Cyber Science & Sociology

Jianhua Ma
MUSE Lab (**M**ultimedia **U**biquitous **S**mart **E**nvironment)
Faculty of Computer & Information Science
Hosei University, Japan

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

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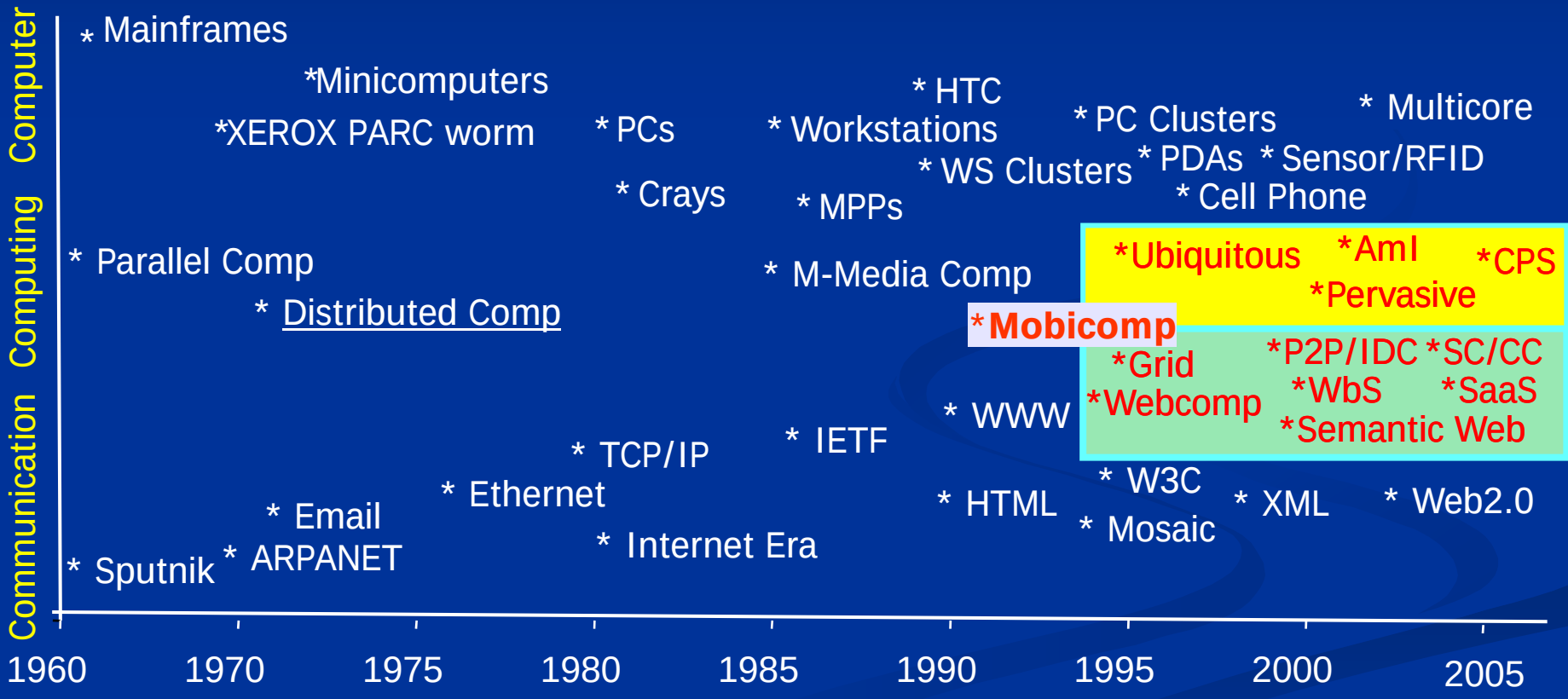
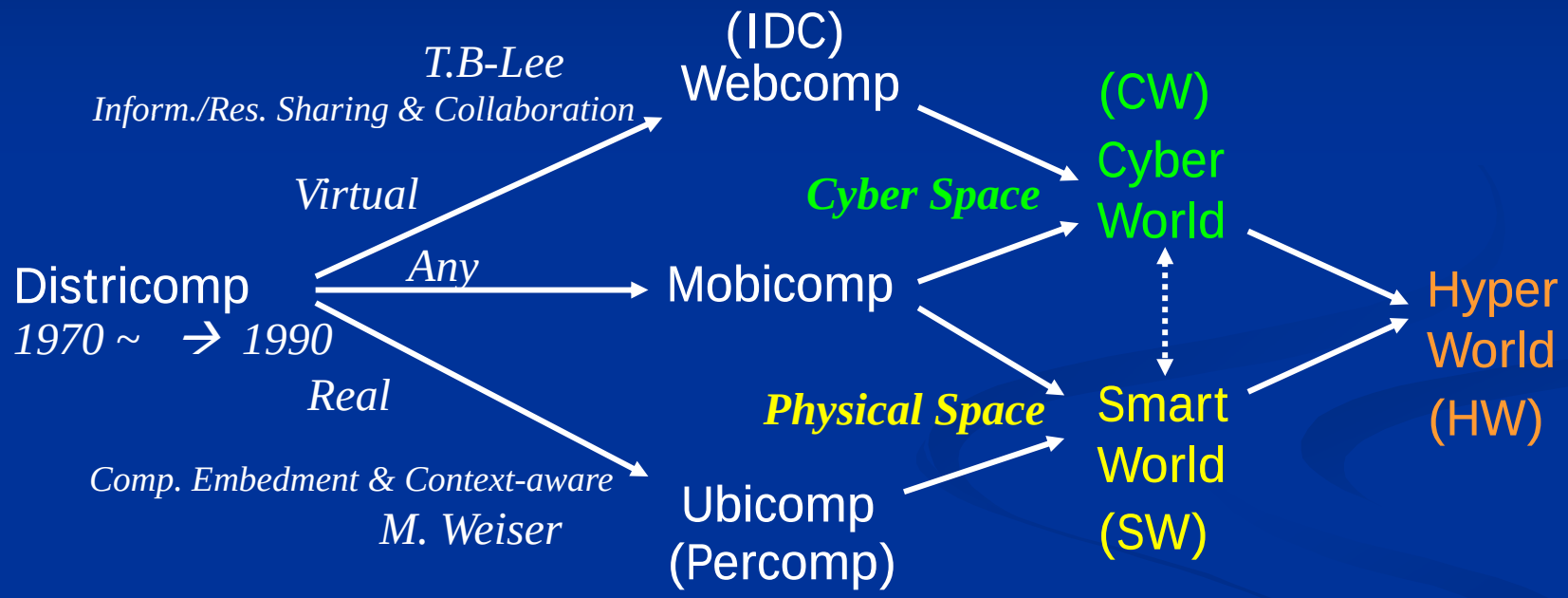
Computer, Communication, Computing

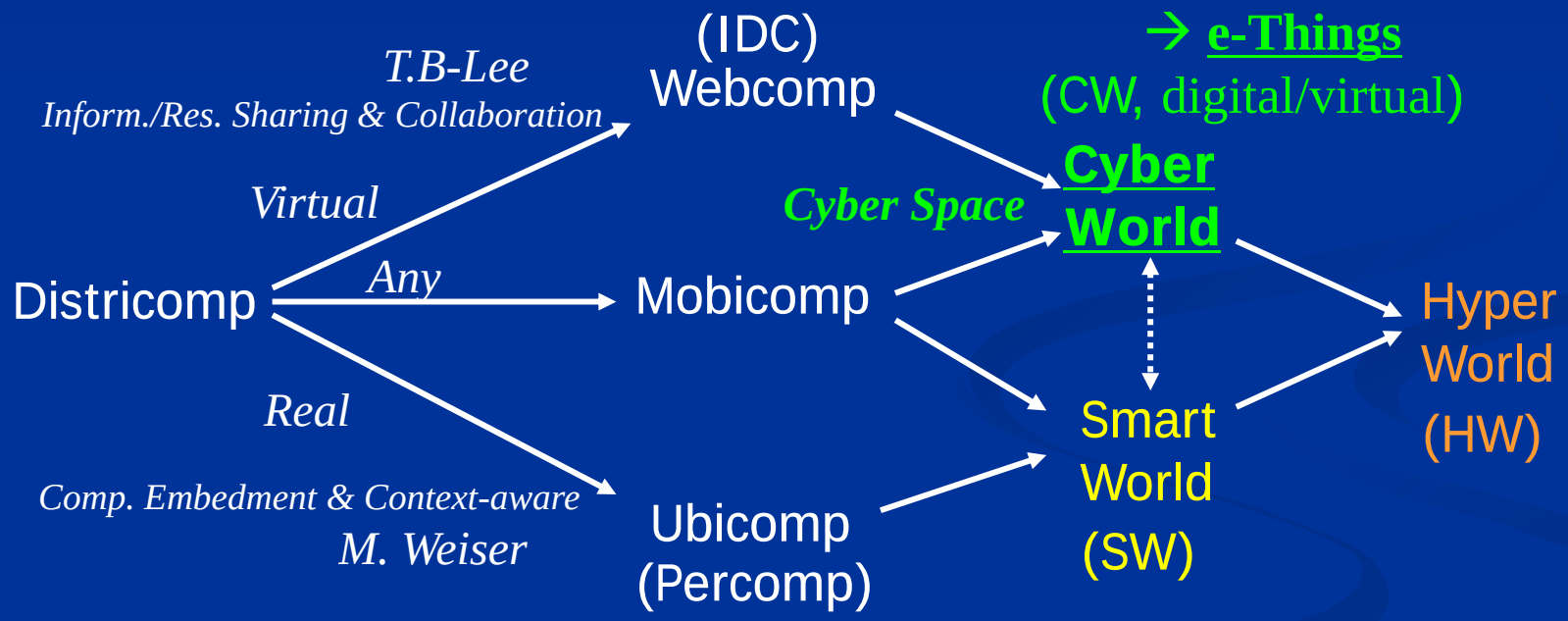


Relations of Computing and Worlds



Relations of Computing and Worlds

Co-found Int'l Conference on Cyber Worlds in 2002



u-Things – Attachment, Embedment, Blending

- Two Fundamental Technology Trends
  - Continuing miniaturization of devices (Moore's law, new material, nanotech., ...)
  - Continuous interconnections by ubiquitous/pervasive wired and wireless networks

u-Things: Physical things with some kind of **A**ttachment, **E**mbedment, **B**lending – **AEB** of computers, sensors, tags, networks, and/or other devices

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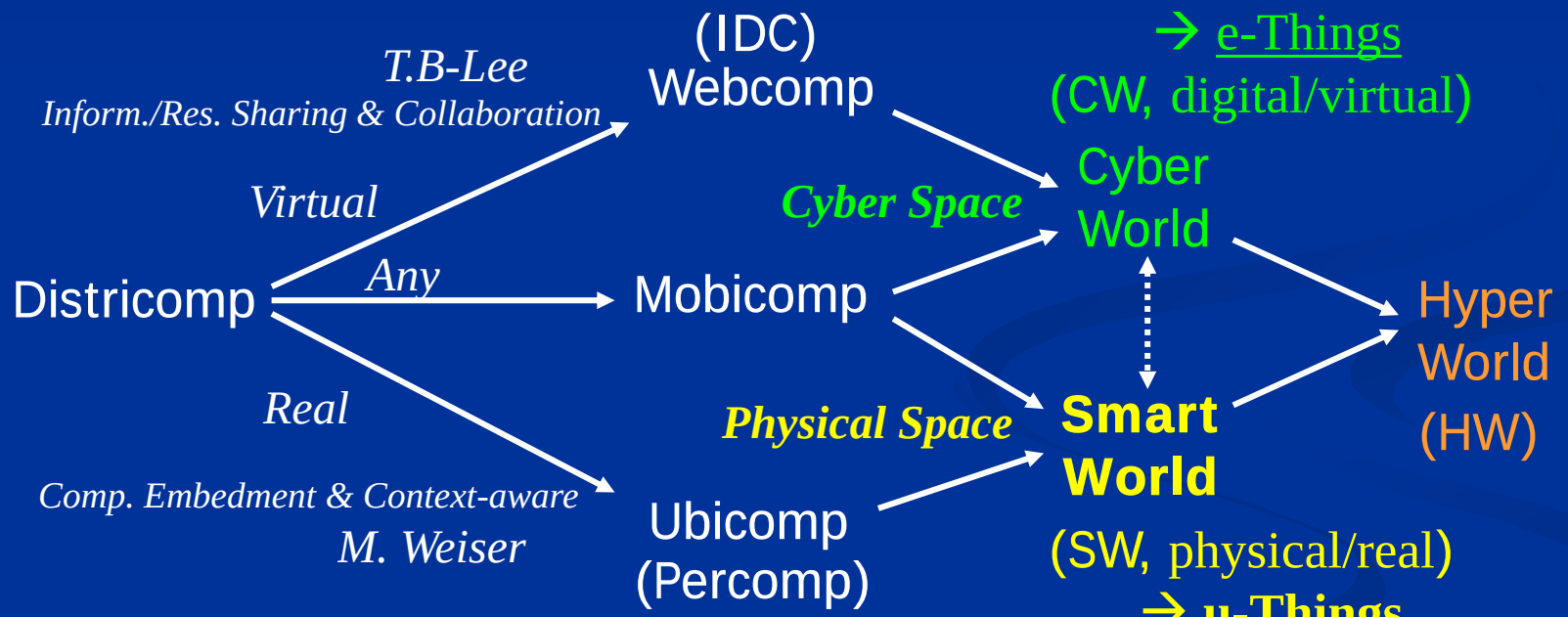
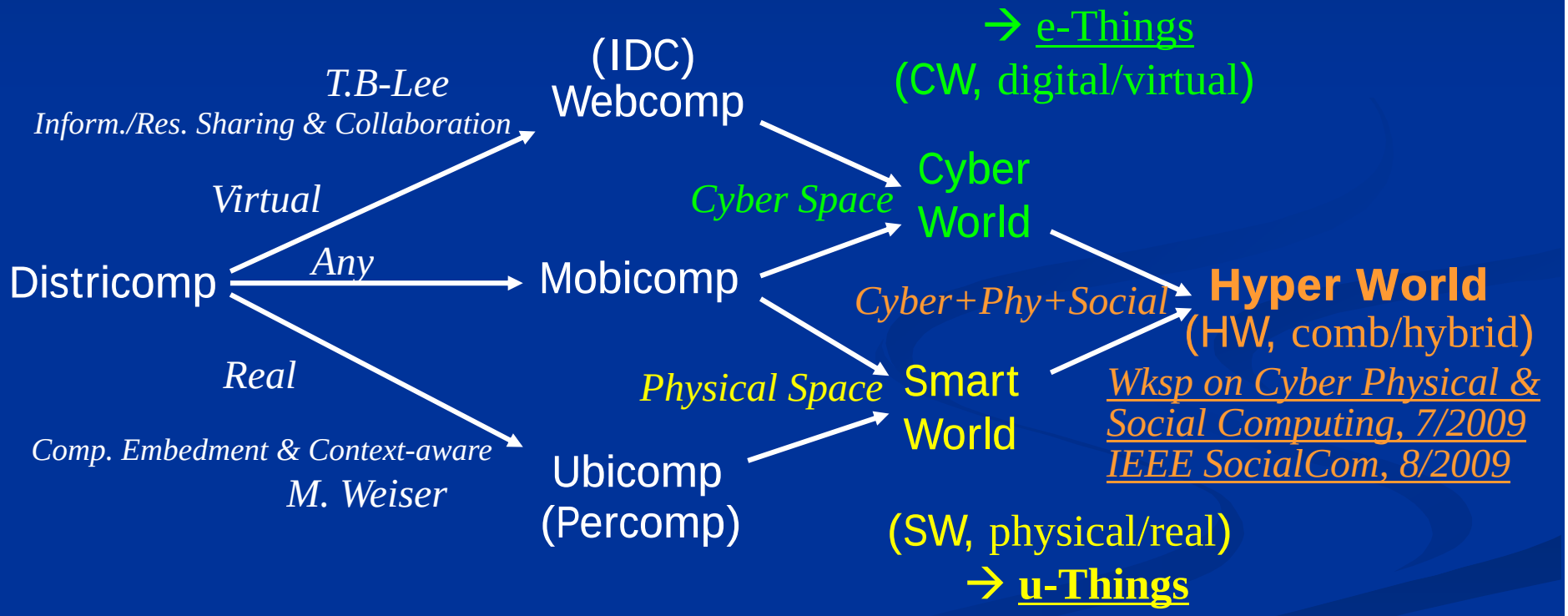


(Internet/Web of Things/Web3.0)
Smart Planet, IBM (2008)

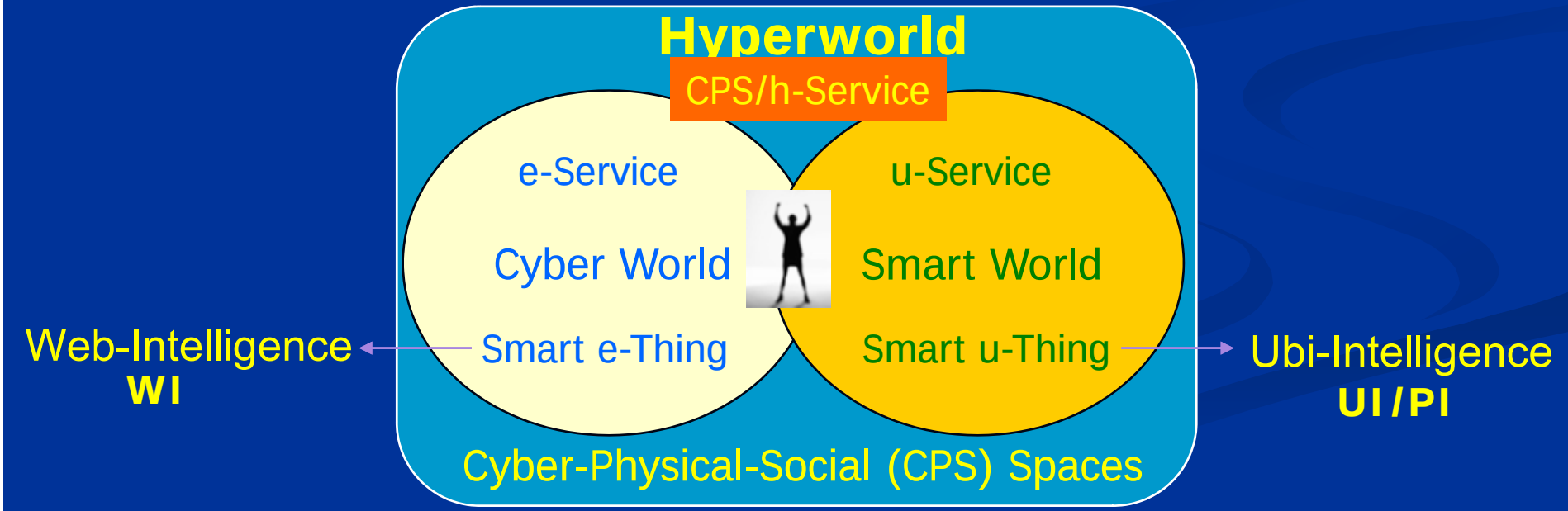
Found Workshop on Ubiquitous Smart Worlds in 2004

Relations of Computing and Worlds



Hyperworld

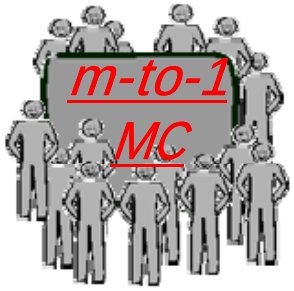
- Virtual Reality → Augmented Reality = Real/Physical + Virtual/Synthetic
- Hyper-environment → Integrated, Interconnected Virtual-Physical Environments
- Hyperworld *(1995, Hyperspace, Hyper-environment, Hyper-interface, etc.)*
  - "Hyperworld Modeling", Keynote in VIS, Melbourne, Feb. 1996 (Kunii, Ma, Huang)
  - "Its basic characteristic is direct mapping between virtual and real worlds via active devices including sensors, actuators, micro-machines, robots, etc." - *1996*
    - *"A Study on a Hyperworld System of One-to-Many Interaction", ICAI'97 (Weiser's 1-to-m relationship)*
    - *"Towards Direct Mapping between Information Worlds and Real Worlds", LNCS1306, 1997*

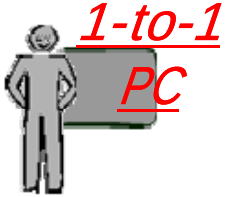


Characteristics in 3 Computing Waves/Eras

Weiser's
3 Relations
3 Waves

The Place of computer technology in our lives...





Comp Element	Mainframes	Personal Computers	e/u/h-Things
Size/Form/User	Large/Stationary/Few	Small/Portable/Many	Invisible/Everywhere/All
Main Role/Obj	Calculations	Information	e/u/h-Services
Proc. Content	Data	Media	Contexts
Central Goal	Fast/Precise/Reliable	Rich/Convenient/Secure	Aware/Comfort/Safe
Basic Behavior	Passive	Interactive	Active
Theory/Tech	Comp Science	Info Science/Informatics	**(??? Science)**

e-Science and e-Social Science

- e-Science *(1999, by John Taylor)*

  - To describe computationally intensive science that is carried out in highly distributed network environments, or science that uses immense data sets that require grid computing.

- e-Social Science

  - A development in conjunction with the wider developments in e-Science. It is social science using Grid Computing and other information technologies to collect, process, integrate, share, and disseminate social and behavioral data.

u-Science

Ubiquitous Computing - Ubicomp

→ Many other computing: Pervasive, AmI, embedded, invisible, context-aware, sentient, proactive, autonomic, amorphous, spray, organic, smart world, u-intelligence, ……

u-Things & u-Services

- → Real things with **AEB** computers, RFIDs, sensors, actuators, networks, etc.
- → Extra cyber dimensions newly added in physical/digital combined u-things
- → Smartness/intelligence from simple reactive function to complex life-like behavior

u-Science & u-Engineering

- → Systematic study of the u-things, theory, technologies, implementations, applications, etc.
- → Based on computer and information sciences, crossed with other disciplines: bio., soc., …
- → To lay foundations for integrating all u-related computing and push interdisciplinary study

Service Science & SSME

- Service Science, Management & Engineering *(IBM)*
  - To describe Service Science, an interdisciplinary approach to the study, design, and implementation of services systems – complex systems in which specific arrangements of people and technologies take actions that provide value for others. More precisely, SSME has been defined as the application of science, management, and engineering disciplines to tasks that one organization beneficially performs for and with another.

Web Science

Web Science Research Initiative *(T-B Lee)*

- The Web is the largest human information construct in history. The Web is transforming society.
- We no longer fully understand the web
- In order to understand what the Web is, engineer its future and ensure its social benefit we need a new interdisciplinary field that we call Web Science.
- To examine the World Wide Web and offer the practical solutions needed to help guide its future use and design

Network Science

Network Science *(US)*

- The study of networks has emerged in diverse disciplines as a means of analyzing complex relational data.
- A new and emerging scientific discipline that examines the interconnections among diverse physical or engineered networks, information networks, biological networks, cognitive and semantic networks, and social networks.
- This field of science seeks to discover common principles, algorithms and tools that govern network behavior.
- The National Research Council defines Network Science as "the study of network representations of physical, biological, and social phenomena leading to predictive models of these phenomena."

Cyberscience

- Cybescience *(2003, Michael Nentwich)*

  - As opposed to "traditional" science that does without networked computers, the notion of "cyberscience" captures the use of these ICT-based applications and services for scientific purposes.

- Genesis of Cyberscience *(SRI's DAPA project)*

  - To catalyze and accelerate the genesis of cyberscience, and will produce the first generation of mathematical models that will populate it and provide the underpinnings of cyber engineering.

Cyber Science

Cyber

- Internet-related prefixes include e-, i-, cyber-, info-, techno-, and net-, that are prefixed to a wide range of existing words to form new, Internet-related flavours of existing concepts. Additionally the adjective virtual is often used in a similar manner.

Cyber Science

- A collection of all cyber-related sciences
- e-Science, u-Science, Web Science, Network Science, Service Science, etc.
- Integrated study and common knowledge of these sciences

Cyber Sociology

Sociology

- It is the scientific or systematic study of human societies, a branch of social science that uses various methods of empirical investigation and critical analysis to develop and refine a body of knowledge about human social structure and activity, often with the goal of applying such knowledge to the pursuit of social welfare.

- Sociology of Internet: analysis of online communities and virtual worlds.

Cyber Sociology

- Human Existence on both cyber and physical spaces
- Human social structure/relation and activity on cyber-physical spaces
- Applying cyber science/facts, and applied to cyber science/engineering