

User Interface Design

Lecture 10: Models and Theories

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In this lecture:

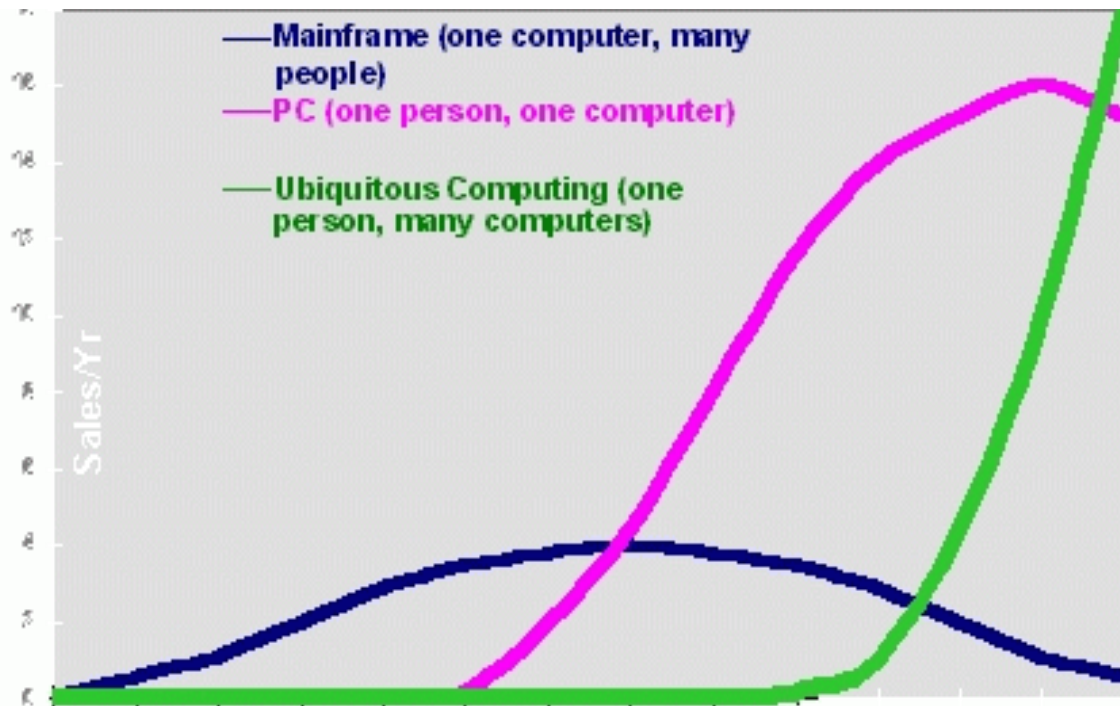
- ▶ Ubiquitous Computing
- ▶ Affective Computing
- ▶ Augmented and Virtual Reality
- ▶ Computer Supported Cooperative Work

Ubiquitous computing

- ▶ **Ubiquitous computing** (or "ubicom") is a concept in software engineering and computer science where **computing** is made to appear anytime and everywhere. In contrast to desktop **computing**, **ubiquitous computing** can occur using any device, in any location, and in any format. Examples, wearables devices.
- ▶ Computing everywhere
- ▶ Many computers serve each person. Typically computers use sensor and wireless.

Ubiquitous computing

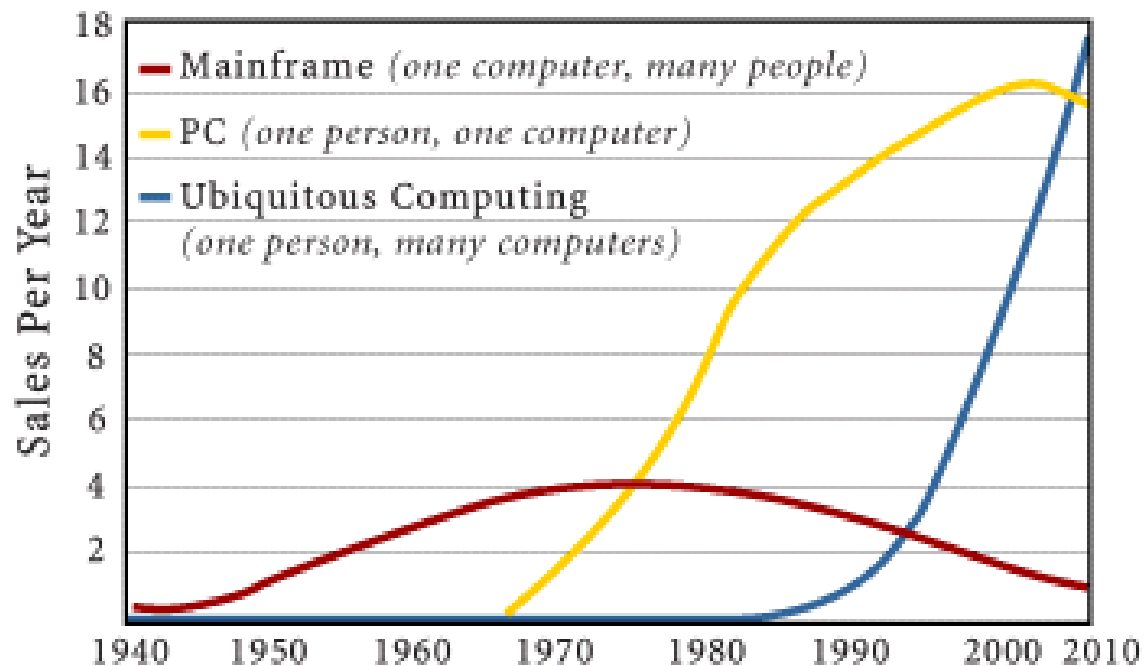
- ▶ The third wave in computing
- ▶ Mark Weiser: the father of ubiquitous computing
- ▶ first articulated the idea of ubiquitous computing in 1988



Ubiquitous computing

Ubiquitous Computing

The Major Trends in Computing



Source: Mark Weiser, Xerox PARC, 1998 (www.ubiq.com/weiser).

Ubiquitous computing

► Challenges and Requirements

- Hardware Applications
- User Interfaces Networking
- Mobility Scalability
- Reliability Interoperability
- Resource Discovery Privacy and Security

Hardware and the User Interface

- ▶ Nanotechnology

The trend toward miniaturization of computer components down to an atomic scale is known as nanotechnology.

- ▶ The multitude of different Ubicomp devices with their different sizes of displays and interaction capabilities represents another challenge

Networks

- ▶ Another key driver for the final transition will be the use of short-range wireless as well as traditional wired technologies

Mobility

- ▶ Mobility is made possible through wireless communication technologies
- ▶ Problem of disconnectivity!!!
- ▶ This behaviour is an inherent property of the ubicomp concept and it should not be treated as a failure

Scalability

- ▶ The primary challenge facing Ubiquitous Computing (UbiComp) in the coming years is how to deal with the sheer amount of data that will be created.
- ▶ The term “Internet of Things” (IoT) is today widely used and the concept it represents that of a world where everyday objects are interconnected and sharing information about their state is something that has stepped out of the realm of science fiction and become a plausible reality

Resource Discovery & Interoperability

- ▶ Resource discovery is the ability of devices to describe their behaviour to the network.
- ▶ Interoperability will probably be one of the major factors for the success or failure of the Ubicomp vision

Security and Reliability

- ▶ In a fully networked world with ubiquitous, sensor-equipped devices several privacy and security issues arise
- ▶ Thus the reliability of ubiquitous services and devices is a crucial requirement

Affective Computing

- ▶ An **affective computing system** is *a system of computational processes that perceives, expresses, interprets, or uses emotions.*
- Common emotions: fear, anger, happiness, sadness, surprise, disgust

Affective Computing

- ▶ **Why is it useful?**
- ▶ Facilitate Human-Computer (Robot) interaction
 - ▶ use emotions in simulated-agent plans (to simulate human reasoning)
 - ▶ communication and joint attention
- ▶ Entertainment
 - ▶ Computer games such as the Sims (EA).

Affective Computing

► Examples

SIMS (*Electronic Arts*)

- *Entertainment*: emotions are used to provide **entertainment value**



Augmented Reality

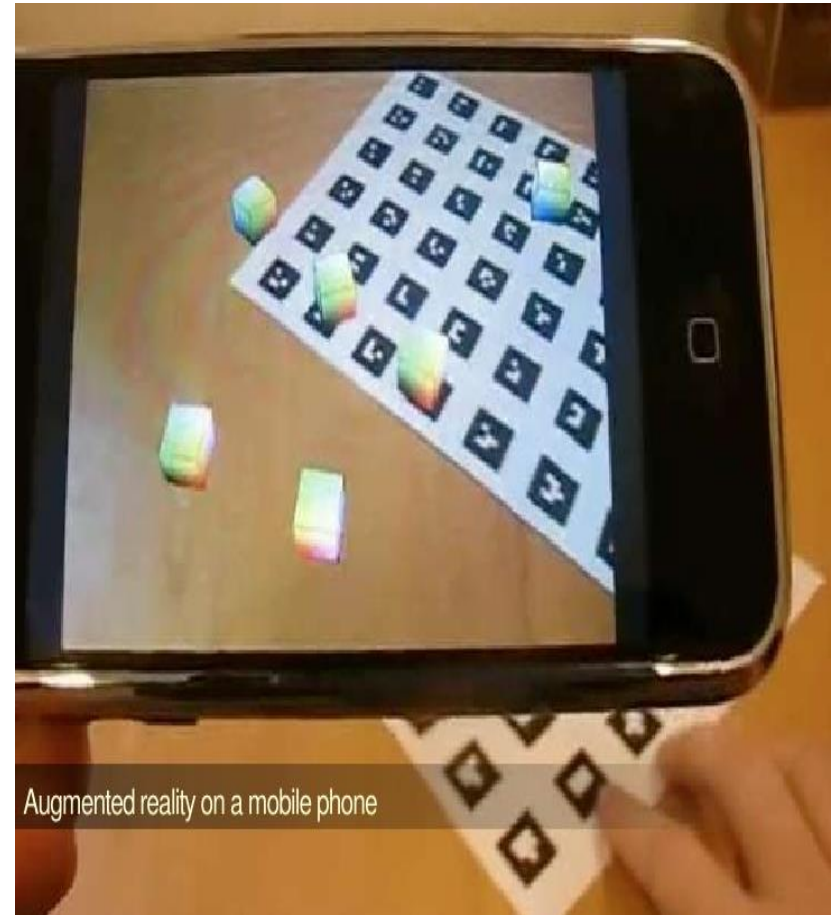
- ▶ **What Is Augmented Reality (AR)?**
- ▶ AR is a combination of :
 - ✓ a real scene viewed by a user and,
 - ✓ a virtual scene generated by a computer that augments the scene with additional information.

Augmented Reality

Augmented reality examples



Augmented-reality browser concept



Augmented reality on a mobile phone

Augmented Reality

- ▶ **Successful commercialization:**
 - Yellow line in football broadcasts
 - Glowing hockey puck
 - Replace times square billboards with own commercials during New Year's Eve broadcasts

Augmented Reality

Augmented Reality

- System augments the real world scene
- User maintains a sense of presence in real world
- Needs a mechanism to combine virtual and real worlds
- Hard to register real and virtual

Virtual Reality

- Totally immersive environment
- Senses are under control of system
- Need a mechanism to feed virtual world to user
- Hard to make VR world interesting

Computer supported cooperative work

- ▶ **What is CSCW?**
- ▶ CSCW (Computer-Supported Cooperative Work) refers to the field of study which examines the design, adoption, and use of groupware.
- ▶ Despite the name, this field of study is not restricted to issues of "cooperation" or "work" but also examines competition, socialization, and play.

Computer supported cooperative work

- Groupware is technology designed to facilitate the work of groups.
- This technology may be used to communicate, cooperate, coordinate, solve problems, compete, or negotiate.

Computer supported cooperative work

- While traditional technologies like the telephone qualify as groupware, the term is ordinarily used to refer to a specific class of technologies relying on modern computer networks, such as email, newsgroups, videophones, or chat.

Computer supported cooperative work

- ▶ Groupware offers significant advantages over single-user systems. These are some of the most common reasons people want to use groupware:
 - ✓ To facilitate communication: make it faster, clearer, more persuasive

Computer supported cooperative work

- ✓ To enable communication where it wouldn't otherwise be possible
- ✓ To enable telecommuting and to cut down on travel costs
- ✓ To bring together multiple perspectives and expertise

Computer supported cooperative work

- ✓ To form groups with common interests where it wouldn't be possible to gather a sufficient number of people face-to-face

Computer supported cooperative work

- ▶ Groupware technologies are typically categorized along two primary dimensions:
 - ✓ **Whether users of the groupware are working together at the same time** ("realtime" or "synchronous" groupware) **or different times** ("asynchronous" groupware).

Computer supported cooperative work

- ✓ **Whether users are working together in the same place ("colocated" or "face-to-face") or in different places ("non-colocated" or "distance").**