Interactive Arts as the Frontier of Future Communication Media

— Learned Lessons from ATR MIC Installations —

Kenji Mase and Ryohei Nakatsu

ATR Media Integration & Communications Research Laboratories
Soraku, Kyoto 619-0288 JAPAN
{mase, nakatsu}@mic.atr.co.jp

ABSTRACT

In this paper, we introduce our research challenges toward realizing future communication media by creating interactive multimedia art installations. Several installations in this direction have already been created and exhibited. These include Interactive Poem, Life Spacies II, Iamascope (interactive kaleidoscope), Tangible Sound, and Augmented Groove.

1. INTRODUCTION

ATR MIC Research has been working to create new communication media and systems by pursuing the science and technologies of vision, graphics, music, virtual reality, interface agents, and social psychology. The evolving communication media and technology will, we envision, facilitate mutual understanding beyond differences in place, time, language and culture. In the course of our research, we have fostered the "Interactive Arts" by providing interactive media artists with a residential laboratory and an open discussion environment for joint/collaborative work with engineering scientists.

Interactive Arts illustrate interesting aspects of future communications. The important characteristics of Interactive Arts include: (i) Bi-directional interaction, (ii) Creation by both artists and audiences, (iii) Active immersion, and (iv) Specialized bandwidth. An active immersive involvement with a successful art piece sometimes gives the sensation of sympathetic communications and realistic experiences.

Many scientists and engineers have dreamed of making intelligent machines since the birth of the first computer. They are interested in realizing artificial intelligence by giving "intelligence" to a mere human-crafted machine. Another dream of some people is to develop a machine that can augment the capability of natural human intelligence. The computer has truly been augmenting human information processing power as an information and networking engine in the Internet age. We can anticipate that in the future we will be using computers that can draw creative and/or Kansei[1] power from humans. Interactive arts are already stimulating human intelligence through their interactions. We should be able to learn how to design future communication systems from interactive art installations.

In the area of human computer interaction and groupware research, it has been considered difficult for computers to join in human communication by facilitating, augmenting, and creating communication itself. Moreover, it has been considered almost impossible to build such a smart computer. Rather, transparent communication systems, such as ClearBoard (Ishii and Kobayashi, 1992), are appreciated because they don't block human creative activities. Today, however, we can see the possibility of a non-transparent system in which a computer actively intervenes and supports the human communication (c.f. Conklin and Begeman, 1988). Computers are becoming much smaller and cheaper relative to computation power and storage space. They are ready to be used exhaustively for at-a-glance trivial purposes. Many creative people have had the experiences of hints for new inventions arising when thoughts or actions are perturbed, when established concept are easily decomposed and associated. The computer is an ideal device to facilitate such perturbation, decomposition and association. We can learn how to support creativity in interface design from interactive arts.

Progress in computing technology in movie, graphics, music, and haptic applications is extending the possibility of computer usage, and it is bringing the art and the technology closer again after science divided them in the Renaissance. Computers have good characteristics of repeatability in operation and performance.

[1] "Kansei" is a Japanese word that doesn't have a proper translation in English. It is a kind of integrated sensitivity of feeling, affectiveness, artistry, aesthetics, etc.

Even people without good performing skills can (virtually) play the instrument at its natural speed. As a simple example, the undo function of an electric painting system allows us to recover mis-touches of brush painting. MIDI sequencers allow many novice musicians to compose and listen to their original music without having the performing skills of musical instruments. Multimedia computing technology is bringing artistry into everyday life for everyone.

In this paper, we focus on the above four aspects of future communication media by means of interactive arts. We will introduce five installations created at ATR MIC after discussing each of the four aspect.

2. INTERACTIVE ARTS AND COMMUNICATION

As mentioned in the previous section, Interactive Arts provide the following interesting aspects for future communications.

Bi-directional interaction Its bi-directional interactions with artifacts lead audiences to a better understanding of the installation and the embedded philosophical message of the artists. As we will use some artifact for realizing the future communication media, we can learn the meanings of "understanding" and "message conveying" via interactions with computerized artifact.

Creative Experience Any art piece is the fruit of the creative process of artists. The audience doesn't create the piece in conventional fine arts. However, the Interactive Arts usually asks people to create things during the interaction. At the time of communication, we also need to create the content of communication, such as topic development, dramatic story-telling, and sympathetic expression.

Active Immersion A good Interactive Art installation is well designed to give active immersion with an easy interface to the audience. They are instantly attracted to the artifact and continue to play, exploring the hidden possibilities. When the future communication media technology succeeds, the people are immersed themselves during the communication for deeper understanding.

Specialized Bandwidth Some artists purposefully select the bandwidth of the interaction channel in the design of art. The purpose is to enhance the importance of the chosen communication media. Some artists say they coin the concept first and then choose the available media and technology that is suitable to realize the concept. In any case, such constraints, technological or not, are often effective in providing a creative environment (Finke, Ward and Smith, 1992). The heart of science and technology is to "model the nature", hence we have to select and reduce the bandwidth economically and effectively. Technology may, in the distant future, be able to give the full range of bandwidth for communications. In the meantime, we can learn again from artists how to design the communication system within the focused bandwidth.

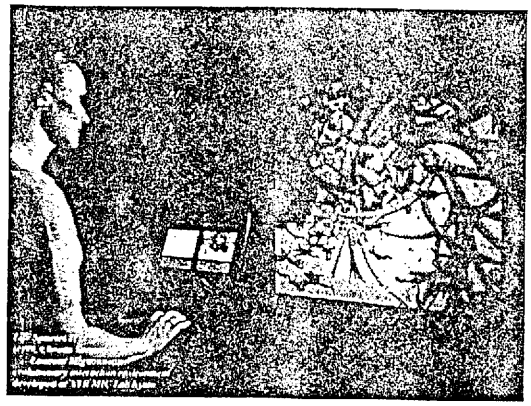
3. INSTALLATIONS

Many multimedia content systems have been created at ATR MIC. Some systems were created as pure "Interactive Art" installations by artists. Others were developed as multimedia creation tools or multimedia communication tools by engineers alone or in collaboration with designers. Among these many, we introduce five installations and systems that could be considered as more or less art installations. We discuss how the aspects discussed above are realized in each installation and try to investigate ways to develop future communication media. They use speech, texts, bodies, graspable disks, and un-graspable water as major interaction media of the user side. These are the selected bandwidth for the user's interaction.

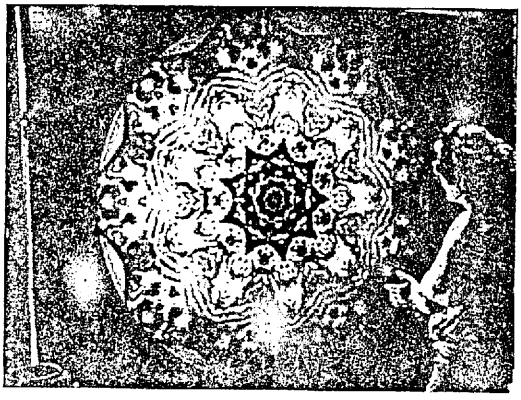
3.1 Interactive Poem

"Interactive Poem" (Tosa and Nakatsu, 1997) is a collaborative poem creation environment. A participant and a computer agent exchange short poetic phrases in the installation. A computer agent named "MUSE," which is carefully designed with a face suitable for expressing the emotions of a poetic world, appears on the screen. MUSE utters a short poetic phrase to the participant. The user utters one of the optional phrases displayed on the sub-screen or creates his/her own poetic phrase, all the while listening to MUSE and feeling an impulse to enter the world of the poem. The speech recognition system identifies the uttered phrase and

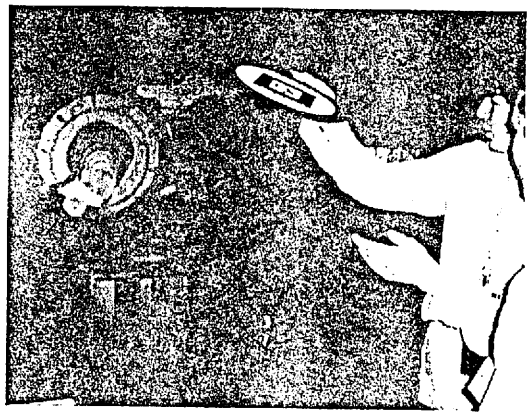
(a) Interactive Poem



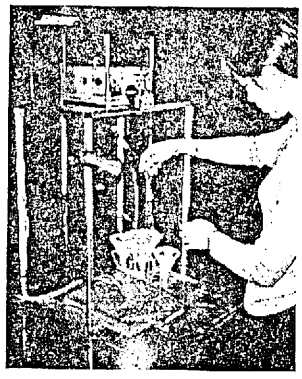
(b) Life Spacies II



(c) Iamascope



(d) Augmented Groove



(e) Tangible Sound 2

Figure 1: ATR Interactive Art Installations
(a) Interactive Poem (©1996-98 Naoko Tosa & Ryohei Nakatsu)
(b) Life Spacies II (©1999 Christa Sommerer & Laurent Mignonneau)
(c) Iamascope (Sidney Fels & Kenji Mase)
(d) Augmented Groove (Ivan Poupyrev et al.)
(e) Tangible Sound 2 (Tomoko Yonezawa & Kenji Mase)

recognizes the emotional element conveyed in pitch, speed, and loudness of speech. Exchanging emotional poetic phrases through this interactive process allows the participant and MUSE to become collaborative poets who generate a new poem and a new poetic world (Fig. 1(a)).

Interactive Poem is a fully bi-directional interaction system where the utterances alternate between a participant and the agent. The user has the freedom to use his/her own phrase and to add any emotional expression to the utterances. The prepared phrases, agent's voice, and visual appearance are well-designed by the artists to provide the active immersion. The length of interaction depends on the prepared phrases and the design of the story.

3.2 Life Spacies II

"Life Spacies II" (Sommerer and Mignonneau, 1999) was originally developed for the ICC Inter Communication Museum in Tokyo as part of the museum's permanent collection. It is an artificial life environment where remotely located visitors on the Internet and the on-site visitors to the installation at the Museum can interact with each other through evolutionary forms and images. Through the Life Spacies II web page, people all over the world interact with the system; by simply typing and sending an email message, one can create one's own artificial creature.

A special text-to-form coding system enables us to use written text as genetic code and to translate it into visual creatures. Form, shape, color, texture and the numbers of bodies and limbs are influenced by the text parameters. The produced creature starts to live and move around in the environment. Depending on the complexity of the written text messages the creature's body design and its ability to move is determined (Fig. 1(b)).

Life Spacies II provides bi-directional interaction with A-Life-like creatures. It also provides an asynchronous communication channel with other visitors through the installation. The texts could be arbitrary. However, many people type meaningful sentences that stimulate creativity. The people are attached to their own creatures from the beginning to enjoy the active immersion of the artwork. As users become familiar with the behavior of the system, they try to extend the life of their creatures.

3.3 Iamascope

"Iamascope" (Fels and Mase, 1999) is an interactive kaleidoscope and a multimedia instrument. The Iamascope installation has been successfully exhibited at many sites throughout the world such as SIGGRAPH97 in L.A., Ars Electronica Center in Linz, Millennium Expo in London, and Kumano Experience Expo in Japan. Using arbitrary images captured by a video camera, it generates kaleidoscopic images that are projected on the wall in front of the performer. As the camera shoots the performer, the generated images consist of the performer, his or her clothes, and anything else in the camera's view. Users can also play music by changing the kaleidoscopic pattern. This is caused by body movements as the system detects such movements to control musical notes and keys. As a result, single or multiple users can draw kaleidoscopic patterns as well as play music by gestures, movements and dances. Figure 1(c) shows the view and the system structure of Iamascope.

Iamascope essentially provides the direct manipulation of images and music. However, the kaleidoscopic symmetrical pattern of the self-image is interacting, feeding back to the players back with well harmonized abstract patterns. Changes in keys, instruments and graphics also give the sensation of bi-directional interaction. People can joyously spend infinitely on generating visual patterns and musical melodies.

3.4 Augmented Groove

"Augmented Groove" (Ivan *et al.*, 2000) is a musical interface that explores use of augmented reality, three-dimensional (3-D) interfaces, and physical, tangible interaction for conducting multimedia musical performance. It was exhibited at SIGGRAPH2000 in New Orleans. Players (users) of the Augmented Groove can play music together simply by picking and manipulating a physical music disk (old LP disks) prepared on a table. The physical motions of the disks are recognized by image processing and interpreted to control musical elements such as timbre, pitch, rhythm, reverb and others. Users can see 3-D virtual graphics attached to the disks whose shapes, color and dynamics reflect aspects of the music controlled by the visitors on the front screen. Several visitors can easily join around the mixing table and play together (Fig. 1(d)).

Augmented Groove is also a direct manipulation of graphics and music. It is still more of a music instrument than an interactive art. However, the effective mapping of manipulation to the music parameter control gives easier understanding of the interaction and leads people to enjoy the creative experience and active immersion. Furthermore the graspable disk interface gives the user a strong attachment to the augmented reality world.

3.5 Tangible Sound

"Tangible Sound" (Yonezawa and Mase, 2000) is a musical instrument that uses water as an interaction medium to control the intuitively appealing feeling of musical flow. Performers interact with water flowing from a faucet into four drain funnels. An important aspect of the instrument is that it provides natural tactile feedback when the user touches, scatters and stops the water flow. Water is tangible but not graspable. The spreading water is particularly enjoyable, since it is linked to musical tension. Interacting with water can be a multi-sensorial experience, since it is possible to see, hear and touch the liquid. The user can control harmonies, resonance frequencies, tension, volume, note timing, etc. by controlling the water flow with his or her hands and choosing drain funnels of different heights (Fig. 1(e)).

Tangible Sound is unique because it adopts water as the user interface. The physical characteristic of water provides different sensations and unexpected responses. Water itself is intimate enough to draw the user into playing with it for a long time. Although only a simple control mechanism for musical expression is provided, people begin to explore the various possibility of controls.

4. CONCLUSIONS

The introduced installations and systems are all very well designed to achieve active immersion and creative experience. The former two installations, which were produced by artists, have embedded bi-directional interactions with simple autonomous behavior. The latter three systems were produced by engineers. These have less autonomy but are designed for good direct manipulation of music, graphics, and tactile sensations. These are, even at this moment, providing collaborative/cooperative environments with others in their manipulation and play. For future communication media, bi-directional interaction will be a key factor. Accordingly, agent-oriented technology for multimedia interactions (c.f. Yonezawa *et al.*, 2001), such as embodied entities, music and tangible objects, will become more important.

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