

Cyber-Assisting Real World with Ambient Intelligence and Semantic Computing

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The current information processing tools such as personal computers and the Internet are not always easy to use. Novice users often have to take a class to master them. The problem is not just a matter of user interface. A deeper AI technology is called for to solve it. A new trend in research was initiated to turn the table around. MIT's Oxygen project, Microsoft's Easy Living, Hewlett Packard's Cool Town, and European Ambient Intelligence Projects as well as our Cyber Assist project, which was carried out at Cyber Assist Research Center of AIST, are among those announcing their new directions: making machines invisible from human users and yet providing rich ubiquitous supporting environment with intelligence.

We proposed a plan of the future cities with information feedback control systems. It is achieved through sensors, actuators and information processing over them. Therefore, our use of "cyber" differs from those used by mass media where the word is synonymous to "digital". In fact, we define the concept as follows:

Cyber = digital + real.

It implies that the cyber world is attained by grounding digital (logical) information to the real (physical) world.

The goal of Cyber Assist project was to develop human-centered information processing assistance systems (intelligence booster) usable without special knowledge or training. We also addressed the problems of information overload and privacy. To achieve the goal, it is essential that machines (digital world) understand human context (real world) and the semantics of information being processed. But fully automatic treatment of meaning of information being processed is still beyond the reach of current AI technology. We took somewhat compromised approach to use annotations, which are provided by human, and set-up context, also provided by human, when systems give information to users.

The research project took three main approaches:

1. Semantic computing,
2. location-based situated communication, and
3. multiagent simulation.

I plan to cover them all in the talk.

Semantic computing is basically a system to be developed on the Internet (digital world). One of the targets is world-wide document sharing system with annotations so that machines can handle some part of semantics.

Communication method and the content are closely related each other and thus should not be separately designed. We believe one of the important grounding of content is to the location (of its existence, use, etc.). By using location as the address to deliver information, in contrast to the global ID such as IP address, the system gets access to the context. It is also useful in protecting the privacy of the recipient because the ID is not necessarily given to the system.

Multiagent simulation was used in an essential way to design societal systems. I will present examples including city-wide-networked car navigation system, bus-on-call system, and simulators used for RoboCup rescue.

Finally, I report systems that we developed for Aichi Expo 2005. We implemented two services: (1) location-based information providing and tracking service in the Global House, which is a pavilion run by Japanese government, and (2) artistic installment of sound in open setting of Japanese garden as a part of Laurie Anderson's "Show and Walk" installment.