CRISTAL
Design and Implementation of a Remote Control System Based on a Multi-touch Display

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Motivation
How to control that many different devices?
How to retain group interaction with virtual media?
Solution: Many Devices

Many devices = many buttons!

www.artlebedev.com
Solution: Many Devices

Touchscreens!

Many devices = many buttons!
Solution: Group Interaction?

How could a „collaborative remote“ look like?
Previous Work
Home Control


Beijar et al.

Sakamoto et al.
Interaction via video

Hyperplant [1]

Interactive Video in FlySPEC [2]


Goals

Develop a user interface that:

• Controls all electronic devices in a living room and

• Supports group interaction
Why Tabletop?

- Ubiquitous
- Multi-User
- Supports group interaction
Instant Feedback

The video image itself is the interface

Many different devices

- Many electronic devices:
  - Lights
  - Window blinds
  - Audio
  - Displays / TV
  - Digital Picture Frames
  - Robotic vacuum cleaner
- But they work very different
- Needed: Easy to understand interaction metaphor
Controlling Devices

Video image:
• User recognize devices easily
• Provides area for interaction

Gesture-based input:
• Discrete States  on/off
• Continuous Value  audio volume 0 – 100%
• Location/Speed  Path for vacuum cleaner robot
• Media selection  play Movie Bolt on TV
Gestures - Continuous

Controlling speaker volume
Gestures - Continuous

Direction of Input
- Axis aligned (a)
- Object aligned (b)
Gestures - Continuous

Object oriented approach:
How to increase, how to decrease a value?
Idea: Top & bottom of real object
Media Selection

Media Server

[Diagram showing media selection process]
Media Selection
Media Selection / Display

Watching Movies
Media Selection

Tabletop is not well suited for watching a movie! Tabletop is for choosing a movie!

Simulate DVD boxes:

- DVD cover
- additional information and
- a preview
Media Selection / Display

Basic Idea: World in Miniature

Pilot Study
Pilot Study

- Qualitative Study
- Primary Goals:
  - Evaluate the usability and design decisions
  - Direction of interaction
  - Viewing angle of video
- Procedure:
  1. Tasks (Observation)
  2. Semi-structured Interview
  3. Questionnaire
Participants & Apparatus

• 16 participants (12 male, 4 female)
• Controlled laboratory setting
Direction of interaction

Preferred direction of interaction:

- Axis aligned
- Object aligned
- None

Preference: 4 of 16  12 of 16  0
Video angle

Preferred viewing angle:

„Birds eye“

12 of 16

„Perspective“

2 of 16

None
Evaluation Results

Overall:
• Very positive feedback
• 15 of 16 rated 4 or 5 (good, very good)
• Rating by controlled device:

1 = very bad
5 = very good
Conclusion

Future Work
Conclusions & Future Work

- Live video image very useful
- Privacy concerns
- Devices not covered by video image
Conclusions & Future Work

- Bulky hardware
- Cluttered coffee table
Future Work
Thank you

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