# Device Interoperability as a Function of Proximity and Orientation

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# Goals of the Project

- Use information about proximity & orientation between people, active & passive devices
- Make user interfaces on mobile devices and large surfaces react accordingly

# Basic Idea

- **Home entertainment system** for managing and watching videos
- **Implicit interaction** rather than explicit control
- **Proxemic regions** with different interface representation and interaction possibilities
- **Personal mobile devices** for exchanging videos with the system facilitated through spatial awareness

# Related Work (I)

- Daniel Vogel and Ravin Balakrishnan: Interactive Public Ambient Displays **[1]**

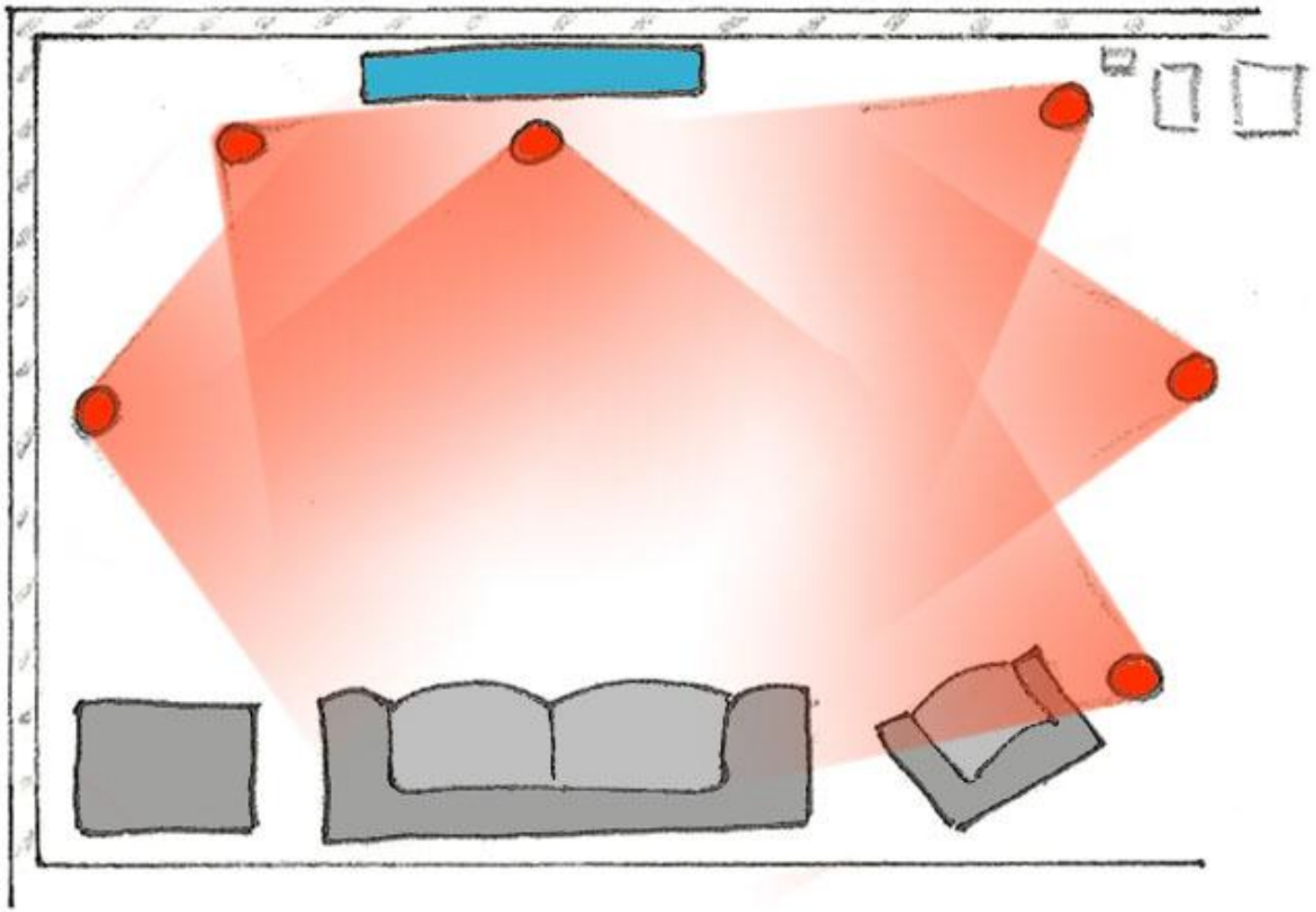

1. D. Vogel and R. Balakrishnan. Interactive public ambient displays: transitioning from implicit to explicit, public to personal, interaction with multiple users. pages 137–146, Santa Fe, NM, USA, 2004. ACM.

# Related Work (II)

- Hans Gellerson: Relate Gateways **[1]**

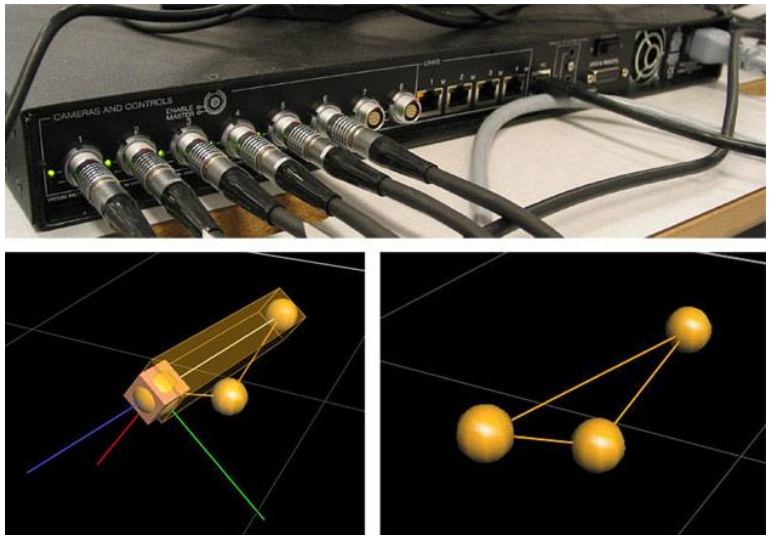

1. H. Gellersen, C. Fischer, D. Guinard, R. Gostner, G. Kortuem, C. Kray, E. Rukzio, and S. Streng. Supporting device discovery and spontaneous interaction with spatial references. Personal and Ubiquitous Computing, 13(4):255–264, 2009.

# Home Environment Setup



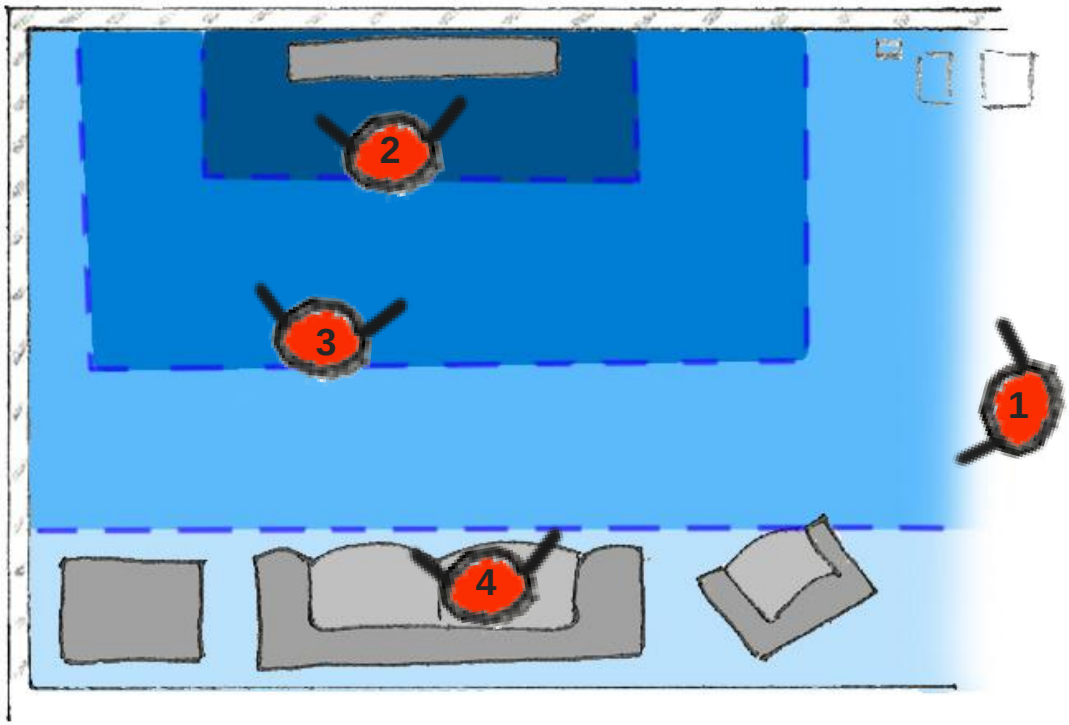
# Vicon Motion Capture System

- Infrared cameras with LED rings
- Reflective markers
- Vicon server and software

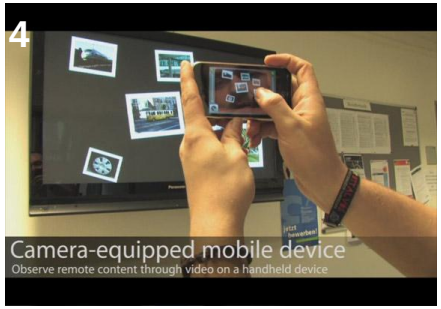

# Person Interacting with the Display

1. Presence
2. Exploration and Browsing
3. Intermediate
4. Watching



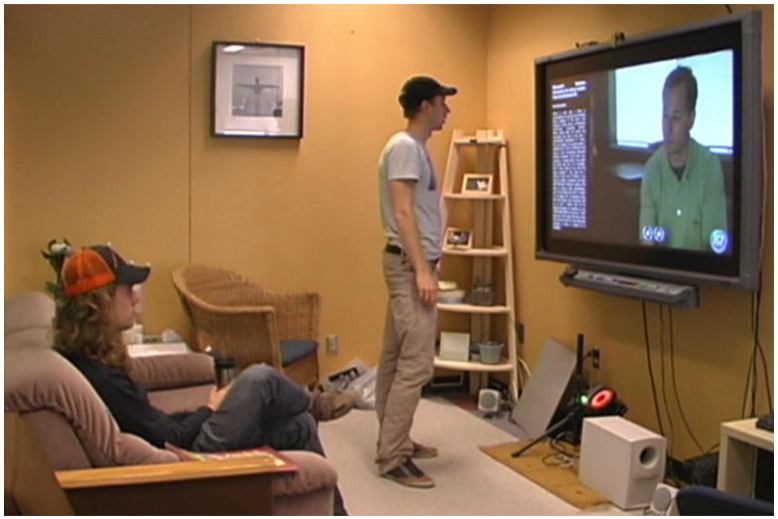






# Multiple People

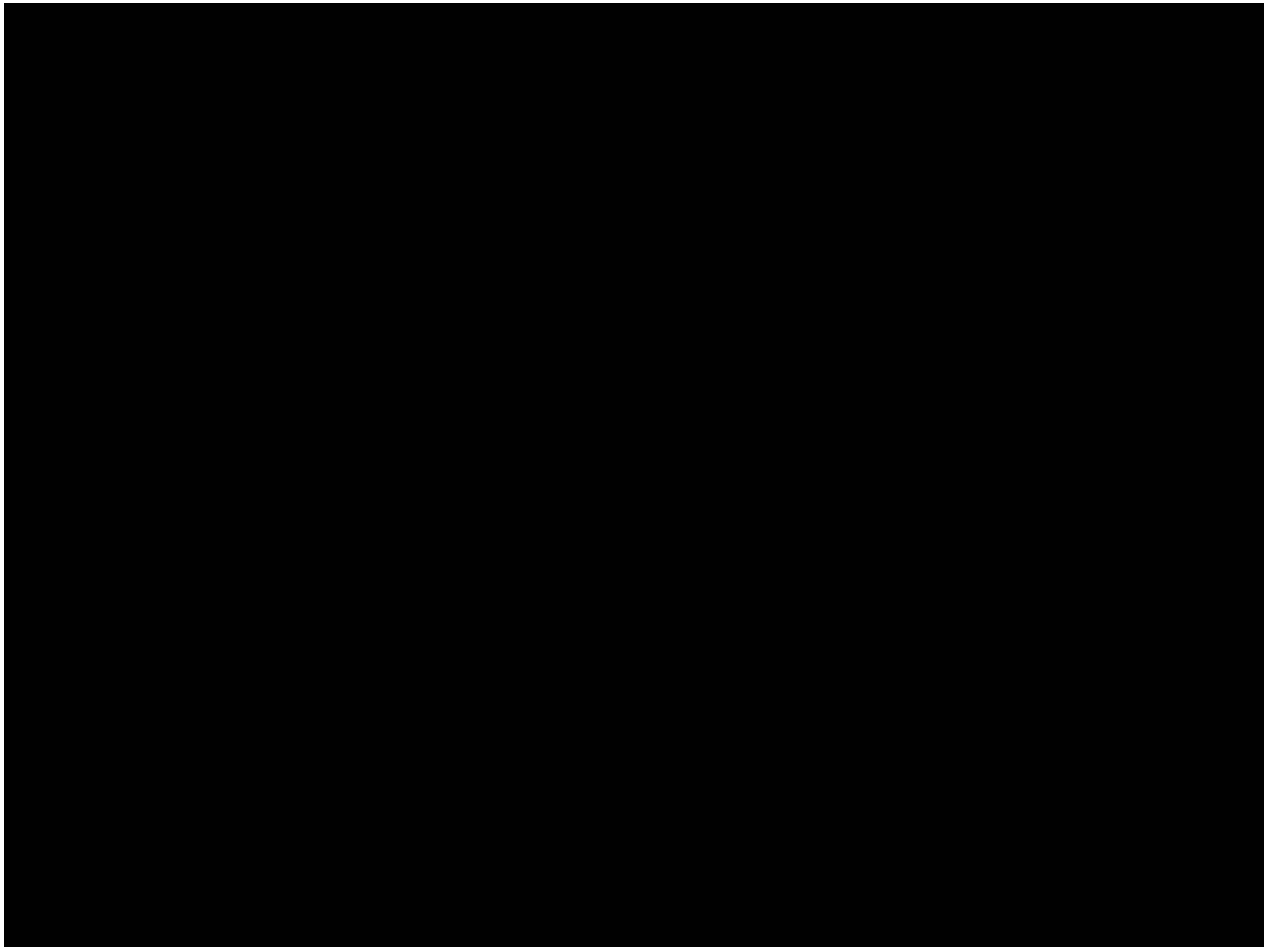
- Overview information for latecomers
- Watching and exploration simultaneously
- Handling occlusion problems
- **Distraction** – when people talk to each other and don't look at the display



# Person to Object Interaction

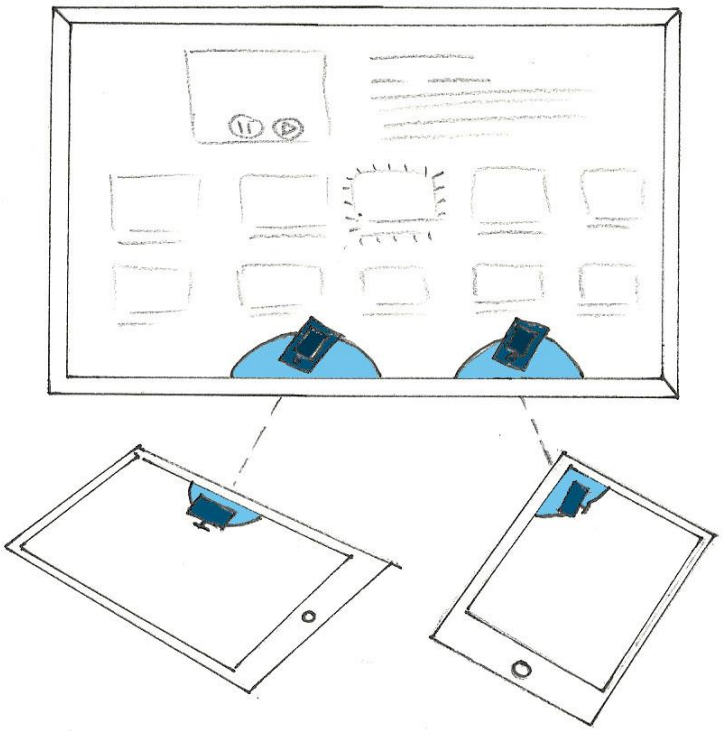
- **Phone call** interruptions
- **Distraction** like reading a magazine
- **Exploration** from a larger distance with pointing

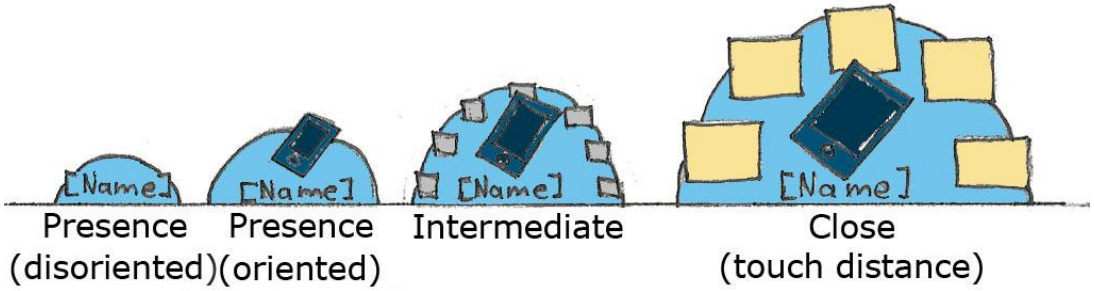
# **Video:** Proxemic Media Player Basic Interaction

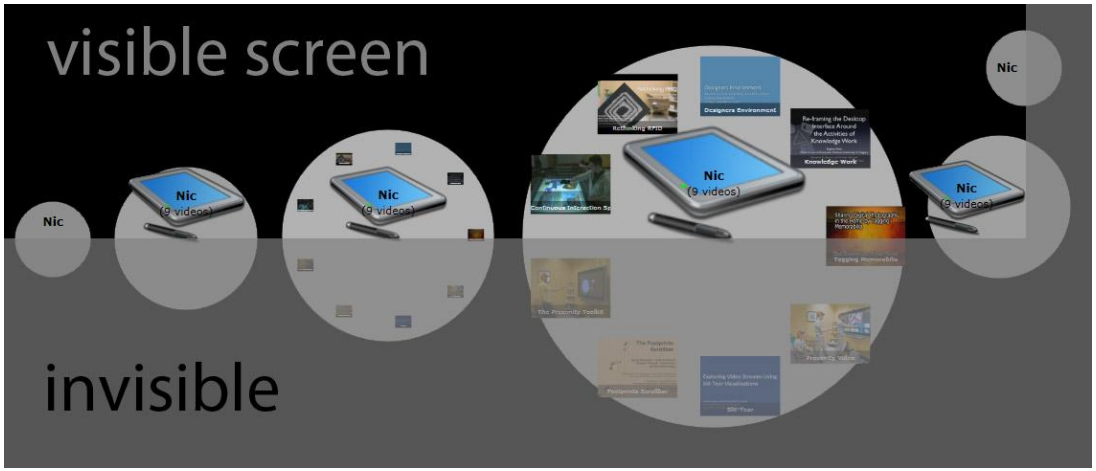


# Interacting with a Personal Device (I)

Spatial awareness through gateway **orientation** and **size**



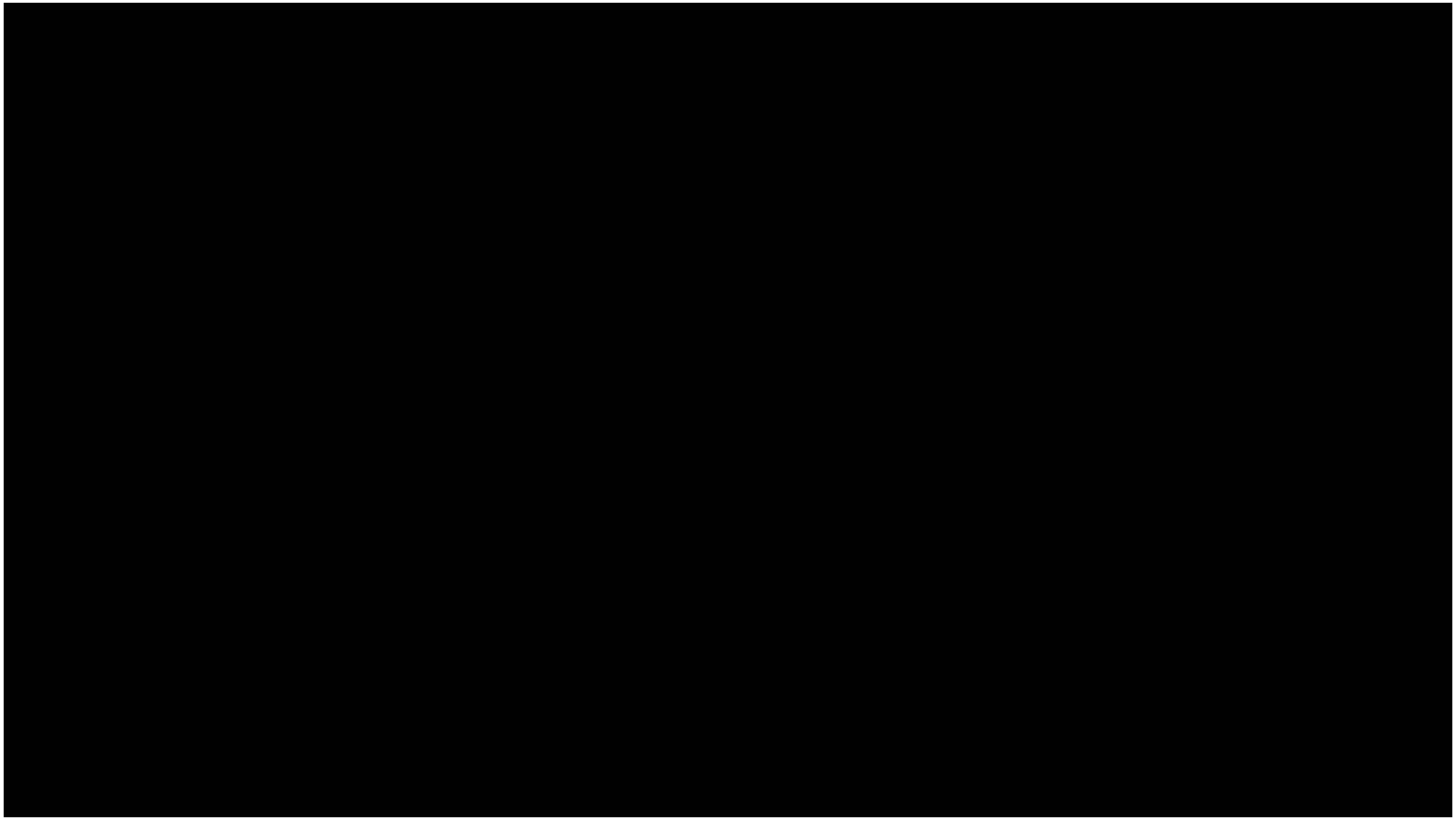


# Interacting with a Personal Device (II)

Exchange of videos with the system:


# **Video:** Interacting with a Personal Device



# Multiple People with a Personal Device

Exchange of videos with others:

# Implementation of the Proxemic Media Player Application

- Microsoft .Net using C# and WPF
- Utilizing the ILAB Vicon Toolkit **[1]** to access spatial tracking information
- .NetworkingGT toolkit **[2]** is used to manage the network communication with personal mobile devices
- XML based Video Database


1. Diaz-Marino, R. and Greenberg, S. They Proximity Toolkit and ViconFace: The Video. Report 2009-946-25, Department of Computer Science, University of Calgary, Calgary, Alberta, Canada T2N 1N4.
2. Brian de Alvis, M. Boyle, and S. Greenberg. .NetworkingGT http://grouplab.cpsc.ucalgary.ca/cookbook/index.php/Toolkits/NetworkingGT.

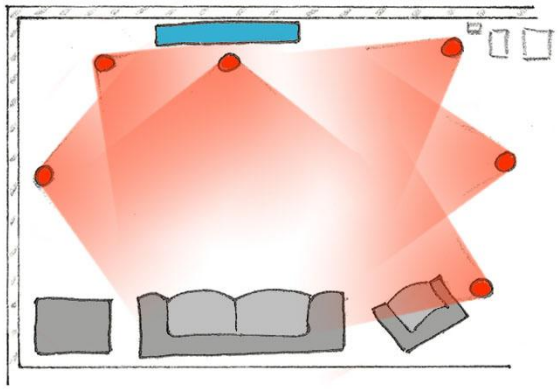
# Conclusion

- Proxemics can facilitate interaction in common application scenarios by utilizing **implicit interaction**
- Knowledge about spatial relations can be used to provide additional value to systems by creating awareness
- Implicit interaction can not completely replace explicit actions




# Future Work

- Extend the dynamic gateway concept and support more devices in the environment. This can be digital cameras, picture frames, sound systems or a thermostat and enable easy control and exchange of data.



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# Smart Board Touch Display

- DViT (Digital Vision Touch) technology.
- Glass overlay
- Optical tracking with four cameras that are integrated into a bezel
- Dual touch possible
- Touch recognition of arbitrary objects


1. smarttech.com. SMART technologies, industry leader in interactive whiteboard technology, the SMART board. http://smarttech.com/.