

# Cyber Assist for Situated Human Support

## Extended Abstract

Hideyuki Nakashima, Takuichi Nishimura and Koiti Hasida

Cyber Assist Research Center  
National Institute of Advanced Industrial Science and Technology  
41-6, Aomi, Koto-ku, Tokyo 135-0064  
[h.nakashima@aist.go.jp](mailto:h.nakashima@aist.go.jp), [taku@ni.aist.go.jp](mailto:taku@ni.aist.go.jp), [hasida.k@aist.go.jp](mailto:hasida.k@aist.go.jp)

### Introduction

The current information processing tools such as personal computers and Internet are not always easy to use. Novice users often have to take a class to master them. The research theme of the Cyber Assist Research Center is the development of human-centered information processing technologies, which can provide situated information that I-want-here-now through "natural interface" (Nakashima and Hasida 2001). In other words, we are strengthening a variety of technologies that link digital realm represented by Internet to us people who live in the real world.

The aim of the talk is to introduce our research plans together with our view of the future information-processing environment.

### Cyber Assist

Our goal is to develop human-centered information processing assistance systems (intelligence booster) usable without special knowledge or training. We also address the problems of information overload and privacy.

Our target is to propose 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 in masmedia, where the word is synonymous to "digital". In fact, we define

cyber = digital + real

meaning that cyber world implies *grounding* of digital, or logical, information to the real, or physical, world.

Our project is classified as follows. We have two main targets:

1. situated information support
2. privacy protection

And we have two main approaches:

3. location-based communication
  4. intelligent contents
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### Location-Based Communication

One of our main approaches is the development of new communication methodology based on *location*, which is the integration/amalgamation of information processing technology and the real physical world through situated communication.

Location-based service itself can be implemented without using location-based communication. In fact, mobile phone and GPS can supply similar service. Non-ID communication is one of our main proposals and is discussed in detail in this paper. Semantic structuring of information, indexed with location is also our main target.

### My-Button

*My-Button* is a nickname given to our target hand-held or wearable device. As the name suggests, the ultimate design of the device has only one button as the interface, no screen nor keyboard. Just one (or two) click(s) on the button in a proper timing triggers the desired service. The key is that My-Button stays with the user long enough to learn the behavioral pattern of the owner.

My-button is equipped with gyroscopes and radio/optical communication media as well as auditory input and output (Fig 1). It communicates with information processing devices in the environment to know its own position and situation. It then keeps track of the history of its usage by the owner and learns his/her intentions contextualized by the situation.

Learning is achieved in cooperation with the environment, since the computing and storage capabilities of the device are limited. Half of the user's history is stored in the environment and retrieved by the key stored in the device. It is important that the information in the environment is meaningful only relative to the information in the device. Even if the servers have full access to their storage, personal information there is either meaningless or unreadable without the help of the personal device.

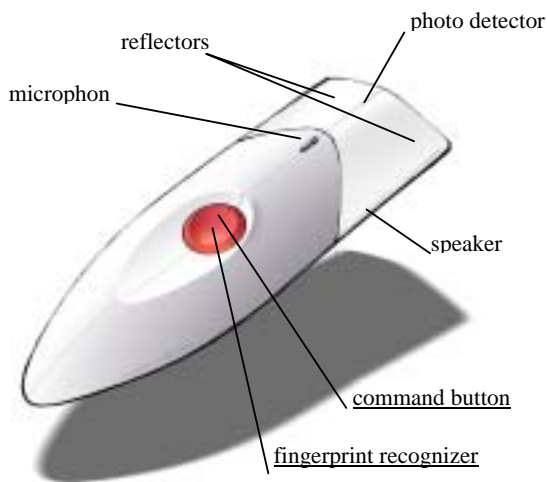


Fig 1 A design of "My-Button"

Since we use location-based communication protocol, the server has no clue to know the identity of the owner of the device. This is the key point of our implementation. Otherwise, our personal history will be open to the public and may be abused.

We have implemented the first version of My-Button as a very simple compact batteryless information terminal (CoBIT) (Nishimura et al. 2002). CoBIT is equipped with a reflective sheet, whose location can be easily identified from cameras mounted in the environment. It can receive infrared signal and replays it as auditory information. The infrared beam itself is the power source of CoBIT, thus there is no need to have any internal power supply.

### Intelligent Contents

A major cause of information overload and digital divide is the semantic gap between humans and computers; humans are better at dealing with deep meaning and machines are better at processing explicit syntax. The only feasible way to systematically fill this gap at the state of the art for the coming several decades or perhaps this century is to make the semantic structure of information content explicit so that machines can deal with them too.

Intelligent content (Hasida 2000) is information content annotated in terms of explicit semantic structure, which is typically predicate-argument structure or semantic network addressing the propositional content

Under location-based communication, the location contributes very much to plugging the private and the public contents. Namely, your spatiotemporal location allows you to use deixes: linguistic expressions, such as *I, you, here, there, now, a while ago*, and so forth, which make sense relative to the addressor's spatiotemporal

logical location. Your queries and private content may contain a lot of deixes, and the spatiotemporal location obtained through location-based communication provides the anchor point in the real world that renders those deixes meaningful.

## Application Images

### Exhibition Guide

The first version of My-Button, CoBIT, is ideal for low-cost guidance terminal for museum exhibitions. It can provide location-dependent as well as personalized information, possibly tuned to the knowledge level and/or linguistic preference of the guest.

### Information Infrastructure for Rescue

One of an important application of My-button is disaster rescue. My-button's become a secondary information infrastructure, which can form an ad-hoc network using their short-range communications. We are building a realistic simulator to plan and test the best networking strategies.

### Cyber Mart

If a shopping cart and stock shelves can communicate each other, there is a large room for supporting shoppers. One of our targets is an automatic payment at the cash register, or shopping without going through the checkout counter.

## References

- Hasida, K. 2000. GDA: Annotated Document as Intelligent Content'. Invited talk at *COLING 2000 Workshop on Semantic Annotation and Intelligent Content*, Luxembourg.
- Nakashima, H. and Hasida, K. 2001. Location-based Communication Infrastructure for Situated Human Support. In *Proceedings of SCI 2001(World Multiconference on Systemics, Cybernetics and Informatics)*, 2001. "Location-Based Wireless/Optical Communication for Situated Human Support"-Invited Session.
- Nishimura, T.; Itoh, H.; Yamamoto, Y. and Nakashima, H. 2002. A Compact Battery-less Information Terminal (CoBIT) for Location-based Support Systems, In *Proceedings of International Symposium on Optical Science and Technology (SPIE)*, 4863B-12.