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Simultaneous Socio-Spatial Shared Signage

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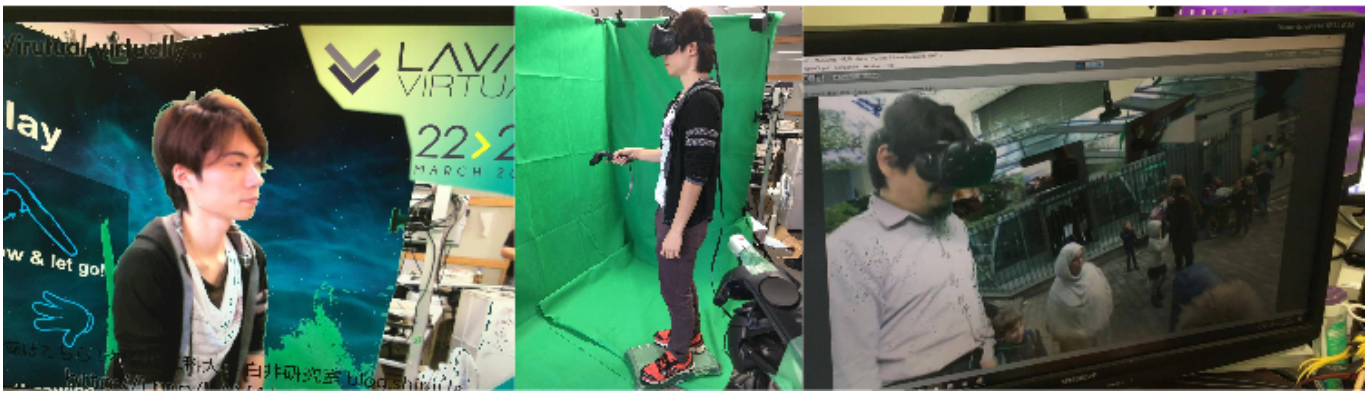

Figure 1: *Simultaneous Socio-Spatial Shared Signage. Audiences can see real-time composed images from several point of view without any wearing hardware.*

Abstract

Simultaneous Socio-Spatial Shared Signage (5S) is an integrated demonstration project which consists of VRoadCast and ExField display systems. VRoadCast is a broadcasting system designed for VE (Virtual Environment) which lets non-players see what the players are doing in game. ExField is a glassless multiplex display system that shows different contents when viewed from different directions. In this demonstration, we proposed an augmented reality broadcasting environment without any wearable components. In this specific version, players can players get to journey to different parts of France. The contents are composed of 2D photos and a 360 degree camera named Theta-S. The prototype was tested by the public at DCEXPO 2016 Laval Virtual stand and was recognized as a new signage media of VR experience for unconnected audiences.

1. Motivation: Spatial Augmented Reality in the Public

While head mounted display (HMD), high-resolution display, and 3D display devices are very common nowadays, no groundbreaking application, especially for public screens and simul-multiplex content display exists. This project aims at developing a novel application for these displays. Simultaneous Spatial Shared Display (SSSD) will further facilitate the current spatial augmented reality in the public without any wearable material, sensing systems, and VRoadCast, a real-time broadcasting system for virtual environment to configure Simultaneous Socio-Spatial Shared Signage (5S).

2. Related Works

Bimber and Rasker proposed Spatial Augmented Reality in 2005 [BR05]. Automultiscopic 3D displays [JUN*15] allowed numerous viewers to experience 3D content simultaneously without the hassle of wearing special glasses or a head set. However, the system was configured with a dense array of 216 video projectors to generate images with high angular density over a wide field of view. For public use, the projector range and dark environment limit the application field.

Shirai proposed multiplex-hidden technologies that can produce multiple channels on a screen, and these technologies continue to the fourth generation by using projectors and flat panels [SHS14]. However, multiplex-hidden technology is based on polarization and color cancelling. Audiences need a filter to select their preferred contents. The idea of using autostereoscopic display to realize spatial augmented reality is not new. In 1692, Gaspar's drawing "Bois-Clai" presented double portraits, which allowed viewers to see different images when looking at a portrait from two different angles [Ant92]. Mercedes Benz SPLITVIEW [MB] introduced similar technologies applied to car navigation systems for two sides, such as for the driver and assistant seats. Sharp, Inc. proposed

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a triple-view liquid crystal display (LCD) [SHA] with a parallax layer to provide three viewing angles. In this system, different contents can be seen from the driver's seat, the assistant's seat, and the backseat. However, these techniques are not scalable because they focus on application to cars and are not always suitable for digital signage. Digital signage requires high resolution, interactive and/or moving pictures, a large screen with less cost, and the ability to be viewed by various audiences even in a bright space.

3. "ExField" engine for SSSD

The proposed system, which is called SSSD or GAD [HS16], enabled (1) Simul-multiplex content display, (2) Perspective correction, (3) Standalone system without mandatory wearable sensing devices, (4) Directional audio for each content, and (5) Attachment ability for conventional 2D display. The proposed system consists of a video subsystem called "ExField" and an audio subsystem, as shown in Figure 2. In the video subsystem, which is built by Unity engine, 12 virtual video channels can be achieved using a single real display. In the audio subsystem, various sound waves are radiated from super-directive parametric speakers toward different directions.

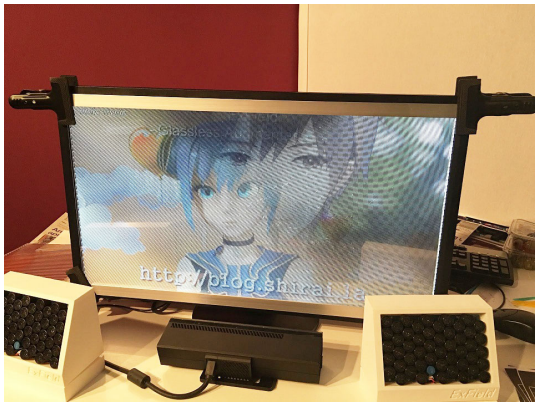

Figure 2: *Hardware and system configuration of SSSD in Laval Virtual 2016.*

Our proposed method involves a light field display (LFD) consisting of an LCD and a lenticular lens panel. A transparent acrylic plate of the foreground is used to fix the lenticular lens panel tightly.

When an off-the-shelf LCD and a ready-made lenticular lens are combined to produce an LFD, the possibility that the ratio of the pixel pitch and the lens pitch is exactly an integer number by chance is almost zero. In most cases, this number becomes a non-integer or a "fractional" value. Even in this case, an LFD can be produced using Ishii's fractional view method [ISH06]. An attached lenticular panel provides a non-integer (fractional) light direction set from subpixels. Ishii's method was extended by Yanaka to cope with the integral photography involving both horizontal and vertical parallaxes [Yan07, Yan08].

4. "VRoadCast", real-time broadcasting system for VE

VRoadCast is a broadcasting system designed for VE (Virtual Environment) which lets non-players see what the players are doing in VE on 2D display media. HMD players and non-HMD players can be merged in 3D environment and the experience is composed by chroma-key using pixel shader on Unity. The contents can be easily authorized by 2D still photos and 360 degree camera named Theta-S.

5. Integrated demonstration as "5S"

Simultaneous Socio-Spatial Shared Signage (5S) is an integrated demonstration project which consists of VRoadCast and ExField display systems. VRoadCast is a broadcasting system designed for VE(Virtual Environment) which lets non-players see what the players are doing in game. ExField is a glassless multiplex display system that shows different contents when viewed from different directions. In this demonstration, we proposed an augmented reality broadcasting environment without any wearable components. In this specific version, players can trip different parts of France. The content is composed by 2D photos and 360 degree camera named Theta-S. The prototype was tested by the public at DCEXPO 2016 Laval Virtual stand and was recognized as a new signage media of VR experience for unconnected audiences.

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