

A Multimodal Interaction Framework for Pervasive Game Applications

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Starting point I: UbiComp environments

- ▶ Smart meeting rooms - Roomware
 - ▶ IT Integration in rooms and room elements
 - ▶ Disappearing Computer (Foto)
 - ▶ UbiComp Infrastructure (Sensors, communication)
 - ▶ Nomadic work & Mobile devices
- ▶ Software support
 - ▶ So far CSCW
 - ▶ Shared work-spaces
 - ▶ Adaptation to different interaction devices



Starting point II: Board games vs computer games



- ▶ Board games
 - ▶ Primarily social situation
 - ▶ Human -> Human
 - ▶ Limited scope of games due to traditional realizations
 - ▶ Limited design possibilities
- ▶ Computer games
 - ▶ Primarily isolated activity
 - ▶ Human -> Mediator -> Human
 - ▶ Unlimited game concepts
 - ▶ Attractive design possibilities

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Starting point II: Board games vs computer games



Board games



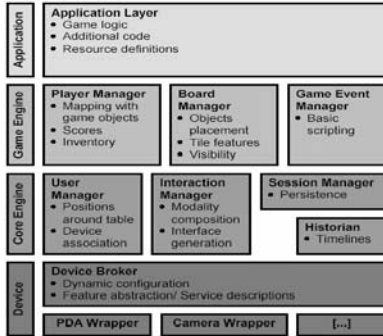
Computer games



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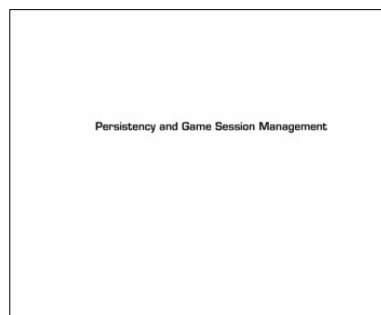
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- ▶ Experimental platform
 - ▶ Software architecture & Interaction framework
 - ▶ Stationary and mobile hardware components



Components I: Game Table

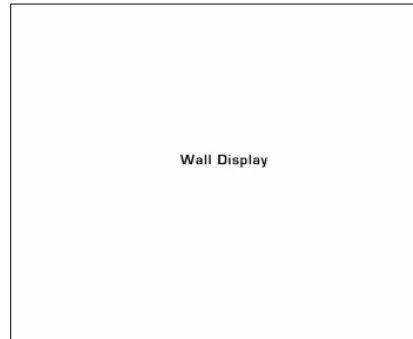
- ▶ InteracTable Roomware component
 - ▶ plasma display, touch sensitive surface
 - ▶ RF-ID antenna (session management)
 - ▶ Camera: Pawn and player detection



Components II: Wall Display



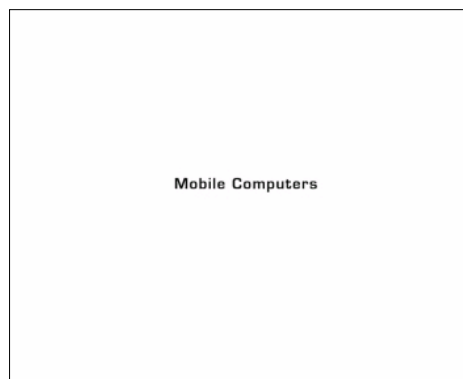
- ▶ DynaWall Roomware component
 - ▶ 3 joint segments
 - ▶ Touch sensitive, back projected
- ▶ Public Display
 - ▶ All information available for anyone anytime
- ▶ Film:
 - ▶ Overview over discovered areas
 - ▶ *Fog-of-war*



Components III: Personal Digital Assistants



- ▶ Pocket-PCs with 802.11b + ViewPort Devices
- ▶ Administration of private data (private device)
 - ▶ E.g. Properties of the playing piece
- ▶ Synchronous & Asynchronous
- ▶ Private communication
 - ▶ Advantage: addressee hidden



Components IV: Audio devices



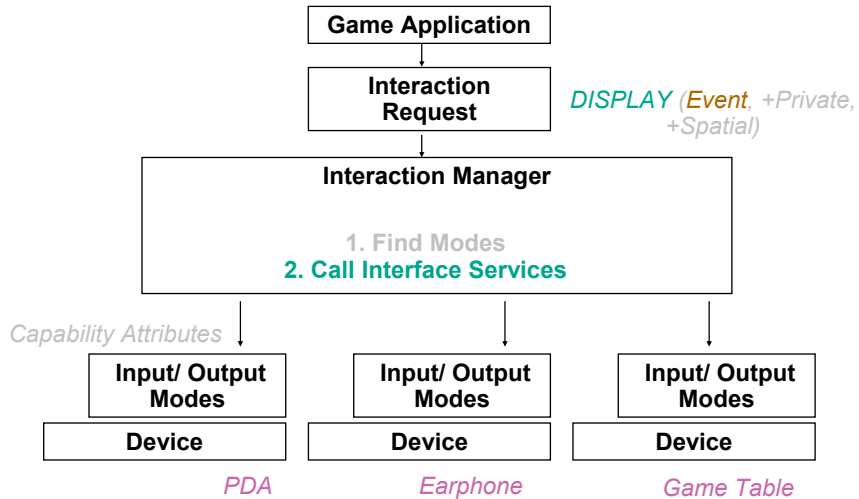
- ▶ Loudspeakers
 - ▶ Public output device
 - ▶ Atmospheric music and sounds
- ▶ Earphones
 - ▶ Private output device
 - ▶ Clandestine message reception
 - ▶ != PDA: Guaranteed delivery, no spatial information
- ▶ Microphones
 - ▶ Multimodal game commands
 - ▶ Natural interaction – in a group setting?

Providing human centered interaction



- ▶ Challenges for Interaction Design
 - ▶ Diverse interaction styles in gaming applications
 - ▶ Dynamically changing device setup
 - ▶ Limited interaction resources
- ▶ Ambient Intelligence Approach
 - ▶ Determine (not design) interfaces by software logic
 - ▶ Free game applications from dealing directly with human interaction
 - ▶ Map high level Interaction Requests
To low level Interface Services
via **Interaction Manager**

The Interaction Manager



The Interaction Manager Finding Modes



1. Weigh each hint
2. Add to Suitability Index
3. Moderate by global rules:
 - ▶ Preference of different effectors
 - ▶ Prevention of mode switching
 - ▶ Interference between modes (modality theory)
 - ▶ etc

Mode \ Attr.	Private	Spatial	Generic	Complex	Simultaneous
1. Table Pawns	-	+	-	-	+
2. Speech	-	-	+	o	+
3. Table Gestures	-	+	+	-	+, except 4.
4. Table WIMP	-	+	+	+	+, except 3.
5. PDA	+	-	+	+	+

'Mode' \ Attr.	Private	Spatial	Audible	Graphical	Textual
a. Table Display	o	+	-	+	+
b. Wall Display	-	-	-	+	+
c. PDA Display	+	-	-	o	+
d. Loudspeaker Audio	-	-	+	-	o
e. Earphone Audio	+	-	+	-	o

The Interaction Manager Basic Example



MENU(PLAYER1, INVENTORY OBJ1, INSPECT | TAKE,
oPRIVATE)

MENU(PLAYER1, INVENTORY OBJ1, INSPECT | TAKE,
++PRIVATE)



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The Interaction Manager Complex Interactions



- ▶ Input on Alternative Modes
 - ▶ Multiple terminating modes of an interaction
 - ▶ e.g. tapping or uttering a command
 - ▶ Applicable when multiple modes are suitable
- ▶ Multimodal Input
 - ▶ More than one input mode required for termination
 - ▶ Timely succession, interference etc.
- ▶ Application provided Interactions
 - ▶ Override the default behavior
 - ▶ e.g. for atmospheric effects
- ▶ Parallel Interactions

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The Interaction Manager Application-provided interaction



Different degrees of privacy for one Interaction Request

- ▶ Everyone: See and hear event
- ▶ Involved Player: Detailed description
- ▶ ~ two Interaction Requests with different degrees of information



The Interaction Manager Parallel Interactions



- ▶ Default case: Several parallel interactions
 - ▶ User experience: Free choice of actions
 - ▶ Provide input for Interaction Request hints



Conclusions



- ▶ Ambient Intelligence/ “Mechanistic Plug and Play translation device”
- ▶ Facilitates application development
 - ▶ for heterogeneous devices and
 - ▶ dynamically changing device setup
- ▶ Currently restricted to narrow domain of pervasive game applications
- ▶ Please see the video tomorrow at the 4 minute madness

The End



Thank you
for your attention!