대형 화면을 이용한 상호작용적 전시를 위한 비디오 아바타 시스템
Video Avatar System for Interactive Exhibition using Huge Screen Projection

이하섭, 立山義祐, 小木哲朗 /慶應義塾大学 システムデザイン・マネジメント研究科, 西岡貞一/筑波大学 図書館情報メディア研究科, 茅原拓朗/宮城大学 事業構想学部, 篠田謙一/国立科学博物館 人類研究部

Hasup Lee[1], Yoshisuke Tateyama[2], Tetsuro Ogi[3] / Graduate School of System Design and Management, Keio University,

Teiichi Nishioka[4] / Graduate School of Library, Information and Media Studies, University of Tsukuba,

Takuro Kayahara[5] / School of Project Design, Miyagi University

Kenichi Shinoda[6] / Department of Anthropology, National Museum of Nature and Science

[*1]*hasups@sdm.keio.ac.jp*, [*2]*tateyama@sdm.keio.ac.jp*, [*3]*ogi@sdm.keio.ac.jp*,

[*4]*nishioka@slis.tsukuba.ac.jp*, [*5]*kayahara@myu.ac.jp*, [*6]*shinoda@kahaku.go.jp*

Abstract: In this paper, we develop the video avatar system for interactive exhibition. We extract background image from recorded video stream using chroma key and send the stream to remote host using TCP or UDP protocol. In our system, 4K resolution projector and 300 inched screen are used for viewers to feel the mood of exhibit's ages.

Keywords: Video Avatar, Digital Museum, Interactive Exhibition

1. Introduction

The origin of the museum is considered the 'Museion' at Alexandria, Egypt in BC300 [1]. Now the museums are spread all over the world and there must be one or more museums in each city. The museum is also modernized and developed like other structures.

The development of computer and computer network makes us more comfortable and efficient. The digitalization using these is progressing in all aspect of our life. The museum is also one of them which are digitalized. You can see the exhibits over the website without going to the museum. The electronic miniature of dinosaurs are animating there. The digital museum is one of the places which show the state of the art of the digitalization techniques.

The video avatar is an avatar that use real camera video stream instead of a graphical character. It can be used in a remote experiment with sharing data, a conference system, etc. If the video avatar is applied to the exhibition of the digital museum, the exhibition is more interactive.

2. Digital Museum

The digitalization of the museum can be included many directions; the digitalization of the exhibition (over the computer network), the advertising, control and maintain the viewers, the place and the device that show the exhibits, etc.

In our research, we considered the digitalization of display method as the direction of digitalizing museum. Our goal is for viewers to feel the mood of the environment when and where the displays existed.

We recover the graphic models from old scrolls and the castle of Kumamoto of Japan. We made the 3D graphic model of the castle and attached textures on it. The textures are made of the photos of the castle of Kumamoto. The textures of the clothes are from the exhibits. For people's animation, we got the motion capture data from the actors.

We developed our augmented reality device for exhibits. It uses half silvered mirror film, screen and two projectors.

One is for the animation of virtual world and the other is for the expression of occlusion between virtual and real objects. The special sound effect is used for feeling the mood of crowded environment. And the video avatar is used for interactive exhibition. The demonstration of video avatar system on the screen is shown in (Figure 1). For viewers to feel the mood of the original ages, the huge screen and very high resolution projector was used.

Figure 1: Video avatar on the screen of the digital museum

3. Video Avatar

Video avatar technology made users can share a virtual space between remote sites [2]. Users can point out the 3D data more precisely using video avatar with stereoscopic devices. We applied this video avatar technology to the display of the digital museum.

The system architecture of the video avatar is shown in (Figure 3). A recorder module records the video stream of

the specialist or audience using a digital camera. A sender module sends this video stream to remote receiver module via the internet using UDP or TCP protocols. The recorder module and the sender module communicate each other using shared memory. The received video stream can be animated using OpenCABIN library and shared memory. The sound stream is full-duplex like a telephone as same as the video stream.

4. Implementation

The video avatar contains only the area of the user on a video frame. The background was extracted using chroma key (green cloth). We summed up the each difference of color values in RGB color space and set the alpha value for pixels by threshold. We used Sony™ digital camera for recording video and its resolution is 800 X 600.

Figure 2: Record part configuration of video avatar

The sender and receiver modules use UDP protocol for communicate in our implement. For rendering contents and video avatar, we developed our renderer module using OpenCABIN library. The configuration of recording part of the system is shown in (Figure 2). We displayed our contents into 300 inched screen using 4K resolution Sony™ projector. The size of video avatar was considered for user's immersion.

5. Conclusions

In this paper, we develop the video avatar system for interactive exhibition. We use very high resolution projector and huge screen for viewers to feel the mood of the environment when and where the exhibits existed.

Acknowledgement

References

[1] Doosan Corp., "Museum section", EnCyber Encyclopedia, http://www.encyber.com/search_w/ctdetail.php?pno=&masterno=69473&contentno=726156

[2] Ken Tamagawa, Toshio Yamada, Tetsuro Ogi, Michitaka Hirose, "Developing a 2.5-D Video Avatar", IEEE Signal Processing Magazine, Vol.18, No.3, pp.35-42, 2001
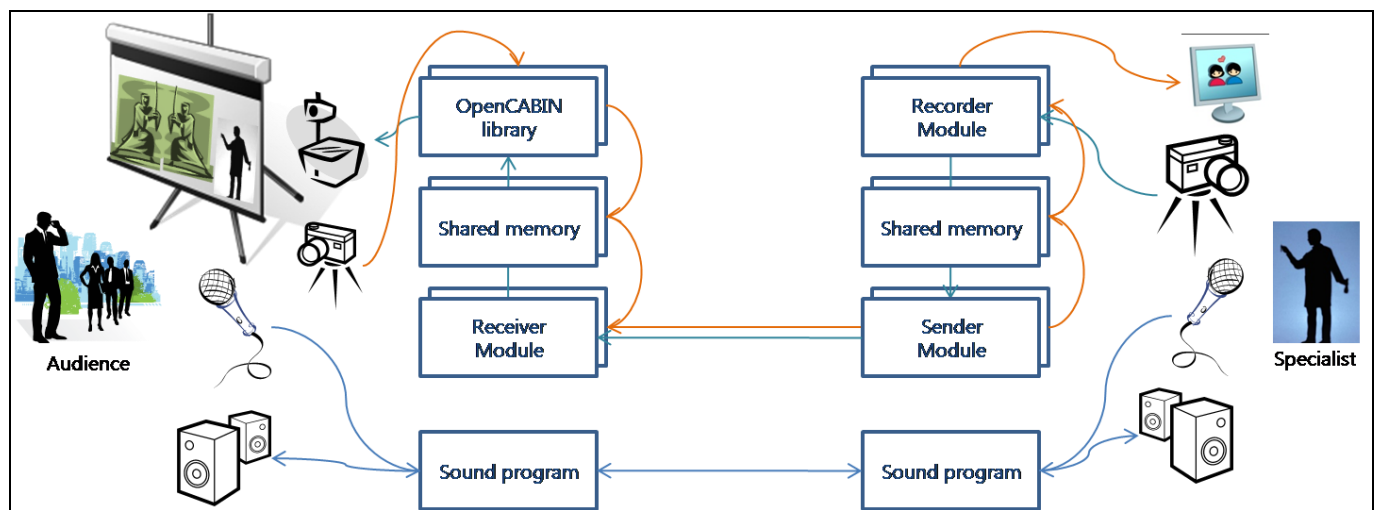
Figure 3: Video avatar system architecture