Tiny Immersive Virtual Reality System with Avatar Control

Ji-Hyung LEE, ManKyu SUNG, ChanJong PARK

VR Team, Human Computing Research Department, ETRI
161 Kajong-dong, Yusong-gu, Taejon, 305-350 KOREA
ijihyung@etri.re.kr

Abstract

The avatar is considered the essential metaphor in multi-participant VR environment. As most user of VR systems desire to feel the immersion, we should generate more realistic scene. The avatar is becoming more human and complex, it needs that we must control the avatar with more detail methods. To navigate the virtual space with these controls, it is required to have the mapping between the navigation and the avatar control, and between the navigation and the input device.

If the participant navigates with his avatar in immersive virtual environment, his immersion will be enlarged. But for the expensive costs of immersive VR system or several reasons, there are few immersive systems having avatars. Therefore, it is required to apply the general immersive VR into desktop VR. In this paper, we propose the tiny immersive virtual reality system with the avatar control.

Key words: VR, Immersion, Interface, Avatar Control, Human-computer interaction, Navigation

1. Introduction

Nowadays, Virtual Reality (VR) enters a new phase. The networked or multi-participant VR system is becoming feasible system for developing or improving the network performance and technology. In multi-participant VR, the avatar which represents a participant becomes essential.

To increase the immersion, the VR systems try to imitate the real worlds and make the humanoid avatar which is made considering human structure, resembles the real human, and acts naturally as if it is the human [1]. Considering the importance of the avatar, there are many attempts to standardize the human avatar for virtual environment. Many people watched activities of Living worlds, Universal Avatar, and H-ANIM VRML Humanoid [2]. The humanoid avatar and animation specification is involved in MPEG-4 SNHC, recently.

Another aspects, immersive VR systems are introduced. Immersive VR system is more intuitive and better in the view of human-computer interaction than typical desktop VR system [3]. Respectively VR has more interfacing devices, and immersive VR Systems consist of several interfacing devices that are not used conventionally in the desktop computer environment [4]. These devices are classified by the function; the viewing, the navigation, the manipulation, and so on. Generally speaking, the HMD (Head Mounted Display) has been used to view the virtual worlds. Sometimes the see-through HMD or the large screen, for example Immersive desk, CAVE (Cave Automatic Virtual Environment) and CABIN (Computer Aided Booth for Image Navigation), has been used [5]. The mouse, the joystick and the spaceball are used to navigate the virtual worlds. And some systems take advantage of the glove and the tracker system with gesture recognition [6]. At the same time, the navigation devices are used as the manipulation devices. In some systems, the unique manipulation device is provided. And there is a noteworthy research about device interface, which desire to design the device independent metaphor [7].

At any rate, as I mentioned above, though the avatar has a significant role in VR, there are few immersive VR systems with the avatar's motion control. Of course, there are several research results which provide avatar's motion slaving with 4 or 8 magnetic sensors [8][9]. But they are not applied into immersive VR system yet. So there is the lack of avatar motion control, the reason is categorized into three roughly. The first is that most of immersive VR systems have an eye to the navigation and the avatar's motion control is not important when the participant uses only his own view. Moreover if only one participant is in the virtual world, it is not necessary to control the avatar's motion. The second is that some large screen systems use the transparent glasses like crystalEYEs. In this kind of immersive VR system, one participant could see another participant through the glass, and the collaborative environment is more important than the avatar's existence. The last one is that some immersive VR system is designed only to model the some graphics objects. In this system, the participants can show only parts of other's avatar body,

the movement and the rotation of mouse in 3D space. It consists of the transmitter, control unit and reciever. As 3D mouse gives the 6 DOF, there is no problem same as in the joystick. But there is the range limit (100-degree cone, 5 feet) [14]. When applying this to our system, similar mapping which is done in spaceball is made. However, to navigate and control, user should move his arm and hand in 3D space. Due to user's fatigue, it is hard to hold logitech 3D mouse for a long time. Ascension Flock of Birds has the magnetic 3D mouse. This is the same case of Logitech 3D mouse.

We try to test the StereoGraphics CEVR (CrystalEYEs Virtual Reality). We considered CrystalEYEs to replace HMD with cheaper one. But CEVR supports the same tracking as that of Logitech 3D mouse. Therefore, we consider 2 aspects; head track and immersion. First, we test this glasses to track the head movement as in section 3.4, and get the same result. Then, we try Head Directed Navigation[15]. However, we didn't adopt the navigation by the head movement because we want to guarantee the freedom of the sight irrespective of the navigation or the avatar's control. In the second aspect, as user wearing this glasses can see the real worlds, it doesn't provide the immersion as much as HMD.

5. Conclusion and Future work

In this paper, we propose the tiny immersive VR system. Our system provides both hands interface to control the avatar intuitively in condition of HMD, to navigate very easily, and to give the simple authoring. To make the avatar metaphor, we experimented several input devices besides spaceball and mouse, and found possibilities of those devices.

As we know that it is necessary to modify the avatar's motion in the situation of the event burst, we want to research about it in near future. And we didn't consider the feeling difference between the real world navigation and that of the virtual world in this paper, but we will try to solve this gap.

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References

1. Bruce Damer: "Avatars!", Peachpit Press, (1998).

2. VRML Humanoid Animation Working Group, http://ece.uwaterloo.ca:80/~h-anim/

3. Casey Boyd: "Does Immersion Make a Virtual Environment More Usable?", http://www.acm.org/sigchi/proceedings/short-talk/cb.htm

4. Dieter Schmalstieg et al.: "Consturcting a Highly Immersive Virtual Environment: A Case Study", *Technical Report of Institute of Computer Graphics,* Vienna University of Technology, TR-186-2-95-12, Austria, (1995).

5. Michitaka Hirose: "CABIN-A Multiscreen Display for Computer Experiments", *Proceeding of VSMM'97, IEEE Computer Society*, pp.78-83, (1997).

6. ChanSu Lee et al.: "The Control of Avatar Motion Using Hand Gesture", *Proceeding of the VRST'98*, pp.59-66, Taipei Taiwan, (1998).

7. Chris Faisstnauer et al.: "Computer-Assisted Selection of 3D Interaction and Navigation Metaphors", *Proceedings of 1998 workshop on Computer graphics*, pp.40-43, Taipei Taiwan, (1998).

8. Norman I. Badler et al.: "Real-Time Control of a Virtual Human Using Minimal Sensors", *Presence*, Vol.2 No.1, pp.82-86, (1993).

9. Sudhashu K.Semwal et al.: "Mapping Algorithms for Real-Time Control of an Avatar Using Eight Sensors", *Presence*, Vol.7 No.1, pp.1-21, (1998).

10. Ji-Hyung Lee et al.: "Avatar's Gesture Recognition using Anthropometry in Real-time", *Proceeding of the 13th Symposium on Human Interface*, pp.423-426, Osaka Japan, (1997).

11. Man-Kyu Sung et al.: The Avatar Navigation of Distributed Virtual Environment By Using Multiview Client", *Proceeding of APCHI 98*, pp108-113, (1998).

12. SpaceTec homepage, http://www.spacetec.com

13. Micheal Morrison et al: "Windows 95 Game developer's guide", Sams publishing Inc., (1996).

14. 3d mouse and head tracker technical reference manual, Logitech, (1992).

15. Head Directed Navigation in Virtual Environments, http://www.cg.tuwien.ac.at/research/vr/hdn.