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
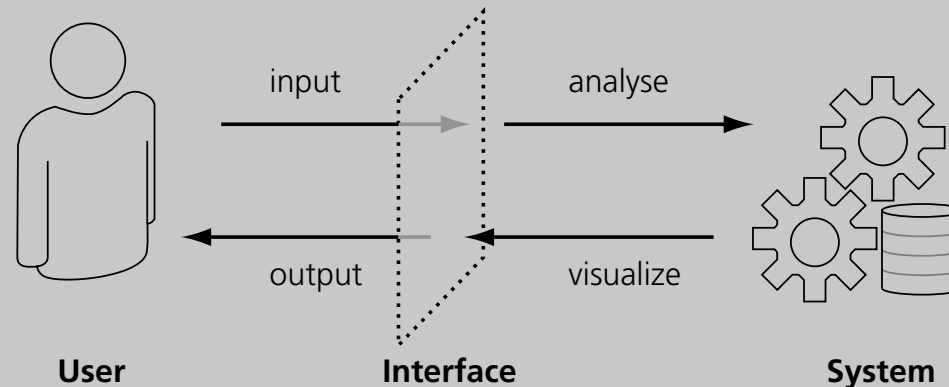 perceiving information

Fig.1: Communication process in human-computer interaction by
the use of a graphical user interface (GUI)

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)
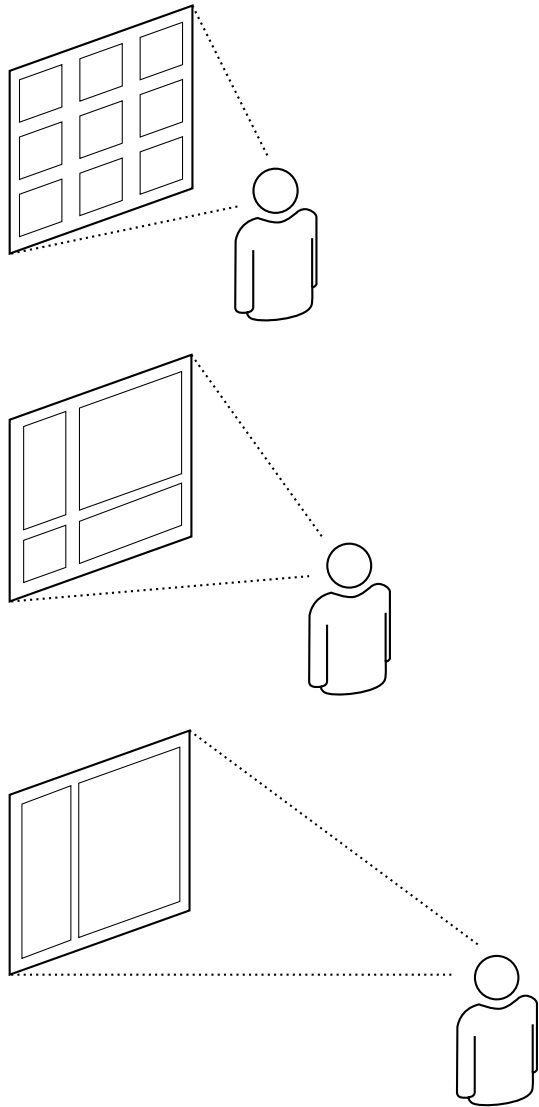
[2] Distance-Driven Interfaces

Fig.2: distance-based user interfaces using semantic zoom technique
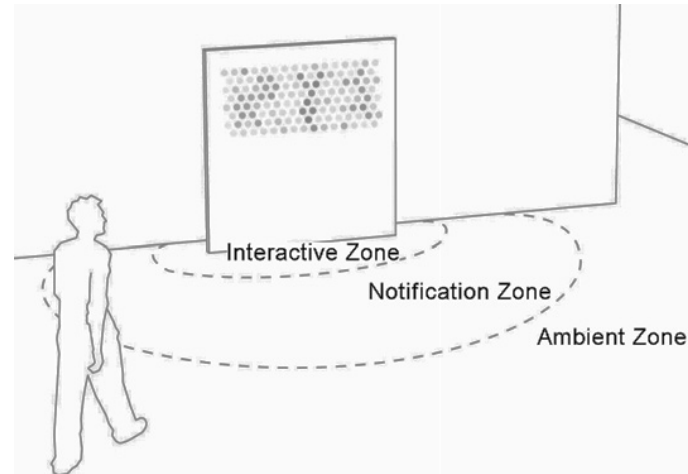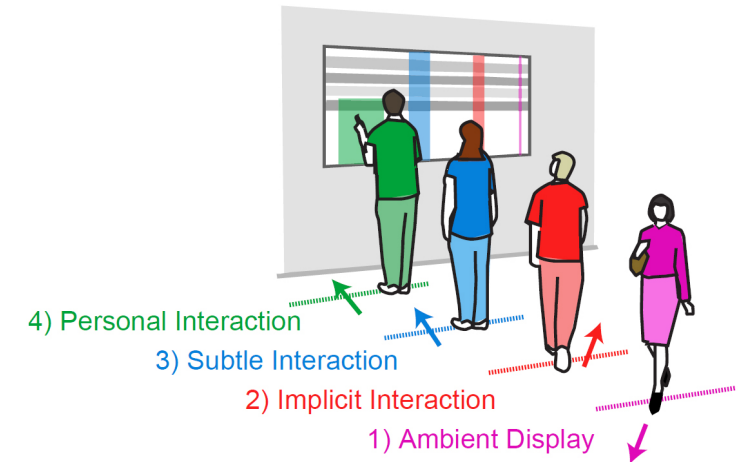
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Fig.3: [1, 2] describes the zones of interaction with a system

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 depends 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)

[3] 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
  measurment ([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**

[4] Guide

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

requirements ▶ user detection ▶ distance computation ▶ UI preparation

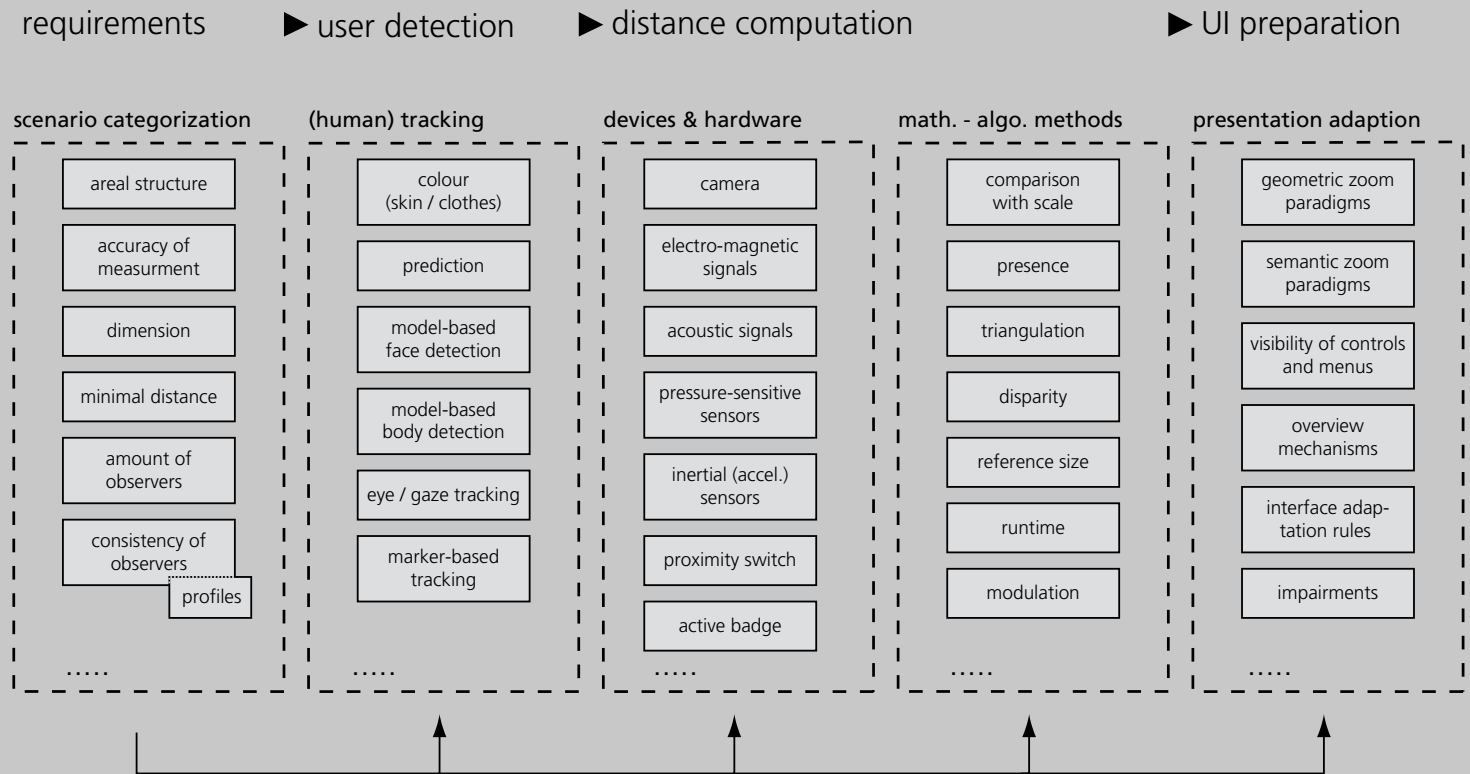| scenario categorization	(human) tracking	devices & hardware	math. - algo. methods	presentation adaption
areal structure	colour (skin / clothes)	camera	comparison with scale	geometric zoom paradigms
accuracy of measurment	prediction	electro-magnetic signals	presence	semantic zoom paradigms
dimension	model-based face detection	acoustic signals	triangulation	visibility of controls and menus
minimal distance	model-based body detection	pressure-sensitive sensors	disparity	overview mechanisms
amount of observers	eye / gaze tracking	inertial (accel.) sensors	reference size	interface adap- tation rules
consistency of observers	marker-based tracking	proximity switch	runtime	impairments
profiles		active badge	modulation	
.....	.....	.....	.....	.....

Fig.4: Extensible guide with modular components as meta-concept for methods and techniques in the field of distance-based visualisations.
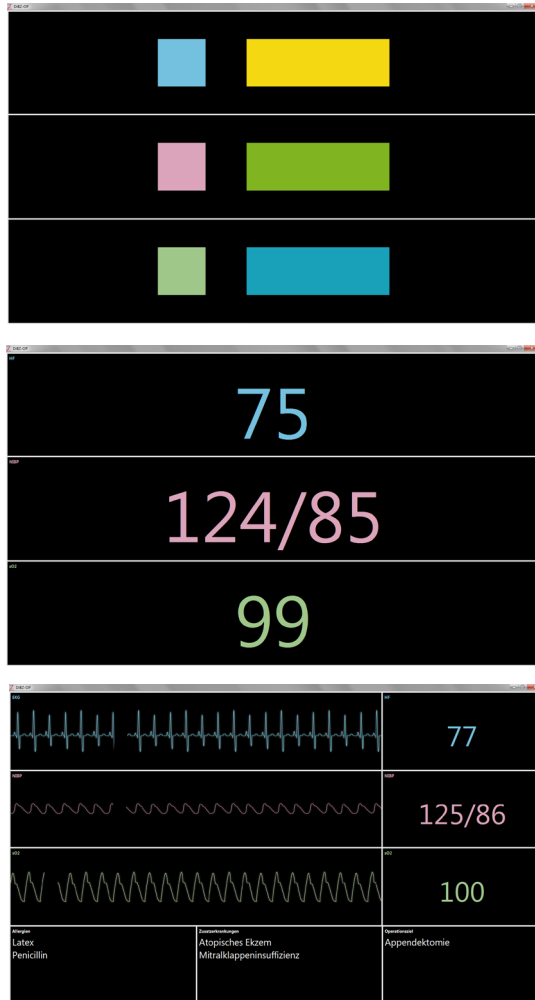
[5] Scenario

Fig.5: presentation adaption of the healthcare patient monitore

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Healthcare - patient monitoring

Scenario Categorization

category	attribute
areal structure	interior / room
accuracy	high
amount of observers	multiple user
consistency of observers	constant
user profile	anonymous
dimensions of display	low / medium
minimal distance	acceptable

Tracking, Device, Algorithm

tracking	hardware	method
face detection	webcams	disparity

Presentation Adaption

adaption	distance	visible information
remote level	large	values displayed as colors
value level	middle	exact values displayed
curve level	short	curve, values and information

[6] Conclusion and Future Work

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

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