RIPE (Research Institute for Pervasive Computing)

Presseinformation

Softwarepark Hagenberg
17. Mai 2005

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Der Computer für das 21. Jahrhundert

Mark Weiser
(1952-1999)

Ubiquitous Computing (1988):
Computer sind allgegenwärtig aber in unaufdringlicher Art präsent:
"each person is continually interacting with hundreds of nearby interconnected computers without explicitly attending to them"

"The Computer for the 21st Century", Scientific American, Vol. 265 No.9, pp. 66-75, 1991.

Pierre Wellner

Augmented Environments (1993):
Interaktion wird angreifbar, in gewohnte Umgebung eingebettet, mit Alltagsgegenständen verknüpft:

"Back to the real world!"

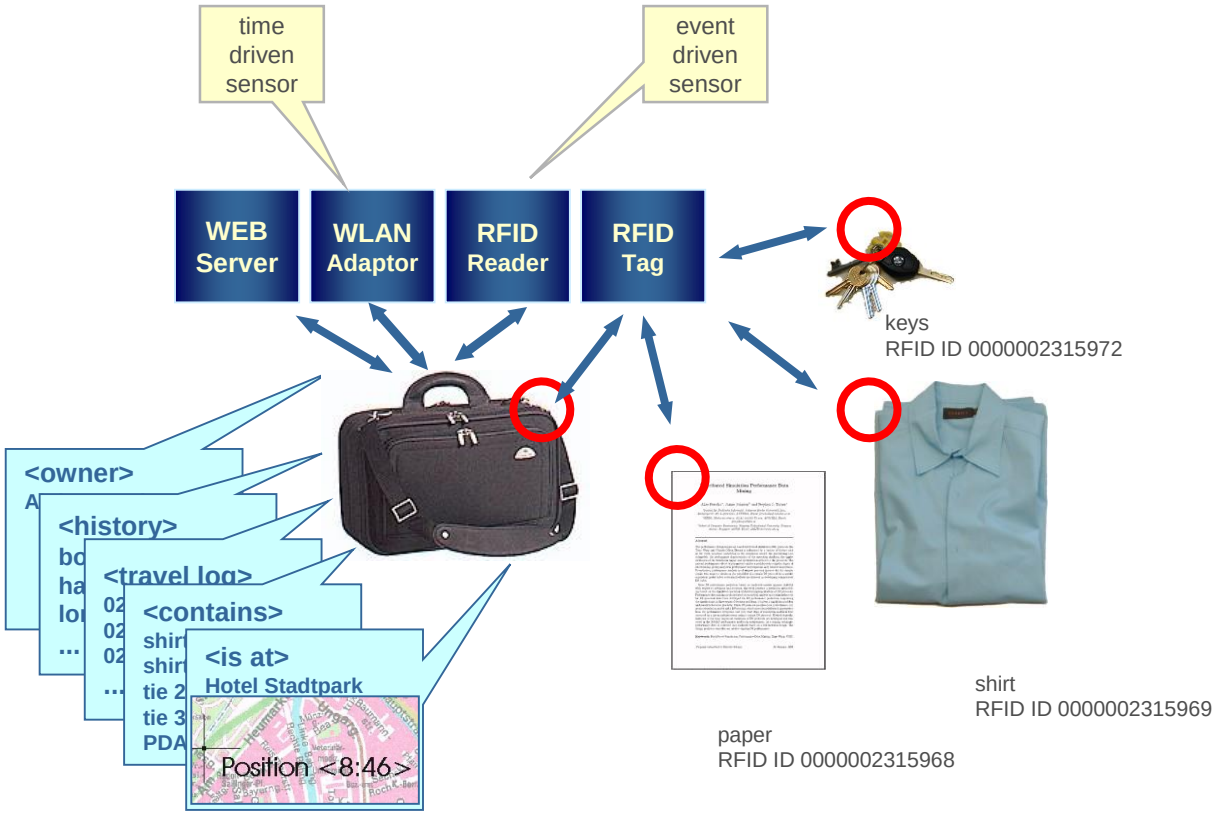
David Garlan

Distraction-Free Computing (2002):
Das Moore'sche Gesetz weitergedacht:
Die Grenzen in der Nutzung von Rechenleistung setzen nicht Speicherkapazität, Prozessor- oder Netzwerkgeschwindigkeit, sondern die beschränkte Ressource der menschlichen Aufmerksamkeit

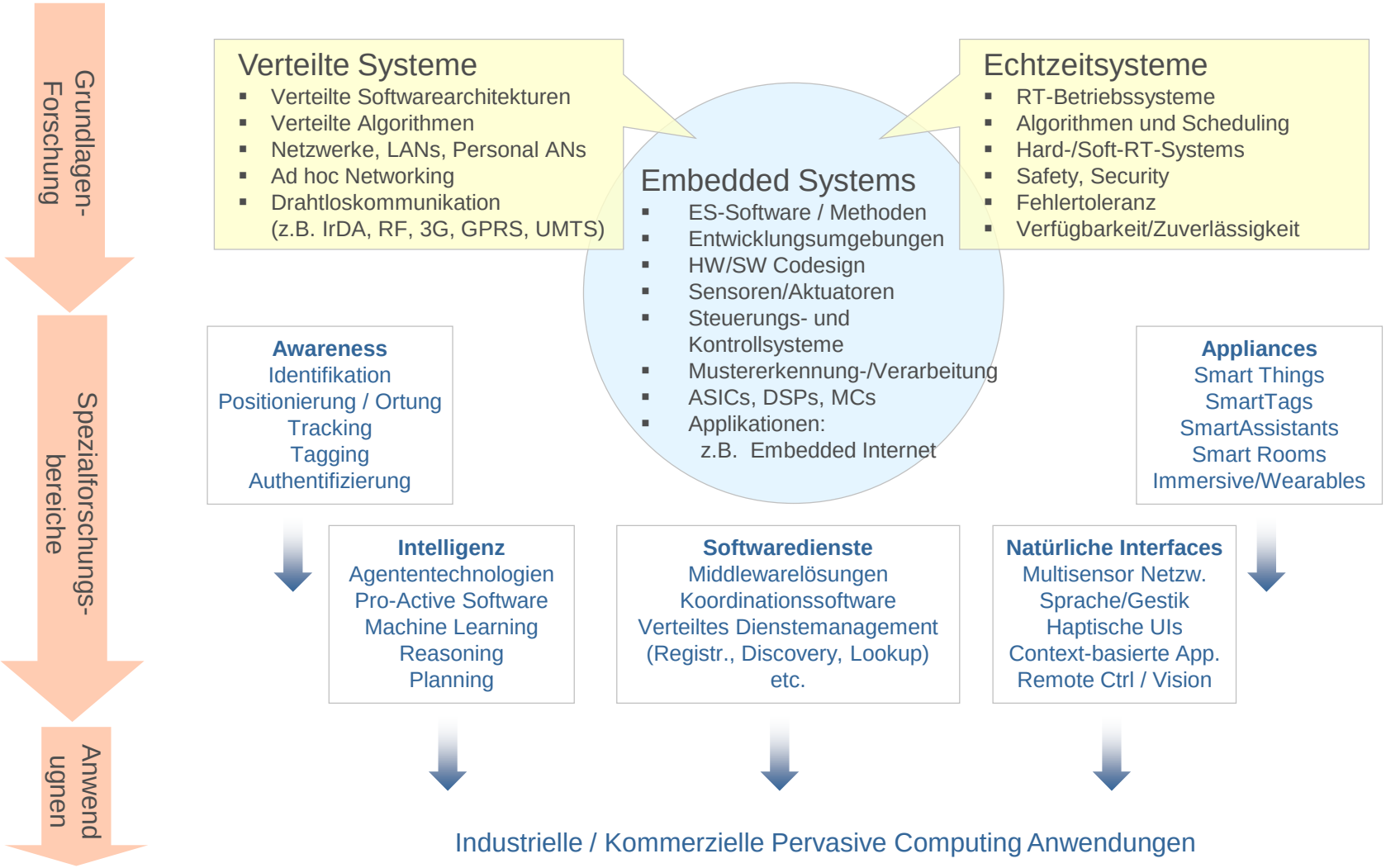
- Ubiquitous Computing
  (Mark Weiser, Xerox PARC 1988)
- Calm Computing
  (John Brown, Xerox PARC 1996)
- Universal Computing
  (James Landay, Berkeley 1998)
- Invisible Computing
  (G. Borriello, UoWashington 1999)
- Pervasive Computing
  (Academia, IBM 1999, SAP 2000)
- Context Based Computing
  (Berkeley/IBM 1999)
- Hidden Computing
  (Toshiba 1999)
- Post PC Computing
  (common sense)
- Ambient Intelligence
  (European Commission, FP5)
- Everyday Computing
  (Georgia Tech, 2000)
- Sentient Computing
  (AT&T, 2002)
- Autonomic Computing
  (IBM, 2002)
- Amorphous Computing
  (DARPA, 2002)
- Spray Computing
  (Zambonelli, 2002)

Miniaturisierung und Wachstum: Ein Netz „aller Dinge“

- unsichbare Prozessoren, leicht, klein, billig, wenig/keine Energie
- in nahezu allen Alltagsgengeständen
- drahtlos vernetzt, durchgehend "online"



Forschungsausrichtung Prof. Ferscha: Pervasive Computing



RIPE // Institut für Pervasive Computing

Universitätsbedienstete

Univ. Prof. Dr. Alois FERSCHA (Institutsvorstand)
Software für Verteilte Systeme
Embedded Systems
Pervasive Computing

em Univ. Prof. Dr. Peter Rechenberg
Sprachen / Übersetzerbau

a. Univ.-Prof. Dr. Günther Blaschek
Mag. Volker Christian
DI Rene Mayrhofer
DI Dr. Simon Vogl
DI Clemens Holzmann
N.N. (WissMimD)
N.N. (Korrekturassistent)

Sandra Derntl (Sekretariat)
Dominik Hochreiter (Technik)
N.N. (Technik)

Forschungsassistenten Drittmittelmitarbeiter

DI Wolfgang Beer
Dipl. Ing. Thomas Scheidl
Manfred Hechinger
DI Dr. Wolfgang Narzt
DI Stefan Oppl
Dr. Stefan Resmerita
DI Martin Reichör
Monika Scholl (Management)

11 Diplomanden
4 Dissertanten

630 Studenten Informatik
300 Studenten Wirtschaftsinformatik
120 Mechatronik, Physik, Chemie, Lehramt

Das „Gewahr werden“ der Dinge untereinander

- Dinge, die “nichts voneinander wissen” …
- ad hoc, dezentral, peer-to-peer
- “Gewahrsein” durch Erkennung der unmittelbaren Umgebung

„Aura“

Main Entry: au·ra ('or-&)

Etymology:

Middle English, from Latin, puff of air, breeze, from Greek; probably akin to Greek aEr air

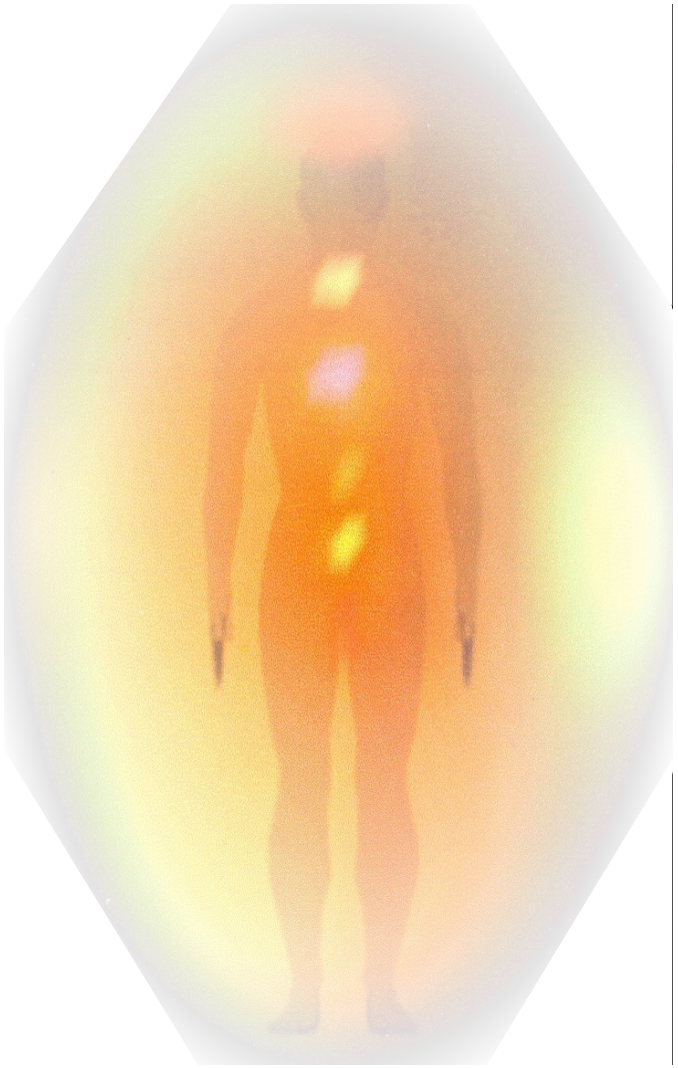
1 a : *a subtle sensory stimulus*

b : *a distinctive atmosphere surrounding a given source*

2 : *a luminous radiation*

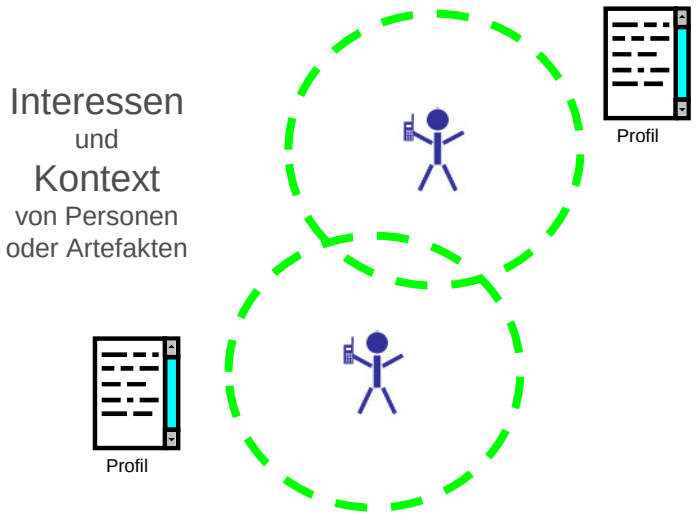
3 : *a subjective sensation (as of lights) experienced before an attack of some disorders (as epilepsy or a migraine)*

4 : *an energy field that is held to emanate from a living being*



<Meriam-Webster Online 2005>

Die „Digitale Aura“



Paradigma zur spontanen Interaktion:

- Individuenzentriert
- spontan / ad-hoc
- kontext-basiert
- räumliche Nähe
- Interessensähnlichkeit

Methodischer Ansatz:

- Interessens- und Präferenzprofil (XML)
- Proximity sensing (BT, IrDA, WiFi, ..)
- “en-passant” Austausch von Profilen
- Profilvergleich / Ähnlichkeitsanalyse
- Aktive / passive „Privacy Control“

Bluetooth

- RF 2.4 GHz, FHSS
- 0-10 / 100 m @ < 0.7 Mbit/s
- 0/20 dBm

WLAN ad hoc

- RF 2.4 GHz, FHSS, DSSS
- 30 – 100 m @ < 11 Mbit/s
- 20dBm

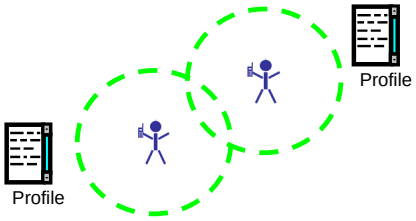
RFID

- 1cm – 6m
- Active vs. Passive Transponder

IrDA

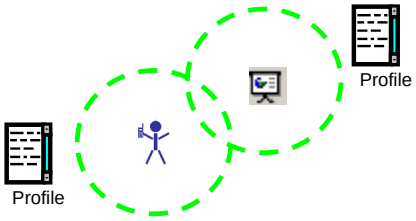
- „Line of Sight“
- 0-3 / 5 m @ < 4, 0.115 Mbit/s

Die „Digitale Aura“: Implizite Interaktion zwischen Personen



A. Ferscha, M. Hechinger, R. Mayrhofer, M. dos Santos Rocha, M. Franz, R. Oberhauser
Digital Aura, "Advances in Pervasive Computing", Austrian Computer Society (OCG), April 2004.
Video DVD PERVASIVE 2004

Die „Digitale Aura“: Implizite Interaktion zwischen Dingen und Personen



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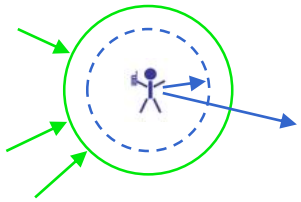
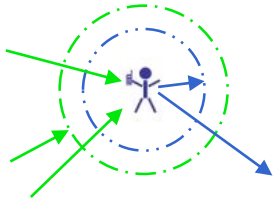
Die „Digitale Aura“: Privatsphäre



Context A



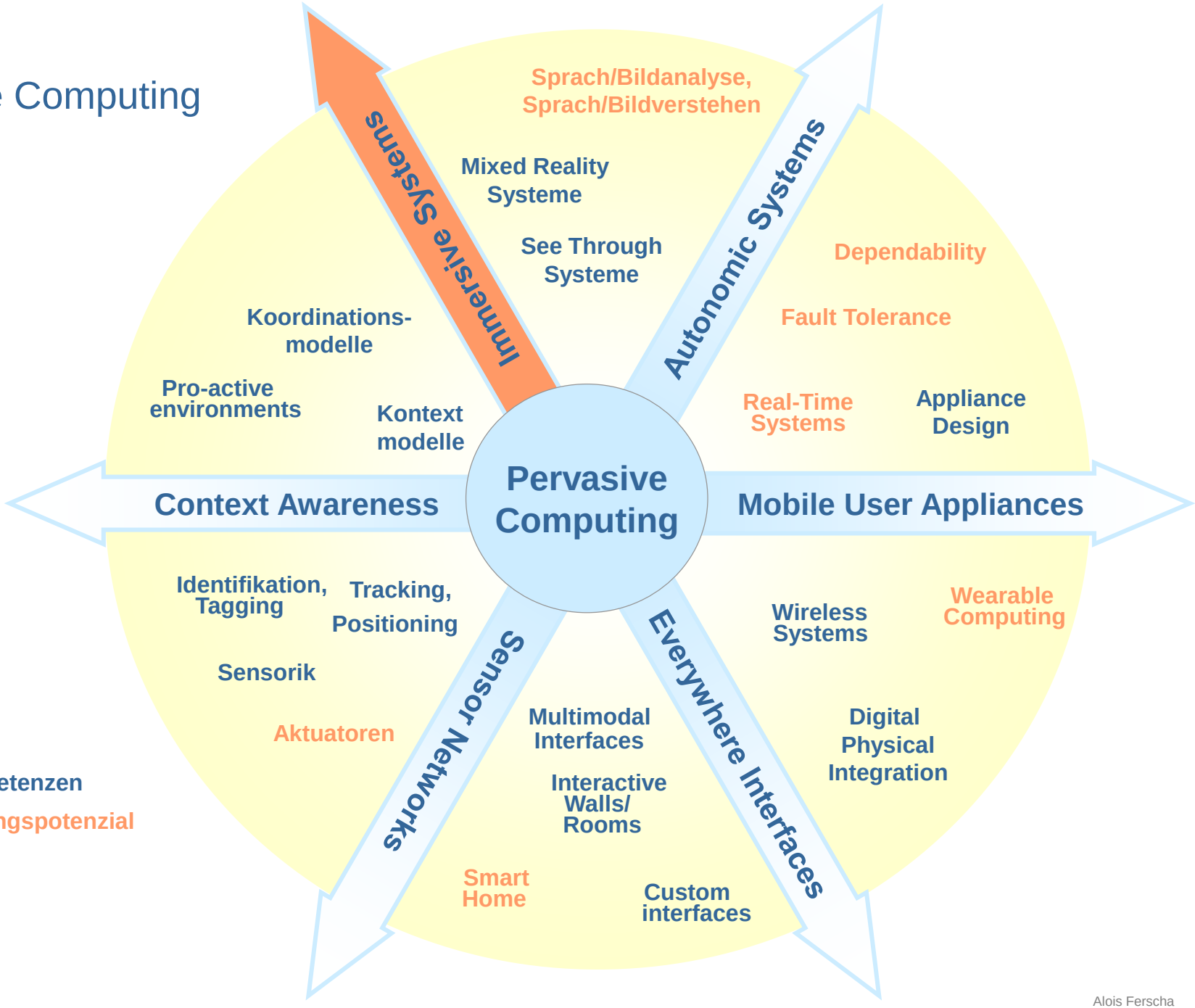
Context B

A. Ferscha, M. Hechinger, R. Mayrhofer, M. dos Santos Rocha, M. Franz, R. Oberhauser
Digital Aura, "Advances in Pervasive Computing", Austrian Computer Society (OCG), April 2004.
Video DVD PERVASIVE 2004

“Interfacing to the physical world is arguably the single most important challenge in computer science today....”

D. Estrin, D. Culler, K. Pister, G. Sukhatme:
„Connecting the Physical World with Pervasive Networks",
Pervasive Computing,
Vol. 1, No.1, pp. 59-69, 2002.

RIPE:
Pervasive Computing



- Kernkompetenzen
- Entwicklungspotenzial

Research Line: Immersive (Cooperation) Systems

Prospect Statement:

„The vision of pervasive computing tells us that the future landscape of smart appliances and smart spaces will be one in which literally “everything” is connected to “everything”, interacting in a collaborative and coordinated way. Interaction in such a world will have to be based on presence, physical proximity, locality, spontaneity and implicitness, rather than on unique resource locators, unique IDs, and global cataloguing. These principles of **interaction will have to be embedded into literally everything**.”

Challenges:

- develop formal models of embedded (spontaneous) interaction, in which things start to interact once they reach physical proximity to each other
- frameworks and tools that allow for a model based system design and development
- mobile/moveable/steerable input and output interfaces, adaptation to user context, adaptation to environmental context, device free interaction
- …

Der „verschwundene“ Computer

Interaktion mit dem „verschwundenen“ Computer bedeutet, dass der Benutzer seine primäre Aufgabe erledigt, und sich nicht damit beschäftigt, einen Computer zu bedienen: **implizite Interaktion**

explizite Interaktion mit einem als „verschwunden“ wahrgenommenen Computer:

- hängt von Vorkenntnissen ab
- bezieht sich auf Erwatung
- ist subjektiv, variiert

Der „verschwundene“ Computer:

Perceived Invisibility

implicit use

explicit use

Interaction Device

Fully Embedded

Invisibility of Technology

Wahrnehmung: Mensch → Physisches Artefakt

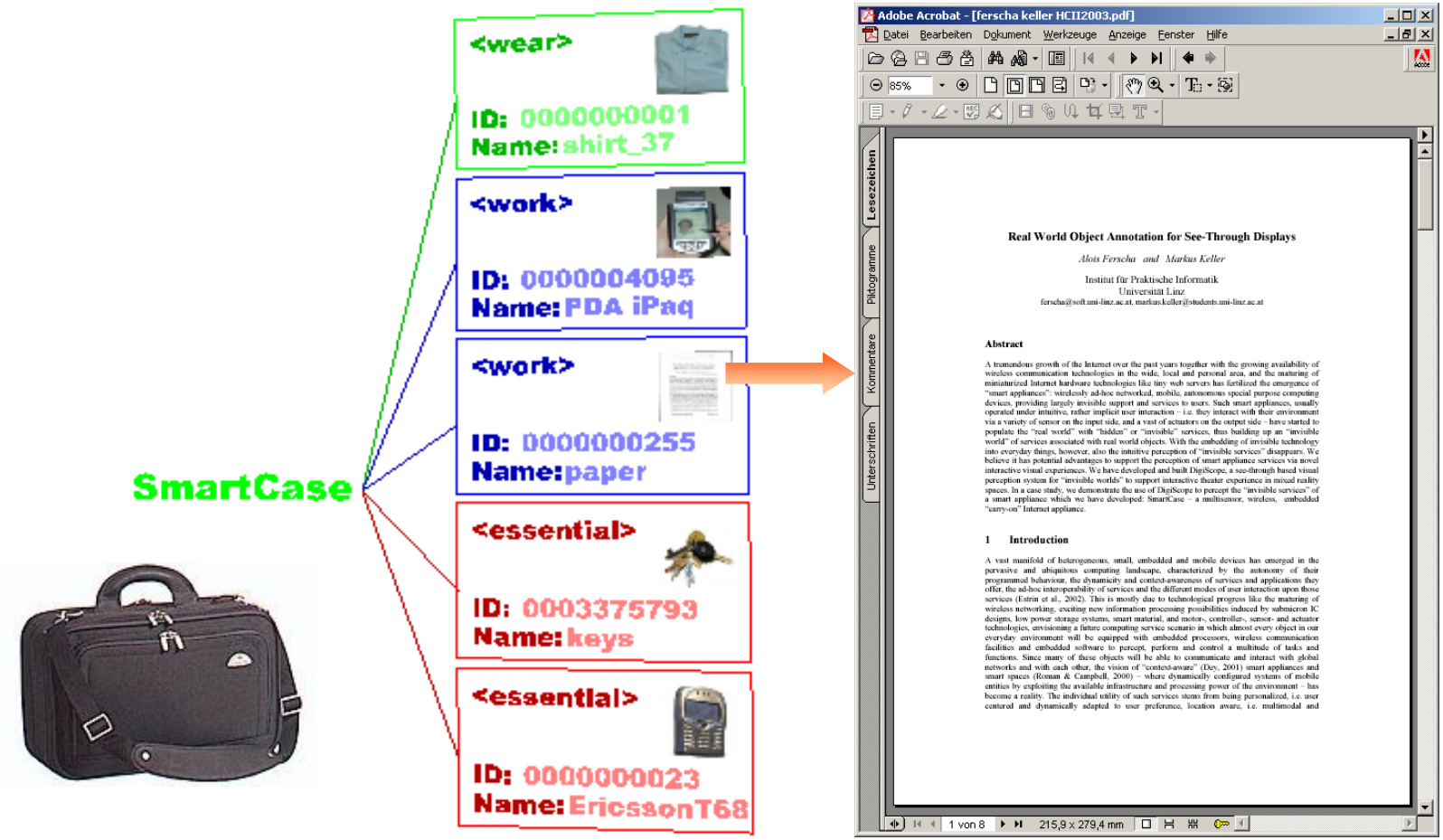
?

Wahrnehmung: Mensch → Physisches Artefakt

SmartCase

Wahrnehmung: Mensch → Physisches Artefakt

Wahrnehmung: Mensch → Physisches Artefakt



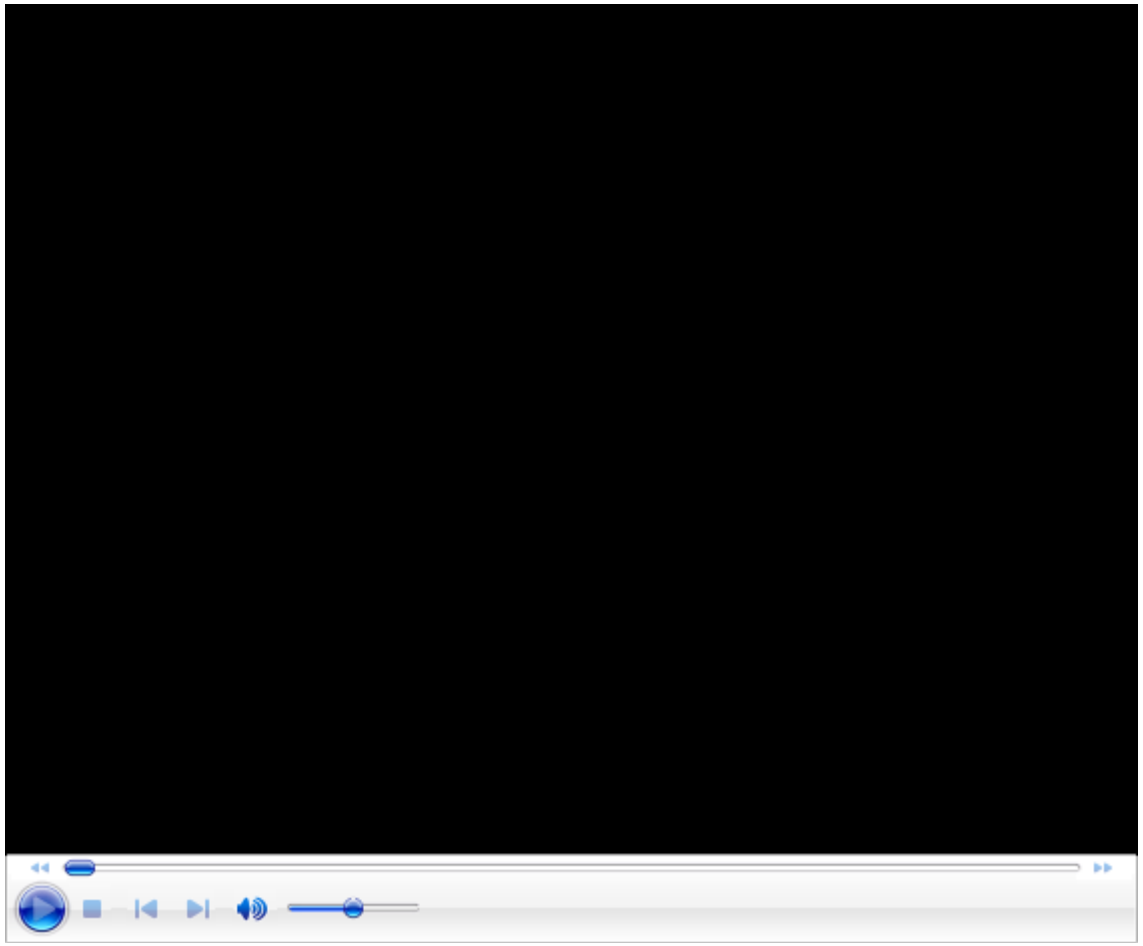
Wahrnehmung: Mensch → Physisches Artefakt: DigiScope

“Das Unsichtbare sichtbar machen!"

Brücke von

digitaler
“Welt der Bits”

realer
“Welt der Dinge”



Der „verschwundene“ Computer:

Perceived Invisibility

implicit use

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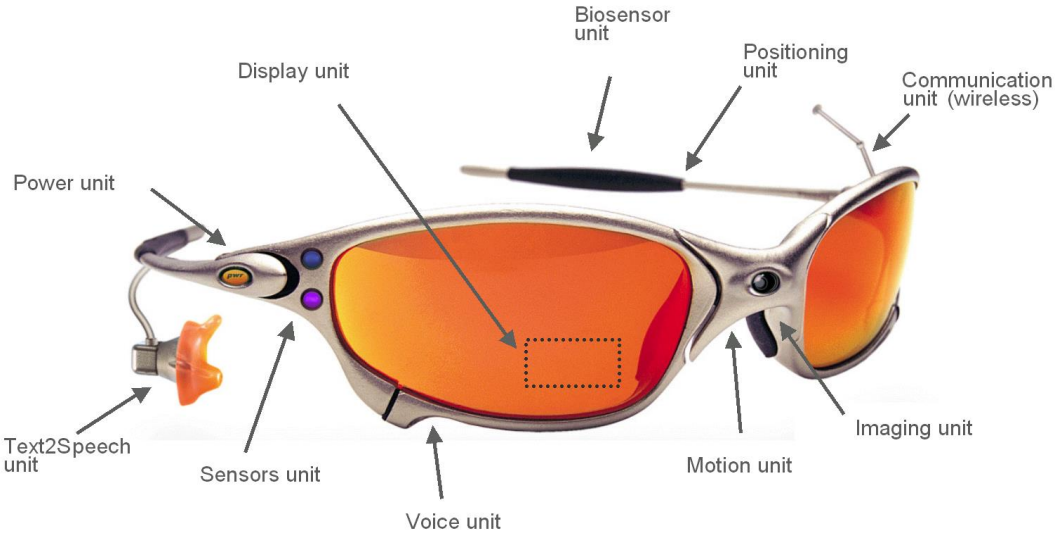
Interaction Device

Fully Embedded

Invisibility of Technology

Wahrnehmung: Mensch → Artefakt: SPECTACLES

“Das Unsichtbare sichtbar machen!"

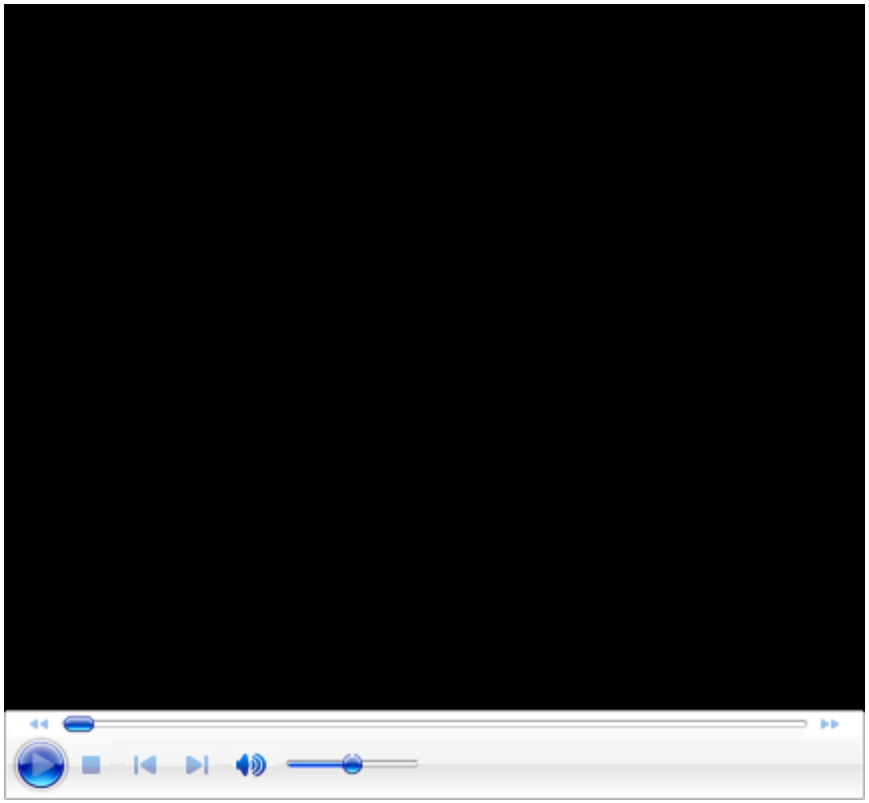


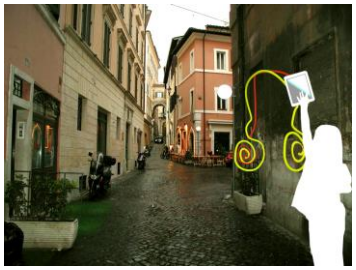
Prototypische Plattform:

- Video Input: Standard VGA, female DB-15 connector. Video Input
- Fits most adult frames and safety glasses. Eyeglass Frame
- Focus Range from 2 to 15 feet
- Field of View 16 degrees horizontal
- See-around display optics.
- 640 x 480, 24-bit color, 60 Hz refresh rate
- 40 grams (excluding eyeglasses)

Wahrnehmung: Mensch → Virtuelles Artefakt: Digital Graffiti

A smart location-based wireless communication service

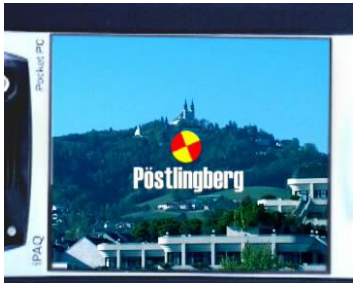




Original Idea: draw virtual pictures (Digital Graffiti) in real locations

Perceive Digital Graffiti in AR-view at the same location

Digital Graffito at the **position** of a parking car, **addressed** to the group of parking managers, perceivable during the parking **time** and **smart** showing dynamic content (time-ticker)

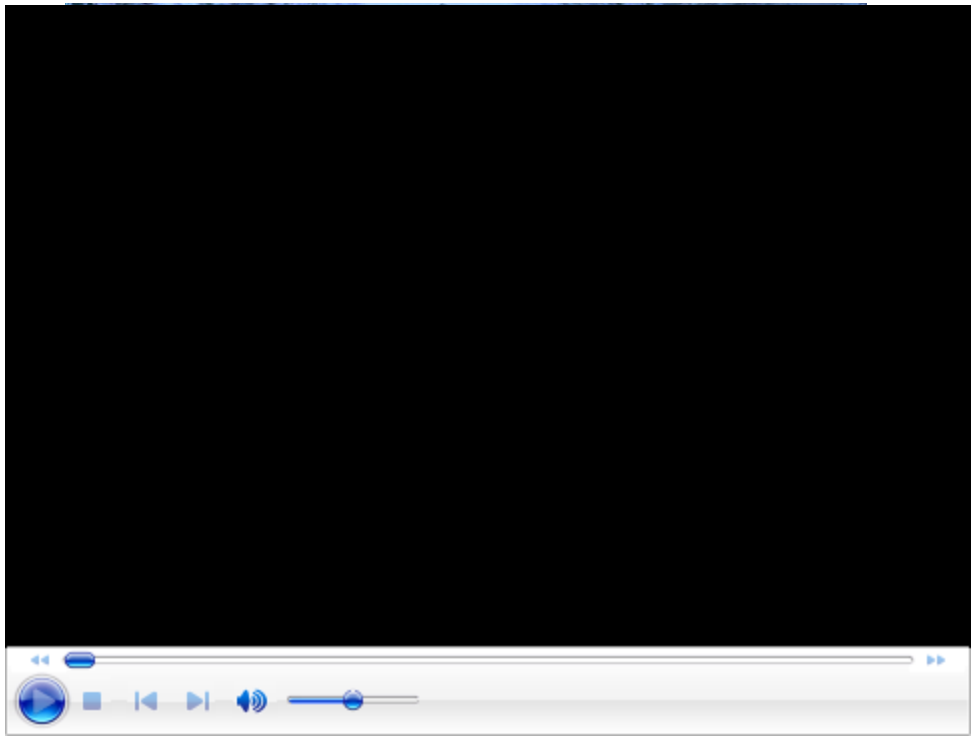


Digital Graffiti annotate points of interest in an AR-view on PDAs

Partners: Institut f. Wirtschaftsinformatik, JKU Linz
Siemens AG CT SE 1, Munich
Ars Electronica Futurelab, Linz

Wahrnehmung: Mensch → Virtuelles Artefakt: INSTAR

Innovative Visualization Paradigms for User Interaction in Car Navigation Systems



Future Scenario: Augmented Reality Navigation Information directly projected onto the windshield

Critical Situation Awareness

Alternative Augmentation: Virtual Follow-Me car

Hightlight Points of Interest along the route

Partners: Institut f. Wirtschaftsinformatik, JKU Linz
Siemens AG CT SE 1, Munich
Ars Electronica Futurelab, Linz

Current Approach: See Through Displays

"Inspecting the Invisible"

- interfaces that better support attention and maintain the fluency of work
- eliminate the gaps between the physical world and the real world objects
- provide users with flexible access to information in new environments

- a new exploration experience of the physical world seamlessly merged with its digital annotations via a non-obtrusive MR interface

- an integration of ubiquitous context-awareness and physical hyperlinking

Current Work

- Video Input: Standard VGA, female DB-15 connector. Video Input
- Fits most adult frames and safety glasses. Eyeglass Frame Size
- Focus Range from 2 to 15 feet
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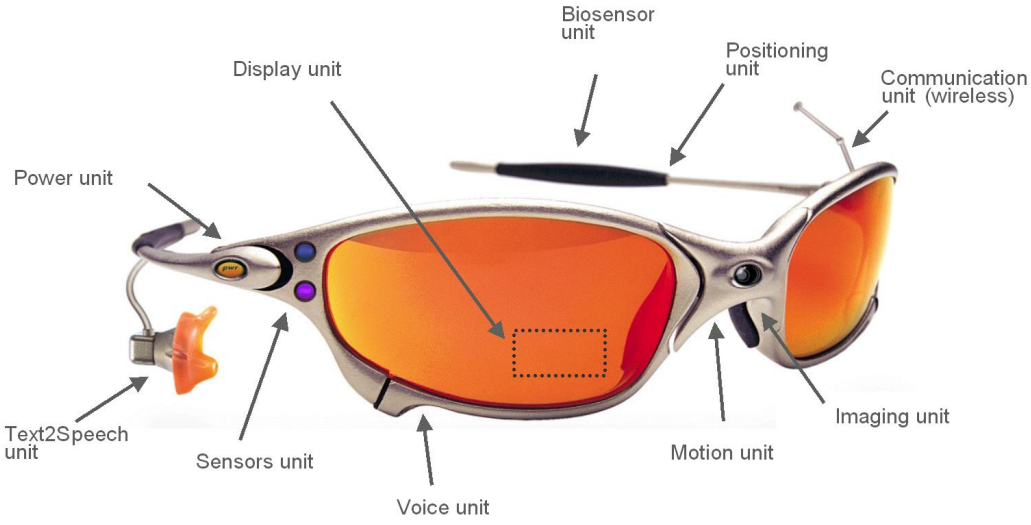
- See-around display optics.
- 640 x 480, 24-bit color, 60 Hz refresh rate
- 40 grams (excluding eyeglasses)

SPECTACLES – Autonomous Wearable Displays

Design goals:

- Wearable autonomous display system
- Adaptable to application domain (HW Assembly)
- Flexible software infrastructure / component based (SW Configuration)

(FIT-IT Embedded Systems, starts March 1, 2005)



RIPE:
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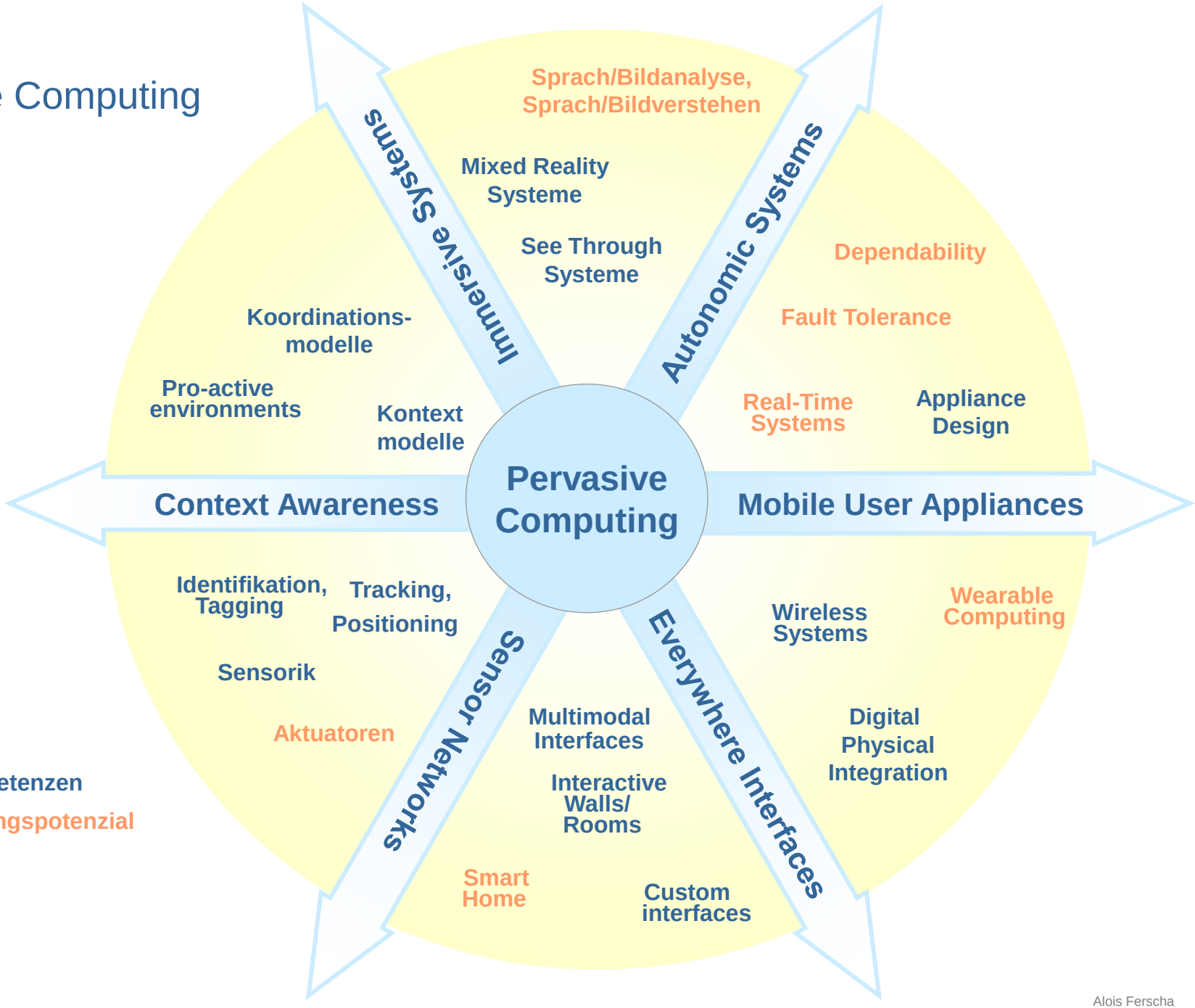

- Kernkompetenzen
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Pervasive Computing Systems

... will empower people through a digital environment that is:

- **aware** of their presence, attitudes, skills, and intent
- **sensitive**, **adaptive** and **responsive** to their needs, habits and emotions
- and **ubiquitously**, **safely** and **securely** accessible
- via **natural interaction**