A Guide To Distance-Driven User Interfaces
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[1] Introduction

Scope
- Graphical User Interfaces and Interaction Techniques
- Integration of characteristics of humans into image process
- Assistance of the user in perceiving information

Motivation:
User has to interact with a system by situation- and context-adapted interfaces to accomplish their tasks.

Aim:
User-centered visualisations

Approach:
extension of explicit and direct interactions (e.g. keyboard, mouse,...) by implicit, presence-aware interactions (e.g. position, orientation, age)
[2] Distance-Driven Interfaces

Zones, depending on the display distance

Ambient Zone: Out of scope - Visualization of general information
Notification Zone In scope - Visualization of individual information
Interactive Zone: In scope - Interaction with the system

- Zones depend on viewing direction and body orientation (Ambient Display and Implicit Interaction)
- Depending on the distance, interaction using spatial gestures (Subtle Interaction)
- Interaction using gestures on the screen (Personal Interaction)
Applications

Challenges in the Design of Distance-Driven Interfaces

- almost unlimited fields of application(s) that diverse in their requirements

- Concrete implementations are very specific in terms of the domain and the users

- „Best Practice“ Approaches exist in subdomains, e.g. human tracking, distance measurement ([3],[4]), an enclosing development approach is missing.

- From developers point of view, sufficient and comprehensive considerations on all relevant aspects are needed.

Enclosing, extensible and modular approach is required which is important for design, reuse and maintenance
**Scenario Categorization**
- Conditions of the application context

**Human Tracking**
- Tracking and identification of users

**Devices & Hardware**
- Technologies for distance measurement

**Algorithms**
- Calculation of the observer distance

**Adaption of Presentations**
- Adaption of interface layout depending on the distance

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### Extensible Guide with Modular Components as Meta-Concept for Methods and Techniques in the Field of Distance-Based Visualisations

**Fig.4**

<table>
<thead>
<tr>
<th>Requirements</th>
<th>User Detection</th>
<th>Distance Computation</th>
<th>UI Preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areal Structure</td>
<td>Colour (Skin/Clothes)</td>
<td>Camera</td>
<td>Geometric Zoom Paradigms</td>
</tr>
<tr>
<td>Accuracy of Measurement</td>
<td>Prediction</td>
<td>Electro-Magnetic Signals</td>
<td>Semantic Zoom Paradigms</td>
</tr>
<tr>
<td>Dimension</td>
<td>Model-Based Face Detection</td>
<td>Acoustic Signals</td>
<td>Visibility of Controls and Menus</td>
</tr>
<tr>
<td>Minimal Distance</td>
<td>Model-Based Body Detection</td>
<td>Pressure-Sensitive Sensors</td>
<td>Overview Mechanisms</td>
</tr>
<tr>
<td>Amount of Observers</td>
<td>Eye/Gaze Tracking</td>
<td>Inertial (Accel.) Sensors</td>
<td>Interface Adaption Rules</td>
</tr>
<tr>
<td>Consistency of Observers</td>
<td>Marker-Based Tracking</td>
<td>Proximity Switch</td>
<td>Impairments</td>
</tr>
<tr>
<td>Profiles</td>
<td>Active Badge</td>
<td>Reference Size</td>
<td></td>
</tr>
</tbody>
</table>

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Panel 6
### Healthcare - patient monitoring

#### Scenario Categorization

<table>
<thead>
<tr>
<th>category</th>
<th>attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>areal structure</td>
<td>interior / room</td>
</tr>
<tr>
<td>accuracy</td>
<td>high</td>
</tr>
<tr>
<td>amount of observers</td>
<td>multiple user</td>
</tr>
<tr>
<td>consistency of observers</td>
<td>constant</td>
</tr>
<tr>
<td>user profile</td>
<td>anonymous</td>
</tr>
<tr>
<td>dimensions of display</td>
<td>low / medium</td>
</tr>
<tr>
<td>minimal distance</td>
<td>acceptable</td>
</tr>
</tbody>
</table>

#### Tracking, Device, Algorithm

<table>
<thead>
<tr>
<th>tracking</th>
<th>hardware</th>
<th>method</th>
</tr>
</thead>
<tbody>
<tr>
<td>face detection</td>
<td>webcams</td>
<td>disparity</td>
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</tbody>
</table>

#### Presentation Adaption

<table>
<thead>
<tr>
<th>adaption</th>
<th>distance</th>
<th>visible information</th>
</tr>
</thead>
<tbody>
<tr>
<td>remote level</td>
<td>large</td>
<td>values displayed as colors</td>
</tr>
<tr>
<td>value level</td>
<td>middle</td>
<td>exact values displayed</td>
</tr>
<tr>
<td>curve level</td>
<td>short</td>
<td>curve, values and information</td>
</tr>
</tbody>
</table>
Conclusion
- First step to an enclosing guide for developing distance-driven user interfaces

Future Work
- Completion of characteristics especially of scenarios, devices, algorithms, adaptations,...
- Integration of additional modules:
  - Authentication for security scenarios, user preferences...
- Visual Workload Balance [5] to keep complexity constant through all distances (in complexity and content)
- Specifications based on the guide saved and provided as templates
...thank you for your attention...

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[A] References


