Welcome to the course:

Ubiquitous Computing

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(Multimedia Ubiquitous Smart Things)
マルチメディア ユビキタス 知的 もの

HP: http://cis.k.hosei.ac.jp/~jianhua/

TA: Kazuyuki Takahashi (MS student)

And you?

Course Objectives

- Provide a unified overview on the broad field of Ubiquitous Computing (UC/UbiComp)
  - Concepts and features of ubiquitous computing
  - Ubiquitous Devices (RFID, sensors, robots, etc.)
  - Ubiquitous Technologies (networks, context-aware, smartness/intelligence, platform, systems, etc.)
  - Trends and Challenges of ubiquitous computing and emerging ubiquitous society

Your Objectives

- Just spend couple of minutes, think about the following questions:
  - Why do you select this course?
    - What motivates you the most?
  - What do you expect to get from this course?
    - What interests you the most?
  - How do you expect to learn?
    - In what way you will feel most interesting?
      In what way you will feel boring?

Course Contents

1. Introduction to Ubiquitous Computing
2. Introduction to Ubiquitous Computers, Networks & Services
3. Sensors and Sensor Networks
4. Applications of Sensors and WSN
5. RFID Technologies
6. RFID Systems, Standards and Applications
7. Handheld Devices and Robots
8. Context and Context-aware Technologies
9. Context-aware Systems and Applications
10. Smart u-Things and Ubiquitous Intelligence
11. Internet/Web of Things
12. Security, Safety and Trust in Ubiquitous Computing
13. Social Issues in Ubiquitous Computing and Society
14. Future of Ubiquitous Computing

Evaluations

- Attendance (20%) + 4 Reports (40%) + Test (40%)
  - Report 1 (Lectures 1-2), submitted by 13:00, October 2
    Theme: Ubiquitous Computing Features and Representative Applications
  - Report 2 (Lectures 3-6), submitted by 13:00, October 30
    Theme: Ubiquitous Devices and related Applications
  - Report 3 (Lectures 7-9), submitted by 13:00, November 20
    Theme: Content-aware Technologies and Systems
  - Report 4 (Lectures 10-13), submitted by 13:00, December 18
    Theme: Trends and Challenges of Ubiquitous Computing & Smart World
  - Final Test (January, the date to be decided)

Report Templates & Requirements

- Report Templates:

  http://cis.k.hosei.ac.jp/~jianhua/course/ubi/TemplateJ.doc

  http://cis.k.hosei.ac.jp/~jianhua/course/ubi/TemplateE.doc

- Report Requirements

- Note 1: Use the above template to write your report.
  Don't change its **style** and **font**! Strictly follow the format!
- Note 2: Write a report based on your reading, understanding & thinking.
  Don't simply cut-paste! ➔ 0 point!
- Note 3: Each report must be in **four** pages including references!
  Can be in either Japanese or English! But, Abstract must be in English!
- Note 4: Name your report file as "R#-YourStudID", e.g., R1-13K0123
  Submit your report to 授業支援システム by the specified deadline.
  Late submission is unacceptable!

Course Materials

- Course Homepage:

  http://cis.k.hosei.ac.jp/~jianhua/course/ubi/

- References

- Ubiquitous computing - Wikipedia
- u-Japan HP: http://www.soumu.go.jp/menu_02/ict/u-japan/
- Stefan Poslad, Ubiquitous Computing: Smart Devices, Environments and Interactions, Wiley, ISBN: 978-0-470-03560-3, 2009.
- Y. Zhang, L.T. Yang, J. Ma, Unlicensed Mobile Access Technology: Protocols, Architectures, Security, Standards and Applications, CRC Press, ISBN-10: 1-4200-5537-2, 2009.
- Q. Li and T.K. Shih, Ubiquitous Multimedia Computing, Chapman & Hall/CRC, ISBN: 978-1-4200-9338-4, 2010
- Related materials on the Internet ← Important, main sources to learn!!

Question?

Lecture 1

Introduction to Ubiquitous Computing

- What is Ubiquitous Computing?
- History & Features of Ubiquitous Computing
- Related Visions & Computing

What is Ubiquitous Computing?

Ubiquitous (adjective) → Everywhere

Ubiquitous

Noun: Ubiquity/Ubiquitousness, Adverb: Ubiquitously

From Wikipedia *Ubiquitous Computing*

- Ubiquitous Computing (Ubicomp) is a post-desktop model of human-computer interaction in which information processing has been thoroughly integrated into everyday objects and activities.
- Ubiquitous Computing engages many computational devices and systems simultaneously, and may not necessarily even be aware that they are doing so.

Video 1 about Ubiquitous Computing

Other Definitions

- Ubiquitous Computing: Numerous, casually accessible, often invisible computing devices, frequently mobile or embedded in the environment, connected to an increasingly ubiquitous network infrastructure composed of a wired core and wireless edges (NIST)
- Ubiquitous Computing is when mobile phones, PDAs, pagers, automobiles, refrigerators, and other easy-to-use devices are linked to the Internet, allowing us to connect anytime, anywhere, a new infrastructure that will be common, ubiquitous, and work invisibly. (IBM)
- Physical Environments created when computing power and network connectivity are embedded in everyday device and object at everywhere in all time

Video 2 about Ubiquitous Computing

Who first proposed Ubiquitous Computing?

Ubicomp - Physical World Computing

„In the 21st century the technology revolution will move into the everyday, the small and the invisible..."

Mark Weiser (1952 – 1999), XEROX PARC

"Ubiquitous Computing enhances computer use by making computers available throughout the physical environment, while making them effectively invisible to the user"

Ubicomp: a field on a physical world richly and invisibly interwoven with sensors, actuators, displays, and computational elements, embedded seamlessly in everyday objects of lives and connected through a continuous network.

- Mark Weiser in his last article in IBM Sys. Journal, 1999

Weiser's Three Relationships

The Place of computer technology in our lives...

Mainframe Comp.

many people share a computer

Use must be well prepared

"run by experts behind closed doors"

Personal Comp.

one computer, one person

direct explicit use

"while it may take you where you want to go, it requires considerable attention to operate"

Ubiquitous Comp.

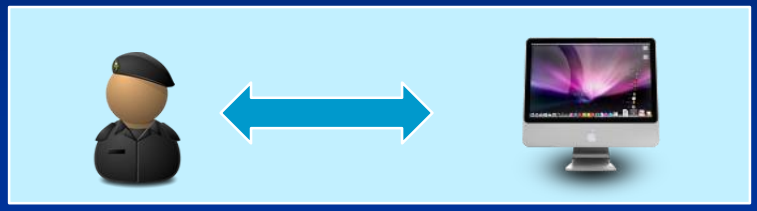
many computers share each of us

Use implicit (automatic)

"each person is continually interacting with hundreds of nearby interconnected computers"

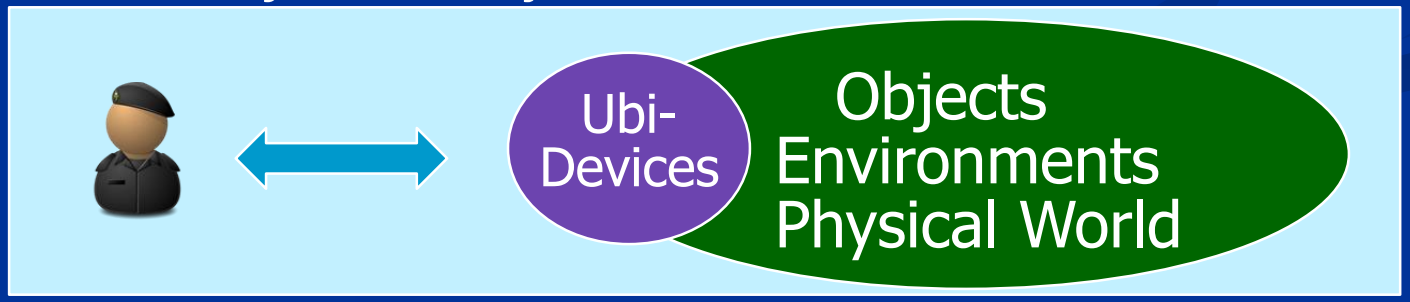
Human Computer Interaction (HCI)

- Human to Personal Computer



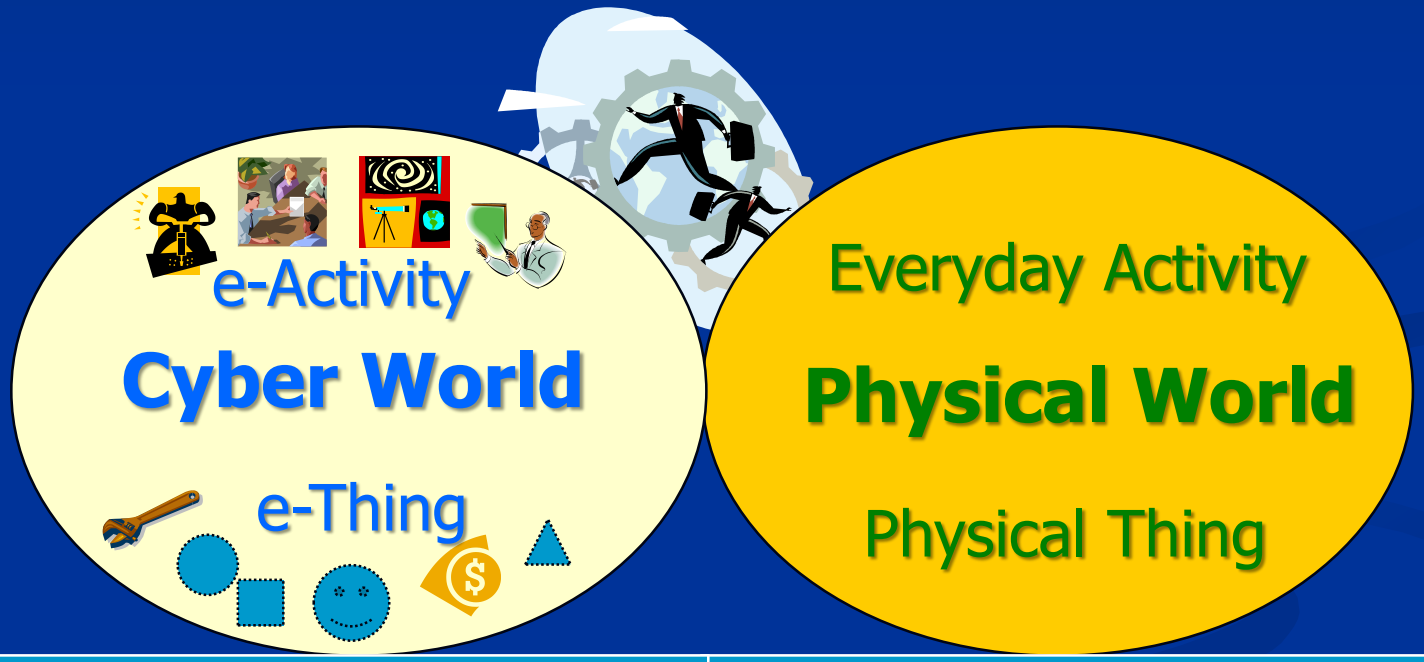
- Human to Internet/Web/Cyber

- Human to Physical Object/Environment/World



Ubiquitous Computing (UC, Ubicomp) → Physical Thing & Everyday Activity

In Real World on physical-cyber spaces in physical-digital form



WbS, SmW, Grid, P2P, EaaS, Cloud	UC, ID, Context, Emb. Sys., etc.
Computers & Networks/Internet	Sensor/M/NEMS, Comps & Per. Nets

Weiser's Vision *(1990):*

Ubiquitous Computing *(UC, Ubicomp)*

Mark Weiser (1952-1999)

1988: Notion „Ubiquitous Computing"

- Introduced and defined by Mark Weiser, XeroxParc
- ubiquitous „everywhere"
- Ubiquitous: economically, in arbitrary amount available

1991 „The Computer for the 21st Century"

- Article in Scientific American
- Vision: Computers become so much of our daily live that we do not take notice of them any longer

Mak Weiser's | *Mark Weither's Ubicomp July/1999*

Industry Vision *(1999, IBM, etc.):*

Pervasive | *Percomp*

Pervasive Computing *(Percomp/Percom)*

EU's Vision *(2001):*

Ambient Intelligence *(AmI)*

Ambient | *AmI*

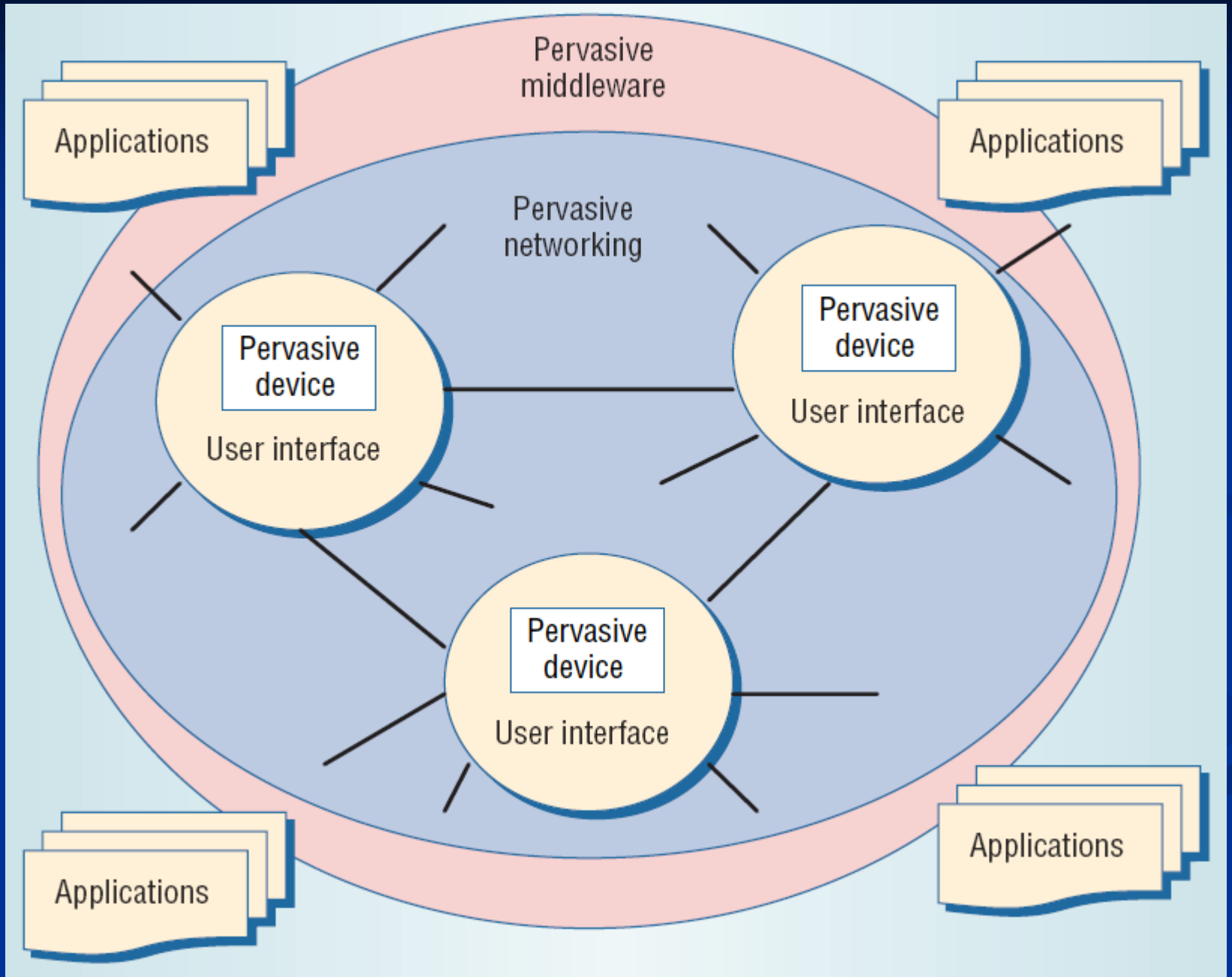
Other Related Visions

- Cyber Physical System (CPS) by US
- Internet/Web of Things (IoT/WoT)
- Smart World and Ubiquitous Intelligence by Ma
- Smart Planet by IBM
- U-Korea (from 2004/Nov)
- U-Japan (from 2005)

Other Similar or Related Computing

- Proactive Computing
- Autonomic/Organic Computing
- Context-aware Computing
- Human Centric Computing
- Embedded Computing
- Wearable Computing
- Sentient Computing
- Sensor Network/Computing
- Mobile Comp, Cloud Comp, Social Comp, ……
- Ubicomp → very wide scope, related to many computing

Ubiquitous/Pervasive Computing Framework



Course Organization

1. Introduction to Ubiquitous Computing
2. Introduction to Ubiquitous Computers, Networks & Services

Report 1

3. Sensors and Sensor Networks
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Report 2

7. Mobile Devices and Robots
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Report 3

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Report 4

14. Future of Ubiquitous Computing

Discussion

Homework

- Access the following websites to learn more about Dr. Mark Weiser, Ubicomp concepts, history, features, related visions/technologies, typical applications, etc.

- Ubiquitous computing - Wikipedia
- ユビキタスコンピューティング - Wikipedia
- u-Japan HP: http://www.soumu.go.jp/menu_02/ict/u-japan/
- Ambient Intelligence
- IBM's Smarter Planet – Japan
- Internet of Things – Wikipedia
- Others you like → Important to get materials from Web!!

Question?

Comment?