

# Augmented Reality – Quo Vadis?

## Ubi es?

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## Motivation

Thus far:

- Great Visions for AR
- Yet, search for „Killer Application“ remains
  - A Solution in Search of a Problem.
- Technology-driven understanding of Augmented Reality (despite Azuma's definition)
  - 3D Information Presentation (e.g., on HMD or mobile display)
  - 6DoF Tracking

At the same time:

- Confluence of Augmented Reality with
  - Ubiquitous (Ambient, Pervasive) Computing
    - Intelligent Environments
  - Wearable (mobile) computing
  - Tangible Interfaces
    - 3D User Interfaces

### Suggestion

**Think about Information rather than Systems**



## Vision

- We are surrounded by information.
  - Information is real, but we cannot always memorize all of it and/or notice it with our limited senses.
    - As an afterthought: does the term „Augmented Reality“ make sense?
  - Information has many dimensions.
  - Information can relate to many aspects of an object, as well as to groups of objects and to relationships between objects.
  - Information has many kinds of reference points.
  - Different people perceive information differently.
  - Information is not static – we need and want to interact with it.
- Computers can help us analyze, explore and understand information.

## Computers can help us analyze, explore and understand information.

- Information access
- **Information presentation / visualization**
- **Information manipulation**

# Information Presentation and Manipulation

## Dimensionality

- 2D Interaction (WIMP)
  - Interfaces to operate the computer itself
  - Desktop-based computing
  - Mobile computing
  - Ubiquitous computing
- 3D Interaction (AR, VR)
  - Concept: exploit users' physical skills of sensing themselves (ego) and their environment (ambient)
  - Issue: how to deal with information that isn't inherently 3D

## Environment

- Interactions in a computer-related (virtual) world (Desktop computing, VR)
  - Issue: How to provide sufficient information (realism)
  - Issue: How to provide an overview as well as detailed information at the same time
  - Issue: Cyber sickness
- Interactions embedded in the real world (AR, wearable + ubiquitous computing, location-based services)
  - Issue: Primary vs. secondary user tasks (dangers in focusing on computer interaction)
  - Issue: Dimensionality clashes between virtual and real

## Back to the Vision:

We are surrounded by information.

- Information is real, but we cannot always memorize all of it and/or notice it with our limited senses.
  - Information access, presentation
- Information has many dimensions.
  - 2D vs. 3D vs. nD: wearable, ubiquitous, AR, VR
- Information can relate to many aspects of an object, as well as to groups of objects and to relationships between objects.
  - Information visualization
- Information has many kinds of reference points.
  - Explicit handling of spatial relationships; extensive, robust tracking
- Different people perceive information differently.
  - Usability studies, psychology, sociology, ethnology
- Information is not static – we need and want to interact with it.
  - Interaction schemes that are compatible with the physical setting.

## FAR research agenda / approach

- Ubiquitous AR
  - Ubiquitous tracking:  
**„AR-ready environment“**
  - Ubiquitous information presentation:  
Mobile windows into an enriched world (**„Informed environment“**)
  - Ubiquitous information manipulation:  
**The world is the interface**
- Real applications
  - Usability and utility
  - Surviving in a dangerous real world
  - No mixed-up senses
- User-centered development
- Outreach to future user communities (e.g. kids)
  - Heterogeneous culture



## Summarizing Thoughts

- AR has great potential.
- Beware of „Solutions in Search of a Problem“!
  - Rather think about suitable systems to present and manipulate information within realistic physical environments in 2D, 3D, nD.
- Utility: unbiased investigations or application requirements vs. technical options (software engineering)
- Usability: in-depth user-centered evaluations

### Burning issues:

- Ubiquitously available infrastructure for wide-area use of AR on mobile devices („AR-ready environments“)
- How can AR users act „normally“ in their real-world environment while also interacting in a virtual world of information? (Will they survive?)



Thank You