



## 1. Space Recognition with VR and MR

In virtual reality, the user is supposed to be immersed in the virtual environment. Ideally it means that the real, physical world including the user's real physical body disappears from both his/her sight and consciousness. As a physical device, HMD typically provides such a situation where the user would see nothing but the virtual world, immersed in the virtual environment. If necessary, the user's hand would be shown as a 3D floating hand on the screen. It also means that there is a clear boundary between the real world and the virtual world. "Diving into the virtual world" is considered as the process a user would experience.

In mixed reality, there is no such clear boundary. Images from the virtual world will be shown typically either on the see-through glasses or as projection on real space. The sense of reality for the virtual world is enhanced by the images from the real world. The user's body is visible and integrated into the mixed reality environment, supporting the sense of reality. Also, objects that belong to the user (i.e. things he/she carries or wears) are integrated in the environment. Therefore entering a mixed reality environment is rather like stepping into a room through a door or entering a garden through a gate. One's real body still exists, and other people around as well.

To summarize, a typical MR environment does not subtract information from the real world but adds information from the virtual world to the user's cognition and experience. The sense of body and space remains the same, while virtual objects or landscapes overlap with the real and the user can interact with them. Entering an MR environment is not like diving into a virtual world, but rather stepping into it on the same ground level, if it is not totally continuous. (If the environment is realized with glasses, for example, there is a moment that the user wears the glasses to enter the mixed reality space.)

Therefore there is a critical difference between VR and MR in the way a user relates him/herself with the environment. While VR brings the user into an artificial environment, MR keeps the user in the real space. At the same time, the boundary between the real and the virtual, and the distance between here and there, become blurred with mixed reality.

## 2. Body and Media Technology

Our concept of body has changed through history, both according to scientific knowledge and philosophical ideologies, and the influence they have had on culture, which, in turn, influence science and technology. Also, there are different but related approaches in thinking about body. That is, body can be seen either as a physical object, an organic system, a mental model, etc. Actually, notion of body is a social matter as well. For example, the idea about the ownership of one's own body changes notably in different societies. Slavery is an extreme case. Altogether, what body means to each person -- to one's self or identity -- differs according to the above mentioned issues and elements such as religion, culture, science, technology, politics and gender, among others.

Development of media technology has brought a big change to the notion of body. The complex network of influence among technology and science, philosophy, religion, fashion, etc. is forming a new vision and status of body in our contemporary culture. Today, digital media technology has been changing our way of seeing body in many ways. We

observe different ways of seeing human bodies in our media environment according to the way the technology relates to the body. Body can be regarded as an image, a virtual object, or even as a data set, instead of a physical, real object that is alive in the real time/space. Body is no longer "as it is", as a biological and physiological entity that belongs to the domain of animals. A body can be enhanced and extended, not only with tools and technologies but also with supplements such as artificial organs embedded inside the body. Also, technologies such as telecommunications, digital entertainment and virtual realities have brought us a new feeling that a virtual world exists within the computer or in the Net, where minds can go in, leaving the bodies behind.

How do we understand these phenomena and relate them within the media culture? What are the roles of the technology and the culture? These questions should be answered to find a better solution to place our bodies in more comfortable positions in the digital society.

We can classify the above mentioned phenomena into the following list.

- Body as an image - with imaging technologies: It already happened with the advent of photography. Body has become a recorded image without a physical entity. With the arrival of electronic media, bodies can be "live" images. We observe anonymous actors and actresses on TV commercials playing a similar role. What matters is only their physical body, detached from the personality, voice, or name.
- Body as a virtual object - with reproduction-technologies: Such body for appreciation that can be recorded, reproduced and looked at, independent from its ownership.
- Body as a data set - with digital reproduction-technologies: Digital technology de-materializes human body to a set of data. We have many real human bodies and virtual characters on the Net: Both are there as data sets, regardless of their originals and the identities. Akira Gomi's CD-ROM-based artwork "Yellows" depicts what is happening to body and identity.
- Enhanced body - with tools incorporated in body: We are all cyborgs, according to Donna Haraway and others. Our body, or even life, is often enhanced or supported with medical artifacts embedded in the flesh. Is there any clear boundary between such body and a body enhanced with high-tech equipment? Or, will there any clear boundary between the Robocop and a person who has his/her body parts replaced by artifacts that are much powerful and stable than organs made of flesh? In fact, Steve Mann consciously experiments himself to be a cyborg connected to the Internet.
- Extended body - with tools and telecommunications technologies: Tools extend our body, both physically and virtually. The feeling of virtual extension of body was observed since early forms of telecommunications technologies such as radio or telephone, with which the sense of space and the location (and size, transparency, etc.) of one's body has changed. However, digital telecommunication has changed the relationship between our body, space and time in a drastic manner.
- Lost body - with telecommunications and other digital environments: In the age of the Internet, "the other end of the telephone line" is no longer clear. Our body is extended, but we do not know where are our extended eyes, ears, etc. Our body can spread in the space without physical entity, or it can be lost in the space, without

knowing exactly where it is. Moreover, while the real space is measurable, there is no sense of scale in cyberspace.

- Immersed body - with cyberspace and other digital environments: Immersion typically happens while playing a game or online chat, or other entertainment. In subjective sense the mind loses connection to the body, which is left in the physical space.

As we can easily see, these are related to and overlap each other. There are both technical elements that work on objective level, and social, cultural elements that work on the subjective level that produce the above status. The subjective elements are in their nature similar to what we already knew with "analogue" media such as photography, film, TV, etc. However, digital technologies have not only enhanced these elements far beyond what analogue media technologies could have done, but also changed the way we regard body and space. Objective elements such as telecommunications technologies and virtual realities or mixed realities, have brought new dimensions in the relationship between the body and the environments. From a wider aspect, these are a part of the fundamental changes that has been taking place in today's world in the way we see body and life, with other -- yet related-- elements such as genetic engineering.

### 3. Mixed Reality as an Everyday Life Environment

We are used to environments where there are screens and speakers everywhere, blending images and sounds from TV, video, games, CD, DVD, etc. with the real landscape and soundscape around us. We regard images on billboards, big screens on the facades of buildings, loud music from the car stereos on the street as a part of the real landscape/soundscape. A huge screen at the corner of Shibuya, Tokyo, is even larger than a house, showing all kinds of images from movie, TV, music video, and commercials. Most of the images are computer manipulated or generated. We live in "real" environments that are flooded with "unreal" images. In between these images the live video of the people crossing the street in front of the screen is shown. The image from the virtual world and the real here-and-now world are juxtaposed, to be seen as a part of the real environment.

If they belong to the real environment, what about personal, portable sources of images and sound? It is known that Sony's Walkman has brought an epistemological change to its users as they walk on the streets. The everyday landscape becomes a different experience because of the music that accompanies. A walkman-user carries his/her sound environment, which can be mixed with the real soundscape (if the sound volume is set not too high), and combined with the changing landscape.

A similar situation has been taking place with mobile phones. Already with its original use as a telephone, it was observed that a user talking to a friend lives both in the real world and the virtual world, which is shared by him/her and the friend. Today, many Japanese walk on the streets or take trains while checking information, exchanging messages and playing games on their i-mode phones. They carry their small screens with them while living and walking in the real landscape. Images from the virtual world or a remote place that are displayed on the mini-screens no longer belong to the outside world but practically become a part of one's body. By being integrated within the mobile phone, which is the last object they leave behind, these images become a part of the mixed reality to go.

Recent program on the big screen in Shibuya is the interaction with mobile phones. Guided by the message appearing on the large screen, people on the street are invited to send the name of one's girl/boyfriend, or a favourite idol or musician, or even an "anime" character, to the large screen, which will be displayed in real time. Extremely personal information of an anonymous passer-by is sent from a mini-screen of one's own mobile phone, to be shown on the extra large screen and to be shared by anonymous crowd, creating a borderless mixture of real and virtual as well as the personal and public.

### 4. Conclusion

Digital media and telecommunication technologies have changed our sense of space, as well as of reality. In our real life we live in environments surrounded by images and sounds that consist of bits, not atoms, which are sent from or generated somewhere.

The boundary between real and imaginary is no longer clear. Today we live in what is called a mediated society. Both real and imaginary information arrive through media technologies in the same manner, forming our knowledge of the world. In such a situation, maintaining a sound sense of one's own body is an important issue. We have been developing the way, how to deal with the real and unreal at the same time.

A mixed reality environment offers a psychologically easier access to users compared to a VR environment. A user does not go through the loss of one's natural sight or his/her own body on the scene. He/she is not isolated from other people and the real world around. But these might not be the only reasons why users feel MR environments more comfortable compared to VR.

Mixed reality can be considered as a technical answer to the above discussed situation. The way the real world and additional information from the virtual world are integrated in one's perception can be identified as a simulation of our nature; perception/recognition system. Actually that might be why mixed reality seems to be familiar to us, and will have a great possibility in visualizing our thought and the way we see the world.