

Experience of a Hybrid Information Space between an Outdoor Field and an Immersive Virtual World

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Abstract

This paper proposes the concept of the hybrid information space that integrates the information seamlessly between the real world and the virtual world, and the prototype system was developed in which the immersive virtual world was constructed from the photograph images that were taken in the outdoor field. In this system, the user can go and come between the real world and the virtual world by using his own cellular phone as an interface device. This system was applied to relive travel experiences.

Categories and Subject Descriptors (according to ACM CSS): H.5.2 [User Interfaces]: Theory and Methods; I.3.7 [Three-Dimensional Graphics and Realism]: Virtual Reality

1. Introduction

This study aims at constructing a hybrid information space in which the real world and the virtual world are integrated seamlessly. In particular, a prototype system was developed by synthesizing an information acquisition technique in which cellular phones were used outdoors 'in the field' along with a high-presence visualization technique that uses an immersive projection display. In the hybrid information space, the user can access information while 'coming and going' in both the real world and in the virtual world. This paper describes the concept of the hybrid information space, and describes how a prototype system that integrates information between the field environment and the immersive virtual world was developed.

2. Concept of Hybrid Information Space

Hybrid information space is a concept that involves the seamless transfer of information between the real world and the virtual world. In this environment, the user can experience naturally information that is acquired in the real world, as well as artificial information that is represented in the virtual world. Figure 1 shows the concept of the hybrid information space. In this study, a method of importing real-world information into an immersive virtual environment and of constructing an augmented virtual world was examined. This method

enables the user to relive an experience in the virtual world after experiencing it in the field by representing high-presence information in an immersive projection environment. In this case, positional information obtained by the GPS is used as a key technology for integrating real world information into the virtual world [EZNaviwalk]. Moreover, a cellular phone was used as the interface device, so users could seamlessly experience both worlds using their own personal devices.

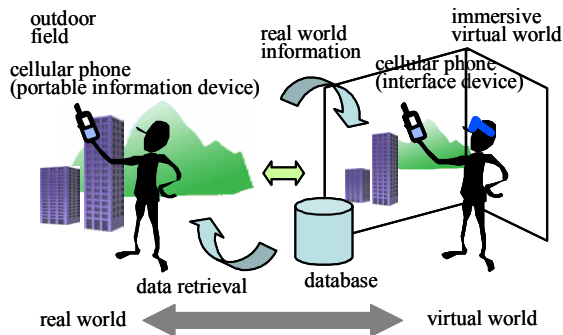


Figure 1: Concept of hybrid information space

3. Prototype System

As a prototype system, a method of recording the information that the user experienced in the outdoor field

and of storing it in a database system was constructed. This system utilizes cellular phones equipped with e-mail, web access, digital camera, GPS and electronic compass functions. When the user wants to record an object or a scene outdoors, he can take a picture of it using the digital camera function of the cellular phone. At the same time, he can record data regarding the position and direction of the area where he is taking the picture by using the GPS and the electronic compass functions. Next, this data is sent to a server computer that is used to generate the virtual world by using the e-mail function. The user can also write an explanation or impression of the scene in the text column of the e-mail, so that this text information can be used as an annotation to the photographic image.

On the other hand, a graphics computer is used as the mail server, and when it receives the e-mail message from the user in the outdoor field, a parser program analyzes the data in the e-mail and stores each data item, such as the photographic image, the position (latitude and longitude), the direction, and any annotation in the database system. For the visualization environment, an immersive projection display named C.C. Wall was used. This system consists of a Linux PC, head tracker, 2.0m x 2.5m screen, and double-stacked DLP projectors. In addition, a cellular phone was used as a wand interface utilizing the web-access function [OYYH01]. When the user accesses the web page of the interface, the interaction menu is displayed on the cellular phone, and the user selects commands or inputs characters using the dial button. Therefore, the user can bring the personal device of the cellular phone that was used to take pictures in the field into the immersive virtual environment, and can seamlessly relive the experience between both worlds.

In this system, an 'empty world' is prepared as the initial state of the virtual world, in which only a texture image of a map was placed on the floor. The application program then retrieves the necessary information from the database, and places the photographic images and the annotation data at the corresponding positions according to the latitude, the longitude and the direction data.

4. Experiment on Reliving Travel Experiences

The hybrid information space is thought to be effective to firmly memorize the precious experiences. In this study, the prototype system was applied to recording travel experiences while visiting the World Expo held in Aichi from March to September in 2005. The subjects were asked to take pictures of those scenes where they gained a strong impression while walking through the Expo site, and then to send them to the server computer with the position and the annotation data. They were also asked to experience a virtual world of the Expo that was

constructed using the transmitted pictures in the C.C. Wall display after coming home from the actual Expo. Figure 2 shows an example of the virtual world of the Expo site.

After the experiment, the subject recounted to us his impression that he could clearly memorize spatial relationships that had not been obtained during the real experience by reliving it in the immersive virtual world. Moreover, the information in the constructed virtual world was more and more enriched when several subjects performed the experimental task. Therefore, the hybrid information space was also useful for the user who experienced the virtual world before visiting the actual Expo, since he was able to gain prior knowledge or acquire a mental map of the Expo site.



Figure 2: Virtual world constructed using the transmitted pictures from the Expo site.

5. Conclusions

In this study, the concept of a hybrid information space that integrates information from the real world with information from a virtual world was proposed, and a prototype system for constructing an immersive virtual world from photographic images that were taken outdoors in the field was developed. This system can be used to relive experiences in the virtual world. In our experiments, this system was applied to relive travel experiences, and it was found to be effective.

References

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