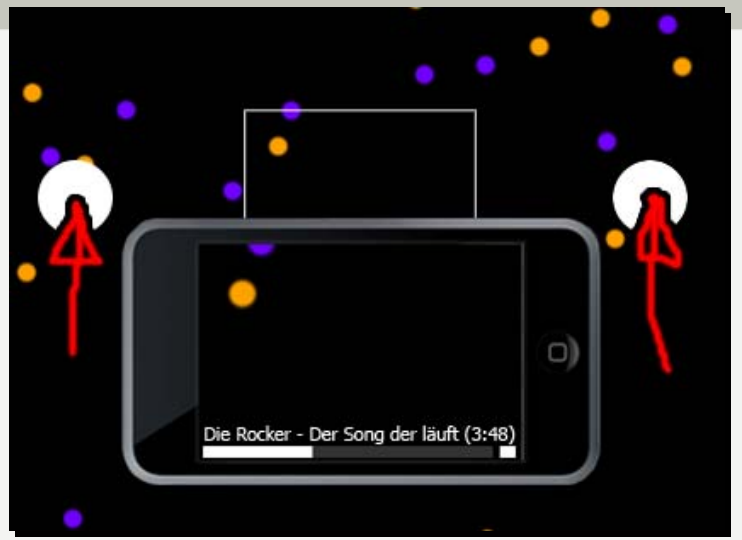




Mode 4 - Magnifier Arm

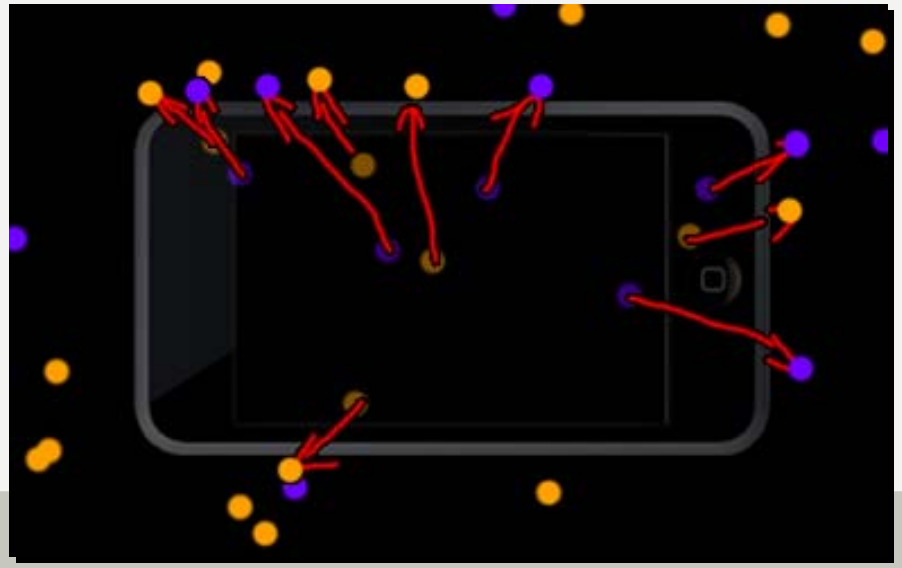
- magnification area can be placed anywhere on the tabletop
- handheld is held in hands

Concept of Interaction



Switching Between Interaction Modes

- switching between on-table and detatched modes by liftig/putting back the handheld
- switching between modes 1/3 respectivly 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

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Implementation

iPod Party

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

Implementation

Hardware Setup

Tabletop

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

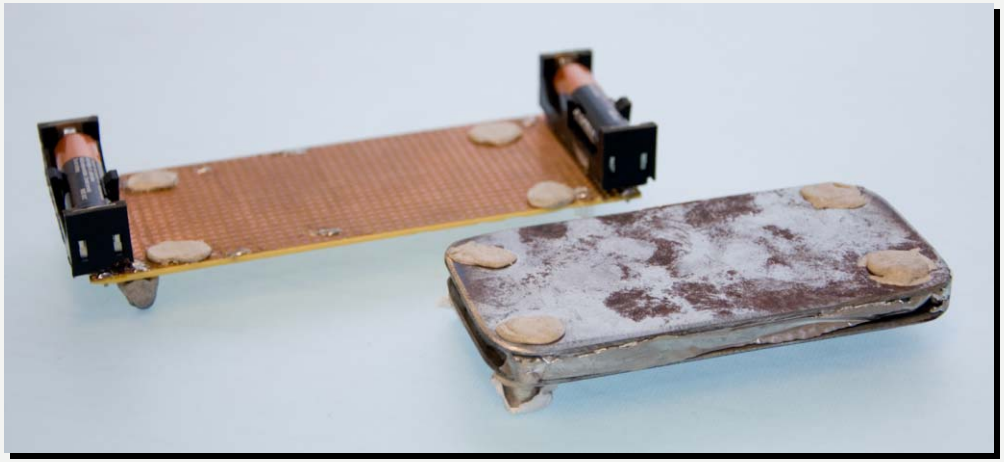
Handheld

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

Implementation

Tracking

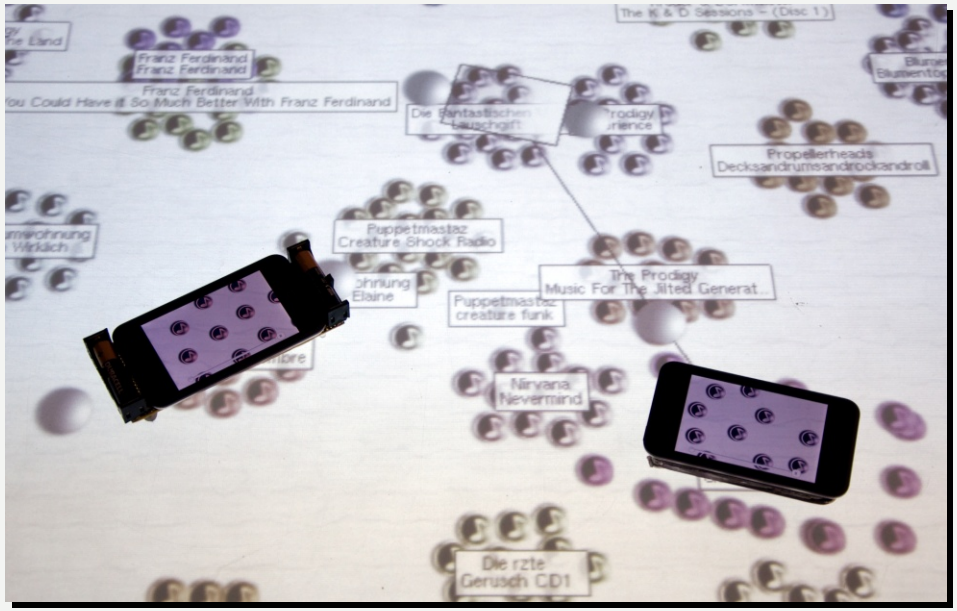
- iPod produces unique pattern of three touch points
- pattern is recognized and identified by the server
- position and orientation information are calculated
- pattern is produced by tracking carriages
- calibration process is needed



Implementation

Look and Feel

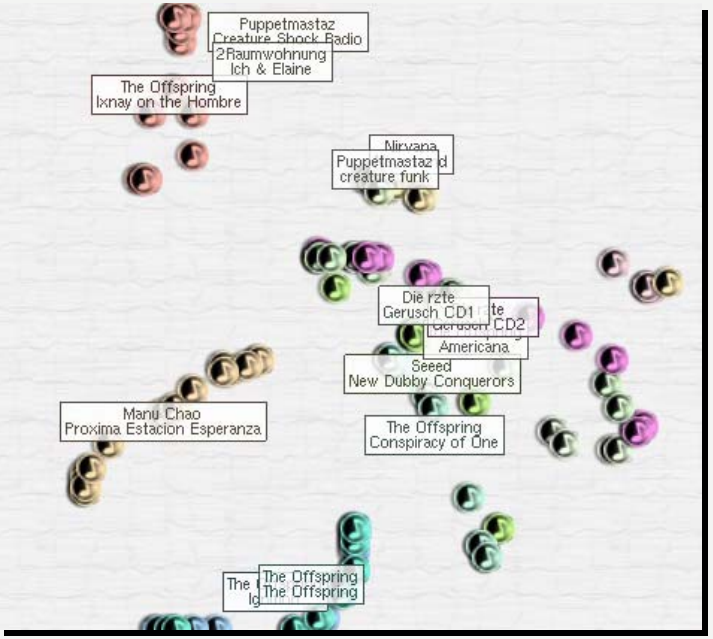
- bright and friendly-looking design
- colorful symbols
- light direction matches the light direction in the room where the tabletop is located

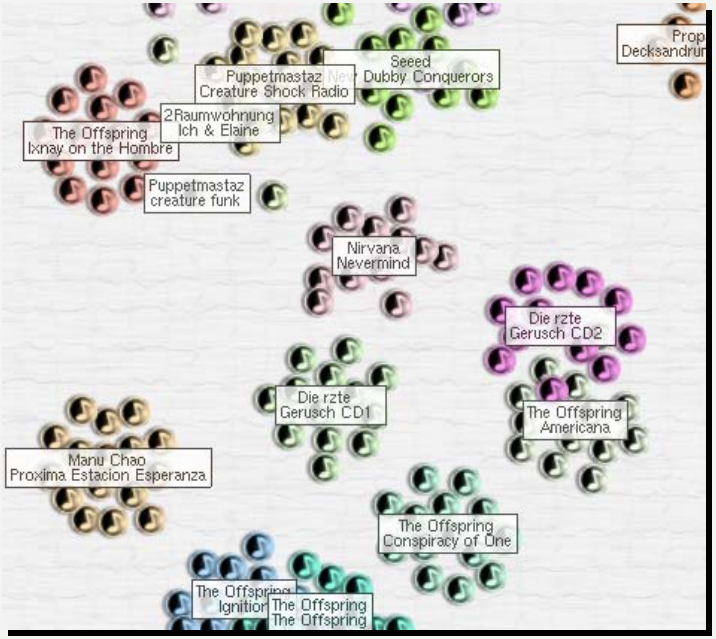


Implementation

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





Implementation

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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Conclusion

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)

Conclusion

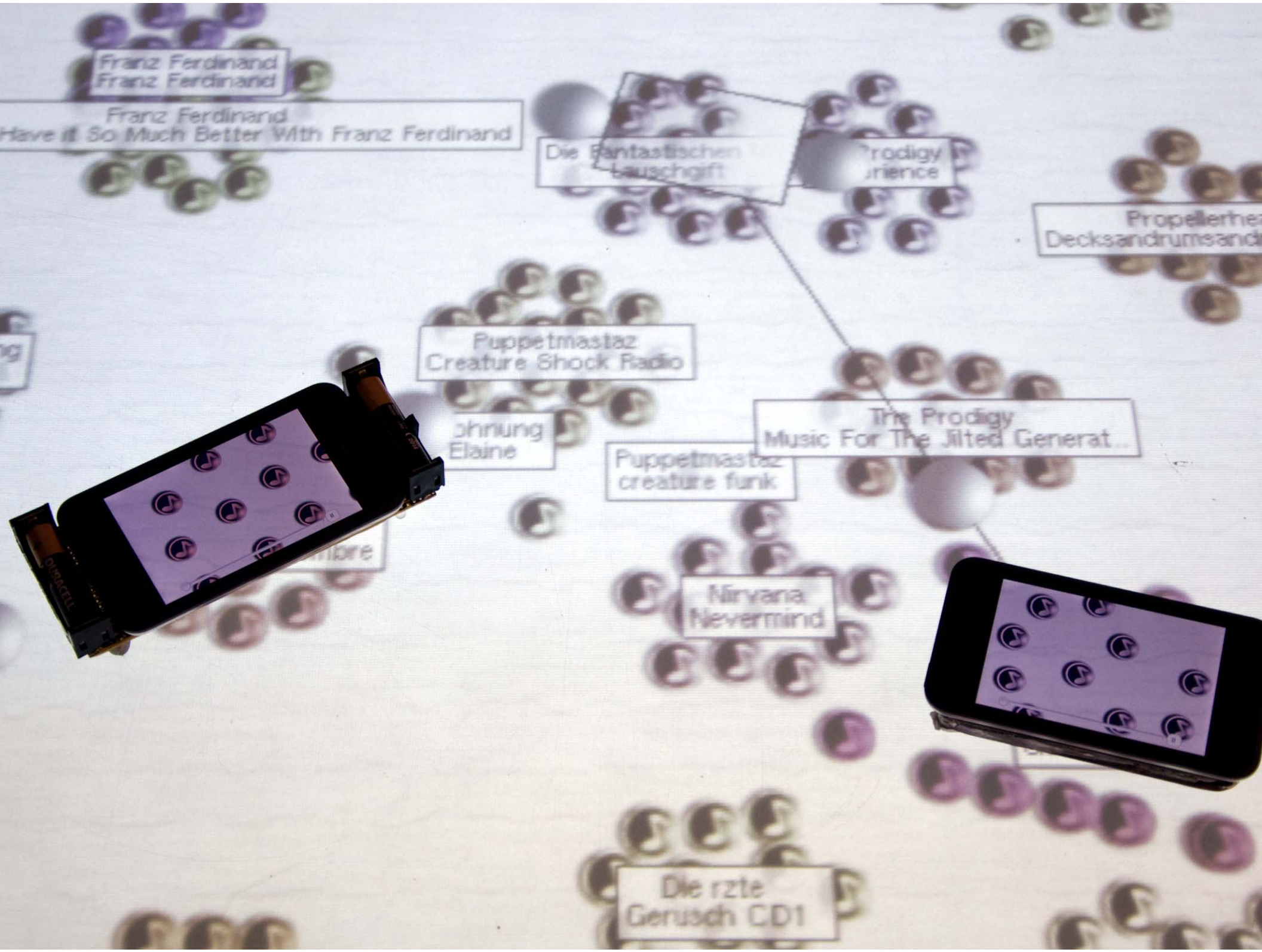
Lessons Learned

- 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.)

Conclusion

Future Work

- remove issues mentioned before
- enhance mulit-user support (embed interaction between the single iPods)
- design and evaluate a user study on iPod Party
- invent additional scenarios (not only music browsing)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Have It So Much Better With Franz Ferdinand
Die Fantastischen
Prodigy
Puppetmastaz
Creature Shock Radio
The Prodigy
Music For The Jilted Generat...
Puppetmastaz
creature funk
Nirvana
Nevermind
Die Ärzte
Geräusch CD1