

InterSpace: Towards Networked Reality

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Abstract

The concept of a new visual communication environment has been proposed. The proposed system is a shared and interactive multi-user virtual space that consists of a CG-based virtual space structure and video-based objects. Human Interface Design Issues are discussed from the view point of creation of new reality for enhanced communication environment.

Key Words:

Telecommunication, Virtual Reality, Visual Communication,
Virtual Community, Cyberspace, Communication Environment

1. Introduction

A shared and interactive virtual space on a network is called "Cyberspace"[1]. A shared and interactive virtual space for multiple users on a network is expected as a powerful tool for human communication. A shared virtual space on the network can be applied to create various useful telecommunication services such as virtual office, virtual shop, virtual campus, and so on. Habitat[2], SIMNET[3] and DIVE[4] are thought to be the initial steps towards a future ideal Cyberspace. These virtual space services are based on information generated by computers. All the visual images of these system are made through computer graphics or animation, and are imaginary. The virtual worlds of these systems have no relation to the real world.

On the other hand, the usual communication tools, such as telephone or videophone, are based on real information, that is, real voice or real video images of real people's faces. In order to support human collaboration in business fields, a shared virtual space based on such real information appears necessary. From this point of view, we propose the new concept of a visual communication environment for human collaboration using a virtual space created by 3D computer graphics and video texture mapping technologies[5]. The proposed system consists of a combination of an imaginary location and real video images.

In this paper, human interface design issues for a proposed shared virtual space are discussed and evaluation of the prototype system is described.

2. Concept of InterSpace

We propose a new concept of a shared virtual space, named as "InterSpace", that is based on the following necessary functions[5].

(1)Seamlessness in planned and unplanned communication

Human communication activities are classified into planned communication and unplanned communication. In regular business meetings, date, place, purpose and members are agreed and planned before the meeting. On the other hand, unplanned and casual meetings occur unexpectedly in a elevator, on a road, or at a passageway. In such casual situation, people recall topics or think of business after seeing the partner's face unexpectedly. Both planned and unplanned communication play important roles in our social communication activities. A shared virtual space is expected as a new communication tool that is able to enhance unplanned communication opportunities.

(2)Video-based Virtual Space

The visual communication environment consists of human objects that express people in the space, and topical objects that transfer information in the virtual space. By introducing 3D perspective expressions, 3D computer graphics is very suitable to create an understandable and imaginative virtual space. In order to represent human objects and topical objects in the virtual space, video images are more useful and more expressive than computer animation. As the video image taken by a camera represents a subset of the information of the real world, people can recognize the actual situation of the partner easily. So, the combination of a CG-based virtual space structure with video-based objects is highly suitable as the virtual

space architecture.

3. Human Interface Design Issues

3.1 Reality of Shared Virtual Space

Concerning reality of virtual communication environment, there are the following two kinds of policy to design a shared virtual space.

(1) Creation of realistic sensation

This policy is the approach to a simulator of physical real spaces. Virtual spaces are visualized to resemble real meeting spaces. Visual images of virtual space are designed in order to realize a feeling of being there.

(2) Creation of strengthened coexistence

This policy is the approach to artificial and responsive environment for interactive communication. Visual images and audio responses of virtual space are designed in order to create artificial effective functions that surpass being there.

3.2 Virtual Self Representation

As a human object in the virtual space represent personal existence in the virtual space, we named it "virtualself". Representation design of virtual self affects their role in communication. If a virtualself has an imaginary expression, an artificial feeling would be occur and many users would feel that the role of this virtualself was as a "persona" of oneself. On the other hand, If the virtualself employs a real video-based expression, the visual image of the virtualself represents the real situation of oneself. Many users would think that the role of this virtualself was as a copy or branch of oneself.

As the video image taken by a camera represents a subset of the information of the real world, people can recognize the actual situation of the partner easily. So, the combination of a CG-based object structure with video-based representation is highly suitable as the virtualself architecture.

Examples of proposed expressions of human objects are shown in Fig.1. Virtualeses are represented as small vehicles that have a window with a video image of individual user.

3.3 Visual and Audio Representation for Virtual Space

In real physical space, visual and audio information are obeyed by fixed physical laws. However, in virtual space, laws and rules of visual

and audio information can be designed freely. Characteristics of human behaviors in a shared virtual space will be strongly affected by such artificial laws. One can get highly intelligent and sensitive ears or eyes in a virtual space in order to enhance the possibility of unplanned encounter.

4. Prototype System and Evaluation

In order to evaluate the proposed concept, a prototype "InterSpace" system was implemented using distributed personal computers and a system server. Visual images of every terminal are created by the personal computers of each terminal. The PC generates an interactive virtual space structure using 3-dimensional graphics. Video images are captured by a camera, and video images are pasted onto CG models using texture mapping. Audio signals of individual user's voices are gathered, mixed and delivered depending on each location in a virtual space. The system server controls data, audio and video communication between the personal computers.

The prototype system has been evaluated in our laboratory. Human behaviors in a virtual space were affected by conditions and laws of the virtual space. Walking through a shared virtual space offers new abilities and enjoyment to many users.

5. Conclusion

The concept of a new visual communication environment has been proposed. The proposed system is a shared and interactive multi-user virtual space that consists of a CG-based virtual space structure and video-based objects. Human Interface Design Issues are discussed from the view point of creation of new reality for enhanced communication environment.

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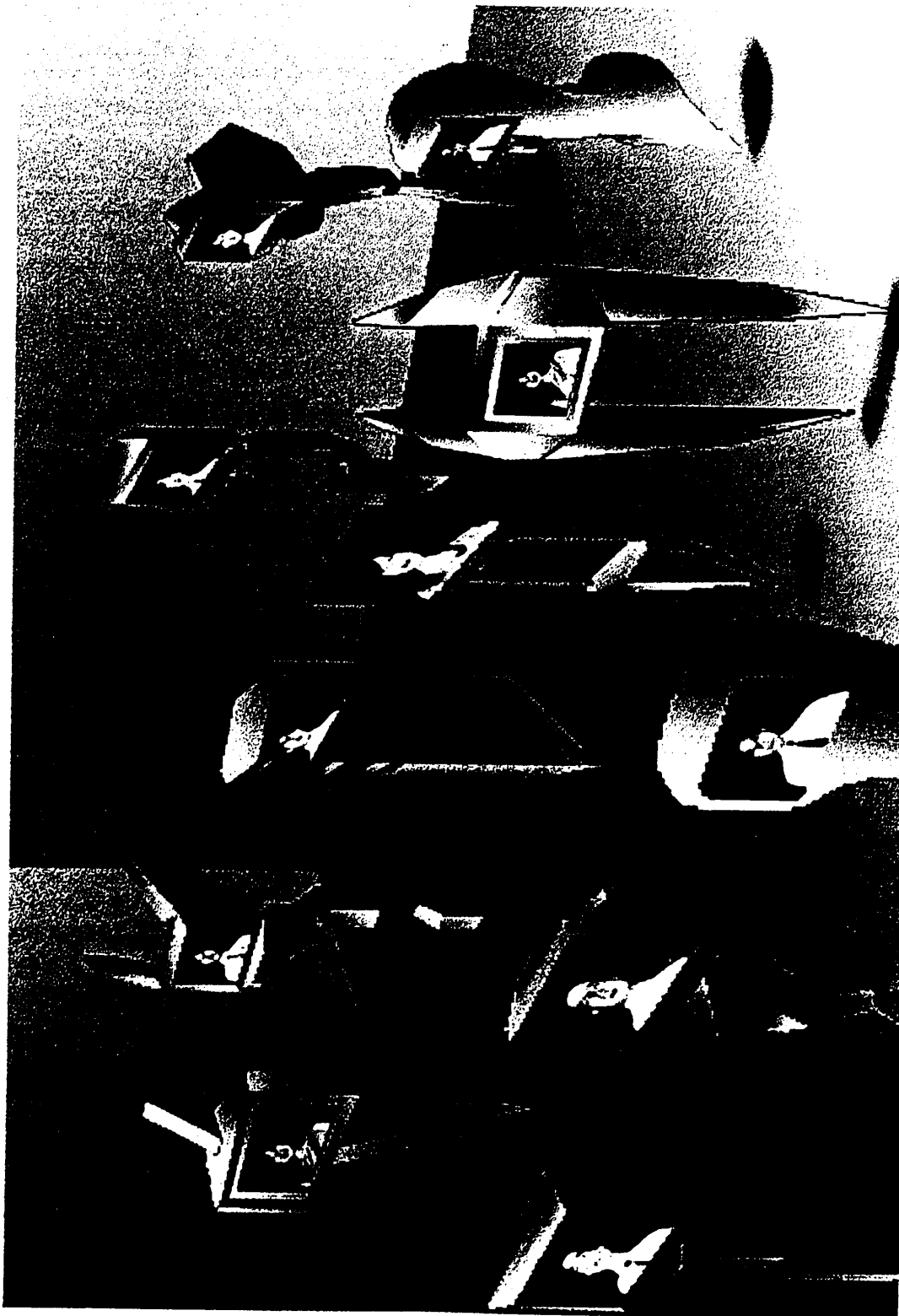


Fig.1 Examples of virtual selves expressions