Structuring Socio-technical Issues of the Ubiquitous Information Society in 2010

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Outline

- Overview of the Yaoyorozu* Project for Designing the Ubiquitous Information Society
- The Ubiquitous Information Technology and its Implication for the Society
- Some Topics in the Current Accomplishments
- Future Work based on Scenarios for 2010 Ubiquitous Information Society

*Yaoyorozu literally means eight millions in Japanese
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Connected Appliances World is one of the Current Hot Topics

- Want to know mother’s physical condition
- Want to record anxious topics
- Want to switch on the lights
- Want to warm the room
- Want to check foods in the refrigerator
- Want to see the children
- Want to be cooked

RGW: Residential Gateway
Microsoft is Coming to the Audio Visual World

Microsoft is Coming to the Audio Visual World

Apple has succeeded, and HP is following

Gates' keynote speech at CES show short on new technology

Instead, he focused on emerging high-tech homes

January 08, 2004 (IDG News Service) - Microsoft Corp. Chairman and Chief Software Architect Bill Gates yesterday presented a host of consumer-oriented technologies at the Consumer Electronics Show (CES) in Las Vegas, but his keynote address touched on just one previously unannounced product.

Windows Media Center Extender, a technology that will wirelessly link computers running Microsoft's Windows XP Media Center Edition with televisions, headlined as the only really new product announcement from Microsoft in Gates' sixth year as a CES keynote speaker.

Emerging Technology: Small Smart Devices

- Antenna built-in type RFID
  - μ-chip
  - 2.45GHz RF antenna

- μ-TAS (Micro Total Analysis System) for Health Monitoring
  - Micro Channel
  - Micro Separation Devices

- 1TB HDD Recorders

Attempts of Ubiquitous Computing by Mark Weiser
Source: Communications of the ACM (1993)
Sample Scenario: Augmented Memory Service

Health/Business Diagnosis and Advice

Augmented Memory Service

3rd Party Service

My Remembrance

Your Remembrance

P2P

Memorizing Service

Memorizing Every Personal Perception and Social Interaction (Conversation, Mail, Phone, …)

Ubiquitous Information Society in 2010

(Annotated World by Small Smart Devices)

Memory of Light

Memory of Road

Small Smart Device

Memory of Bench

Diagnosis and Advice
Concerns and Multi-Disciplinary Study: the Yaoyorozu Project

- What society people are expecting?
- Is the existing privacy protecting concept sufficient? Human information environment is shifting like: Desktop => Mobile => Ubiquitous
- How to obtain popularity of the smart embedded middleware technology in the world?

Project Teams

- Life Style Design (NIME, UDIT, Hitachi)
- Policy and Ethics (TUT, Hitachi)
- Systems (U. of Tokyo, Hitachi)
- Middleware (U. of Tokyo, Keio U., Hitachi)

NIME: National Institute of Media Education
TUT: Tokyo University of Technology

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The Yaoyorozu Project: its Goal

Research Goal
- Desirable Institutional Systems & Core Technology for Ubiquitous (Yaoyorozu) Information Society in 2010
- Research Methodology
  (August 2002-March 2005)

- Official Name: Research on Ubiquitous Information Society based on Trans-Disciplinary Science
- Support: Special Coordination Funds for Promoting Science and Technology by MEXT (Ministry of Education, Culture, Sports, Science and Technology, Japan)
“Yaoyorozu” (= eight million) means countless in number, particularly in the phrase “Yaoyorozu no Kami-gami, or “eight million gods”, indicating that gods live not only in the many old temples, but in trees and stones, in the sky and water, constantly surrounding and protecting us.

For our project, we use “Yaoyorozu” in place of Ubiquitous for the heterogenous intelligent devices surrounding and protecting us.
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Technology Structure of the Ubiquitous Information Systems

Access Network

Service Request

Service Delivery

RFID

Device Network

Sensor Node

HI & P2P Network

HI: Human Interface
P2P: Peer to Peer
Human Centric Layered View

- The Immediate Environment
- Instant Partners
- The PAN (Personal Area Network)
- Virtual-Real World

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# Features of the Ubiquitous Information Systems

<table>
<thead>
<tr>
<th>Layer</th>
<th>The PAN (Personal Area Network)</th>
<th>The Immediate Environment</th>
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<th>Virtual-Real World</th>
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</thead>
</table>

- **Mobile and Internet**
  - Wireless LAN

- **Ubiquitous**
  - Mobile and Internet
  - Instant Partners

- **Features**
  - Myriad of Information Devices
  - Dependent on Spatial Constraint
Sociological Expectation for the Ubiquitous Information Society

Mass Media Systems

Functionary Specialized Systems

Legal System

Economy

Politics

Academia

Mr. A System

Ms. B System

Business Communication Route: Information Exchange under the Business Relationships

Ubiquitous Information Systems (Spatially Constraint Communication)

Mass-Media Communication Route: Illusion of One-to-One Communication

Personal Communication Route: Personal Information Exchange

Revenge by Gemeinschaft against Gesellschaft
Impacts by Notable Emerging Technology

Notable Emerging Technology
- Photo Packet Switch
- 1$/GB Storage
- System on Chip (e.g. 100MGates with 4Mbits)
- Biometrics
- Sensors for Cogni. & Physiological Condition
- Wearable Interfaces
- RFID
- Autonomous Sensors
- Micro Generator /Battery

Virtual (Media) World

Personal World

Real World

Traditional Idea for Ubiquitous Information Systems
- Anytime
- Anyplace
- Anything
- Anyone

Self-Actualization Symbiosis
Augmentation
Secure Life

Biological Information Base
Implications in Information Systems Evolution

Virtual (Media) World
- EDP (1970-)
- Office Automation (1980-)
- Information Collaboration (1990-)
- Fine Collaboration (2000-)
  - Efficient
  - Affluent

Personal World
- Mobile IT (1990-)
- Mobile IT-Bio Integration (2000-)
  - Self-Actualization
  - Symbiosis
  - Augmentation

Real World
- Automation of Big Plants
- FA Robotics (Comfort & Energy Saving)
- Embedded (Safe & Eco)
- Collaboration
  - Secure Life

Virtual World
- Automation
- OA
- FA
- Network
- Yaoyorozu

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Koko-Memo (Here-it-is): Citizen Network

- e-Citizen Rooms by Local Governments
  - More than 70 local governments are currently operating the electronic citizen conference rooms in Japan.

- What operation is successful?

LG2C Type

C2C Type
Koko-Memo (Here-it-is): Use Case

- Utilizing Mobile Phone with Camera and GPS
- Supporting Everyday Communication

Use Flow

- Take Photos by Phone
- Send GPS Mail to Server
- Receive Uploaded Notice
- Browse by Phone

Server

Copyright (C) Shobunsha Publications Inc. (Map)
Koko-Memo (Here-it-is): Field Study

<table>
<thead>
<tr>
<th>Time</th>
<th>4 hours (10:00～14:00)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registrations</td>
<td>150 topics</td>
</tr>
<tr>
<td>Each team</td>
<td>7.5 topics / hour</td>
</tr>
</tbody>
</table>

- Two persons for each team recruited by the local NPO
- Walk from Hamamatsu Station to Castle Park

Observations
People within the same time and area enjoy communication according to their discovery.
Camera and Privacy

- Monitoring & Tracking
- Gate Keeping
- Emergency Support
- Information Access Control
- Multi-Agent Simulation
- Risk Analysis

Town Management System

Camera Network

Sensor Network
Camera and Privacy: Automatic Negotiation among the Participants

Privacy Protection Guideline by OECD

- Cube Representation

Source: IEEE Spectrum, July, 2004

Privacy Conscious Video Monitoring

- Mosaicking based on Policies of the Participants
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Systems Research for Knowledge Synergy

- Humanity (Policy, Life-Style)
- Opinion
- Systems Directing with Models
- Models for Discussion
- Opinion
- Engineering (Middleware)

- ✓ Cognitive Model (Scenario)
- ✓ Multi-Agent Model
- ✓ Micro Behavior Model
Four Representative Scenarios

- Steppen-wolf
- Womb
- Ich
- Wir

Goal Attainment

- Augmented Memory Service
- Home Care Service
- Traceability
- e-Democracy

Subsistence


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Techno-Problems for Ubiquitous Information Systems

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-Mobile and Internet

-Ubiquitous

-Identity Mgmt
-Context Awareness
-Service Automation
-Dynamic Integration
-Anonymous Integration
-Hetero-Integration
### Presumed Socio-technical Issues for Ubiquitous Information Society

<table>
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<tr>
<th>The PAN (Personal Area Network)</th>
<th>-Is it possible to define a clear boundary between wet and dry brain?</th>
</tr>
</thead>
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<tr>
<td>The Immediate Environment</td>
<td>-Is it acceptable that computers are disappearing?</td>
</tr>
</tbody>
</table>
| Instant Partners                | -Impact of real-time policy negotiation to human behavior in constructing relationship  
|                                 | -What social infrastructures are required to foster relationship by the Instant Partners? |
| Virtual-Real World              | -Product liability of the ubiquitous services?  
|                                 | -Impact of traceability to the power balance of participants in demand and supply chains  
|                                 | -Qualified and economical government services based on ubiquitous information technologies |
Concluding Remarks

- The Yaoyorozu Project aims at designing ubiquitous information society in 2010 by multidisciplinary efforts.

- POL team: examining ethics in the ubiquitous information society, LD team: extending IT use to citizen communication, MID team: increasing privacy consciousness in IT as well as enhancing secure and versatile connectivity of IT.

- Among the efforts, SYS team is working in order to direct the whole research activities by developing future scenario as well as network ecology models.

Track Organizers:
Motohisa Funabashi, Hitachi, Ltd.
Guenter Mueller, The University of Freiburg

Session 1: Socio-technical Scenarios for the Ubiquitous Information Society
Session 2: Self-organizing Mechanisms for Highly Distributed Intelligent Devices

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Thank you

http://www.8mg.jp