

# HyperReality

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## INTRODUCTION

On the Internet, a cyberspace is created where people communicate together usually by using textual messages. Therefore, they cannot see together in the cyberspace. Whenever they communicate, it is desirable for them to see together as if they were gathered at the same place. To achieve this, various kinds of concepts have been proposed such as a collaborative environment, tele-immersion, and telepresence (Sherman & Craig, 2003).

In this article, HyperReality (HR) is introduced. HR is a communication paradigm between the real and the virtual (Terashima, 2002; Terashima, 1995; & Terashima & Tiffin, 2002). The real means a real inhabitant such as a real human or a real animal. The virtual means a virtual inhabitant, a virtual human or a virtual animal.

HR provides a communication environment where inhabitants, real or virtual, those are at different locations, come, see, and do cooperative work together as if they were gathered at the same place. HR can be developed based on Virtual Reality (VR) and telecommunications technologies.

## BACKGROUND

VR is a medium composed of interactive computer simulations that sense the viewer's position and actions and replace or augment the feedback to one or more senses such as seeing, hearing, and/or touch, giving the feeling of being mentally immersed or present in the virtual space (Sherman and Craig, 2003). They can have a stereoscopic view of the object and its front view or side view according to their perspectives. They can touch and/or handle the virtual object by hand gesture (Burdea, 2003; Kelso, 2002; Stuart 2001).

Initially, computer-generated virtual realities were experienced by individuals at single sites. Then, sites

were linked together so that several people could interact in the same virtual reality. The development of the Internet and broadband communications now allows people in different locations to come together in a computer-generated virtual space and to interact to carry out cooperative work.

This is collaborative virtual environment. As one of collaborative environments, the NICE project has been proposed and developed. In this system, children use avatars to collaborate in the NICE VR application, despite being at geographically different locations and using different styles of VR systems (Johnson, Roussos, Leigh, Vasilakis, Marnes & Moher, 1998). A combat simulation and VR game are applications of collaborative environment.

Tele-Immersion (National Tele-Immersion Initiative=NTII) will enable users at geographically distributed locations to collaborate in real time in a shared, simulated environment as if they were in the same physical room (Lanier, 1998).

HR provides a communication means between real inhabitants and virtual inhabitants, as well as a communication means between human intelligence and artificial intelligence. In HR, communication paradigm for the real and the virtual is defined clearly. Namely, in HR, a HyperWorld (HW) and coaction fields (CFs) are introduced.

Augmented Reality (AR) is fundamentally about augmenting human perception by making it possible to sense information not normally detected by the human sensory system (Barfield & Caudell, 2001). A 3D virtual reality derived from cameras reading infrared or ultrasound images would be AR. A 3D image of a real person based on conventional camera imaging that also shows images of their liver or kidneys derived from an ultrasound scan is also a form of AR. HR can be seen as including AR in the sense that it can show the real world in ways that humans do not normally see it. In addition to this, HR provides a communication environment between the real and the virtual.

## HR CONCEPT

The concept of HR, like the concepts of nanotechnology, cloning and artificial intelligence, is in principle very simple. It is nothing more than the technological capability to intermix VR with physical reality (PR) in a way that appears seamless and allows interaction. HR incorporates collaborative environment (Sherman, 2003), but it also links collaborative environment with the real world in a way that seeks to be as seamless as possible. In HR, it is the real and virtual elements which interact and in doing so they change their position relative to each other. Moreover, the interaction of the real and virtual elements can involve intelligent behavior between the two and this can include the interaction of human and artificial intelligence. However, HR can be seen as including AR in the sense that it can show the real world in ways that humans do not normally see it.

HR is made possible by the fact that, using computers and telecommunications, 2D images from one place can be reproduced in 3D virtual reality at another place. The 3D images can then be part of a physically real setting in such a way that physically real things can interact synchronously with virtually real things. It allows people not present at an actual activity to observe and engage in the activity as though they were actually present. The technology will offer the experience of being in a place without having to physically go there. Real and virtual objects will be placed in the same "space" to create an environment called an HW. Here, virtual, real, and artificial inhabitants and virtual, real, and artificial objects and settings can come together from different locations via communication networks, in a common place of activity called a CF, where real and virtual inhabitants can work and interact together.

Communication in a CF will be by words and gestures and, sometimes, by touch and body actions. What holds a CF together is the domain knowledge which is available to participants to carry out a common task in the field. The construction of infrastructure systems based on this new concept means that people will find themselves living in a new kind of environment and experiencing the world in a new way.

HR is still hypothetical. Its existence in the full sense of the term is in the future. Today parts of it have a half-life in laboratories around the world.

Experiments which demonstrate its technical feasibility depend upon high-end work stations and assume broad-band telecommunications. These are not yet everyday technologies. HR is based on the assumption that Moore's law will continue to operate, that computers will get faster and more powerful and communication networks will provide megabandwidth.

The project that led to the concept of HR began with the idea of virtual space teleconferencing system. It was one of the themes of ATR (Advanced Telecommunications Research) in Kansai Science City. Likened to the Media Lab at MIT or the Santa Fe Institute, ATR has acquired international recognition as Japan's premier research centre concerned with the telecommunication and computer underpinnings of an information society. The research lasted from 1986 to 1996 and successfully demonstrated that it was possible to sit down at a table and engage interactively with the telepresences of people who were not physically present. Their avatars looked like tailor's dummies and moved jerkily. However, it was possible to recognise who they were and what they were doing and it was possible for real and virtual people to work together on tasks constructing a virtual Japanese portable shrine by manipulating its components (Terashima, 1994).

The technology involved comprised two large screens, two cameras, data gloves, and glasses. Virtual versions were made of the people, objects, and settings involved and these were downloaded to computers at different sites before the experiment's start. Then it was only necessary to transmit movement information of positions and shapes of objects in addition to sound. As long as one was orientated toward the screen and close enough not to be aware of its edges, inter-relating with the avatars appeared seamless. Wearing a data glove, a viewer can handle a virtual object by hand gesture. Wearing special glasses, he/she can have a stereoscopic view of the object.

Most humans understand their surroundings primarily through their senses of sight, sound, and touch. Smell and even taste are sometimes critical too. As well as the visual components of physical and virtual reality, HR needs to include associated sound, touch, smell, and taste. The technical challenge of HR is to make physical and virtual reality appear to the full human sensory apparatus to intermix seamlessly. It is not dissimilar to, or disassociated from, the challenges

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