

The Coming Cyber Society

-Types of Multimedia Applications & Services in Japan-

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Abstract The 21st century will see the formation of a "Cyber society" that, while separate from the real world, will cooperate with it, leading to the further expansion and development of world society. Cyber society allows the formation of virtual space through the connection of multiple computers in a network. In this virtual space, multiple users can communicate with each other and can collect and exchange information while moving about freely and engaging in activities.

Three main technologies are vital to the construction of the Cyber society: platform technology for converting multimedia information to optical signals and performing digital processing and communication processing on such signals; communications network technology for transferring these signals from one point to another; and application technology for configuring the Cyber society that will be formed on this network.

This paper describes platform technology and network technology with an emphasis on their relationship to application technology for configuring the Cyber society, and will also discuss InterSpace, one of the cyber society platform system of the Cyber society.

I. INTRODUCTION

With the advance of telecommunication systems, telecommunication services have moved on from telephone services that convey voice end-to-end, and entered the era of multimedia communications which comprehensively handle images, data, voice and text within cyberspace. The following three categories of technology are examples of ways to fulfill this need. The first is technology that converts digitized multimedia information from an electric signal to an optical signal, and processes, switches and transmits this optical signal as is, without reverting back to an electric signal midway. The second technology is one that builds networks that transfers this optical signal economically and with a high level of efficiency. The third technology achieves a highly functional application system that operates on this fully optical network. The integration of these three technologies will bring about a new telecommunication service in the future. In this service, cyberspace and the Cyber society will be configured within a network, and by systematically combining this network with our real

society, it is thought that this service will make our lifestyles more fulfilling. It is "electronic space" where many people can not only gather and communicate with each other, but also collect and exchange information while engaging freely in a variety of activities [1].

The NTT Human Interface Laboratories is now engaged in the research and development of "InterSpace" with the objective of constructing a platform for a new information-communications environment where people of the multimedia-communications era can interact with each other in an enjoyable and efficient manner to exchange information and achieve a higher level of mutual understanding [2]. InterSpace is a form of cyberspace with enhanced communication functions that allow people to converse with each other using both speech and facial images.

After a explanation of Multimedia communication services trends, this paper introduces InterSpace, a multi-participant virtual space, as a communications platform for the Cyber society era.

II. TRENDS IN MULTIMEDIA SERVICES

Although there are 61 million telephone subscribers in Japan, the rate of increase in subscribers is minimal. Conversely, the number of personal computers is increasing at the rate of millions of units a year, and by the year 2000, it is predicted that there will be around 40 million personal computers in Japan. The rate of connection to a network via modems or LANs is approximately 60%, which means that around 20 million personal computers are connected to a network. This figure is about one-third the number of telephone subscribers, and in the year 2000 it is thought that, like fax machines, people will make full use of personal computers in their personal lives as well as for business purposes.

The number of personal computers has been rapidly increasing in recent years, and it goes without saying that a major reason for this is the spread of personal computer communications and the Internet. At the end of 1996, 13 million host computers were linked to the Internet worldwide. The number of users was ten times this figure at about 130 million, with these users using electronic mail and World Wide Web servers. As this situation evolves, even the content of information is becoming multimedia oriented, and may contain text files, still images or voice, making conventional analog modem access too slow. Calls are on the increase for a much quicker means of access. Demand is therefore growing for ISDN as a method of providing high speed access to the Internet. In Japan, the use of ISDN has spread dramatically from about 400,000 lines in March 1995, to about 610,000 lines in March 1996, and to about one million lines in December 1996.

With this trend, it is obvious that hopes will be high for the development of a telecommunications service that successfully combines high speed with low costs as the content of information changes more towards high quality video. We believe that it is necessary to set the following three objectives, and conduct research and development in line with these objectives if we are to achieve such a telecommunications service. The three objectives are a Photonic network, Mega media and a Cyber society.

A. Photonic Network

In the event that signal processing speed at network nodes reaches a gigabit per second level, it will become difficult to plan a wide-spread reduction in network costs employing signal processing technology that uses conventional electronic circuits. A new communications principle will therefore be required. What has emerged from this is a next generation network platform technology called the Photonic network. The Photonic network is fully optical network technology of a terabit or petabit level that uses optical wave communications..

In establishing Photonic network technology, all-encompassing research and development is necessary. This research and development should start with the very basics, including new optical theories, optical device technology such as optical amplification and optical branching, and optical ATM (Asynchronous Transfer Mode) exchanges, and extend right through to systems technology.

B. Mega Media

The receiving of low cost multimedia network services that transmits megabit class information, such as video information, across the world in less than a second is vital to a multimedia society that intends to integrate broadcasting with communications. The key technologies to achieving this Mega media are FTTH (Fiber To The Home) and ATM. The FTTH concept was planned in Japan in 1990. The idea is to lay optical fibers to the homes of subscribers, enabling all subscribers to use optical fibers by the year 2010. For this plan to materialize, research and development is needed into achieving an economical and compact ONU (optical network unit), which will be the end terminal device for the optical fibers laid in the home.

Hopes are high for ATM technology to become the key communication format of the multimedia era. Presently, research institutions are conducting research and development that will make ATM technology faster, highly reliable and more economical.

C. Cyber Society

When Mega media forms the infrastructure of our age, what type of society will we become? We will

become a 21st century information distribution society, or Cyber society. The dramatic transformation towards information distribution will be brought about by money circulating on networks. Money, which forms the basis of our social economic system, is likely to become the focus of the information distribution society, with information and products to circulate electronically on networks.

The basic concept of information circulation is that people who want information and people who want to provide information can easily meet up on a network and feel at ease.

As with the telephone in the 20th century, the Cyber society will require a universal means of communication for the 21st century that everyone can use. Therefore, information sharing technology that links users with information, and information distribution technology that uses this information sharing technology to link information suppliers with demand will become necessary. Information sharing technology encompasses security technology that enciphers information and confirms user identifications, and directory technology that retrieves the information requested by the user. Information distribution technology includes cyber space technology that provides a virtual communication space combining such elements as virtual reality and computer graphics, safety commerce technology that allows for the worry-free buying and selling of products and information using electronic cash, and intelligent agent technology that processes a variety of tasks that used the network on behalf of the user. The combined use of these technologies will shape communication methods for the 21st century.

Thereby, I finish my descriptions of Photonic networks, Mega media and the Cyber society. In relation to the Cyber society, which from the users' perspective will have the most effect on ease of use, an outline of InterSpace technology will follow. This paper will describe the InterSpace concept, system configuration and matters for consideration concerning this technology, which will form the foundations of the Cyber society.

III. INTERSPACE CONCEPT & SYSTEM

A. System configuration and function distribution

InterSpace will form the foundations of the Cyber society. InterSpace system configuration is shown in Fig.1., and the image of the InterSpace world is shown in Fig.2. Main system components are clients that provide users with the service, and a virtual space server that supports multiple-user communication, manages resources, and runs the service. The server connects to the clients by ISDN lines, Internet, OCN (Open Computer Network), or similar. A user in InterSpace uses a mouse, joystick, or other input device to maneuver freely through virtual space that is generated by three-dimensional CG on a personal computer display. Each participant in InterSpace appears in virtual space as an "avatar" that acts as one's other self. This avatar is also generated by three-

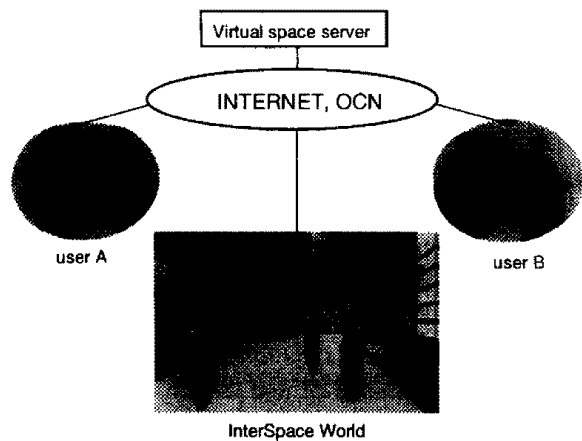


Fig.1 The InterSpace system configuration.



Fig.2 The image of the InterSpace world.

dimensional CG, with the face of the avatar being the participant's real-time facial image mapped from a video camera mounted on his or her personal computer. In InterSpace, when two avatars approach each other and make eye contact, a voice path is automatically established between them. In this way, participants can approach each other in virtual space and engage in face-to-face conversation with much the same feeling as using a video telephone. Each client in this system consists of a multimedia personal computer that has been upgraded with three-dimensional CG functions, a video camera for inputting real-time facial images, a telephone set for voice communications, and a mouse or joystick for performing operations. The client performs a variety of functions including the drawing of virtual space through three-dimensional CG, drawing of other avatars in the participant's field of vision based on positional information of each avatar from the control server, pasting of facial images from the facial image server onto corresponding avatars, and input/output control for the mouse or joystick. The virtual space server consists of a control server, a voice and facial image server, and a contents control server. The control server performs log-in control, collects information from each client on the position of its avatar in virtual space, and distributes such information to each client. The voice and facial image server, on the other hand, performs voice mixing, controls the start, end, and volume of conversation according to the distance between avatars and the degree of eye contact between them, and collects facial images from each client's camera and redistributes them. The contents control server communicates with each client and prepares and downloads the contents necessary for each particular service, especially when the client has no local CD-ROM, requires updated information, etc.

B. InterSpace services

InterSpace, with its enhanced communication functions that allow multiple participants to converse with each other through voice and facial images, can easily be expanded for use in education, entertainment, cyber shopping, and other fields.

(1) Diversified communication

InterSpace's ability of allowing multiple participants to converse with each other simultaneously makes it easy for people that encounter other people in virtual space to start up casual conversations.

(2) Education

The CyberCampus trial was held in Japan. It was completely designed for learning English conversation. On this campus, communicators (English instructors) in the Information Center, stores, or elsewhere speak out in English so that students can be trained in English conversation. In this way, InterSpace makes it possible to learn foreign languages through a variety of pseudo experiences.

(3) Cyber shopping and entertainment

In the virtual stores, customers and store clerks can converse with each other so that customers can receive descriptions of specific products and clerks can accurately determine customers' needs. InterSpace can also be applied to advertising by including ads with other types of information, games, etc. NTT is now doing a CyberSociety open experiment on the Internet. (URL(Japan)=<http://cybersociety.elcs.intsp.or.jp/>) or (URL(USA)=<http://www.ntts.com/interspace/>) In this experiment, anyone can freely join the CyberSociety simply by registering as a user.

IV. CONCLUSION

This paper is described multimedia communication trend, platform technology and network technology with an emphasis on their relationship to application technology for configuring the Cyber society, and have been explained InterSpace, a multi-participant virtual space, where multiple participants can appear as their own avatars with real-time video facial images in a common virtual space over a network. We have also described the examples on InterSpace services.

REFERENCES

- [1] M.Benedikt: "CyberSpace: First Steps", MIT Press, 1992.
- [2] G.Suzuki, S.Sugawara, M.Moriuchi: "Visual Communication Environment using Virtual Space", ICAT'93, 1993.