Interactive Exhibition with Ambience using Video Avatar and Animation on Huge Screen

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Abstract. In this paper, we develop an interactive exhibition system using a video avatar and an animation on huge screen. As the video avatar, we extract background images from recorded video stream using Chroma key and send the stream to remote using TCP/UDP protocols. The animation on huge screen provides immersion and ambience of the ages of displays. We restore clothes, ceremony, crowd, etc. using computer animation. 4K resolution projector with 300 inch screen is used in our system and it makes viewers to feel the ambience of the environment when and where the displays existed.

Keywords: Video Avatar, Museum Digitalization, Interactive Exhibition, Digital Restoration, Huge Screen

1 Introduction

There have been existed a lot of museums in history. The museum named Museion at Alexandria, Egypt BC300 is considered the first one [1]. They spread all over the world geometrically and there are several museums in most cities. Also their themes are various like history, foods, clothes, etc.

As computer technologies have been developed, many things in our life are digitalized. The museum is researched using these technologies, too. Users can watch the exhibits on the homepage via computer networks. The exhibits are digitized as graphical models [2]. The museum is constructed in virtual world using VR technique [3]. The information of the art is retrieved using computer vision methods [4]. Tourists of museum are guided using digital devices [5]. The museum is one of most digitalized facility.

The exhibition of the museum becomes more interactive if an export explains in front of the viewers. This environment can be developed using the video avatar [6]. The applications of the video avatar are a remote experiment with sharing data, a conference system, etc. And the viewers can feel more immersive using huge screen that the animation of exhibits projected into.

In this research, we focus on the interaction and the immersion of viewers. We develop a video avatar for the interactive exhibition system. We extract background images from the video stream using Chroma key and send the stream to remote host via computer networks. Finally, the video avatar is superimposed on the animation on the screen in front of the viewers. For viewers' immersion, the animation on huge screen is used and provides the ambience of the ages of displays. The clothes, ceremony, crowd, etc. of the ages of displays are restored using computer animation. We use 4K resolution projector and 300 inch screen in our system and it provides the feeling of the ambience of the environment when and where the displays existed.

2 Digital Museum

In this research, we restore an animation of the exhibit's age from the old scroll. Then this animation is projected onto a huge screen for viewers to feel immersion. The video avatar is added on this animation for interactivity. The demonstration of whole system is shown in (Figure 1). The animation is restored using described images on the scrolls for viewer to feel the ambience of its age.

Fig. 1. Demonstration of digital museum

3 Video Avatar

Video avatar is developed to share a virtual space between remote places [6]. Video avatar helps the users to point out the 3D data more precisely. It uses stereoscopic devices for input. In our research, we show video avatar on the restoring animation to interact with viewers.

The expert explains about the animation in front of the camera with microphone. The record module records this video stream and the send module transfers this stream to remote host of the museum via TCP or UDP protocols. The record module and the send module communicate with each other using shared memory. The video stream is received by the receive module and projected on the screen by render module using OpenCABIN library. The receive module and the render module share data through shared memory, too.

The viewers watch the animation and listen to the explanation. They can ask questions or comments to the expert with microphone. The sound data stream which handled by sound program is full-duplex like a telephone. The exhibition is interactive using this video avatar system on the exhibits or the animation. The system architecture of video avatar is shown in (Figure 2).

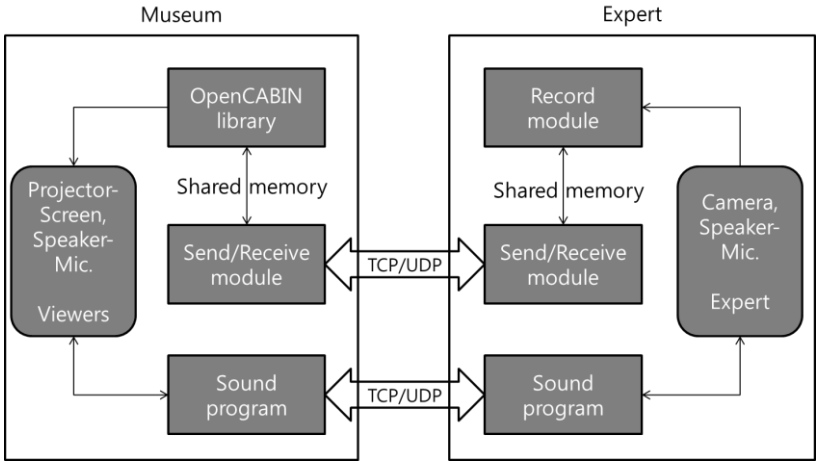

Fig. 2. System architecture of video avatar

4 Animation Restoration

We restore a character animation of an old scroll contain landscape of ceremony. 3D graphical models are created from real photographs of the buildings. We extract their textures from the photographs. The textures of character's clothes, hats, bags, knifes, shoes, etc. are made by referencing exhibits and materials of museums. The example of real image and model of our system are shown in (figure 3).

First, 2D scraps of contour of people of the old scroll are placed. Then we replace them with the 3D characters and animate them. We get motion capture data from the actors for character animation. The voices of characters are dubbed by the professional voice actors and the special sound effect is added for feeling the mood of crowded environment.

Fig. 3. Photograph (left) and model (right) of Kumamoto castle

5 Implementation

We use Sony® digital camera for capturing the expert and its resolution is 800 x 600 pixels. Chroma key technique is used for background removal. The each difference of color values in RGB color space is summed up and the alpha value for pixels is determined by threshold. The expert's video avatar is superimposed on the animation on the screen.

Fig. 4. Send and receive part of video avatar

The record module is implemented using Intel® Integrated Performance Primitives library. The record and the send module communicate using shared memory. The send module sends video stream to receive module via Internet using UDP protocols. The render module accesses the video stream that the receive module received and stored into shared memory. The render module is developed using OpenCABIN library which displays graphical contents on the screens and handles user's inputs like position, direction, joystick values, etc. [7]. The final animation is displayed on 300

inch screen using 4K resolution Sony® projectors. The recording part configuration of video avatar system and the video avatar on the animation are shown in (figure 4).

Fig. 5. Old scroll of Kumamoto Castle

Fig. 6. Character placement of crowd (left) and ceremony (right)

Fig. 7. Character animation of crowd (left) and ceremony (right)

We made the animation of crowd and ceremony of old ages of Kumamoto Castle in Japan. It is restored using old scroll which contains various people and snapshots of ceremony. The scroll is shown in (figure 5). We make the 3D model of castle using texture from real image of it. The 3D characters are created with referencing to other exhibits like clothes, knives, hats, bags, etc.

We scrap people from the scroll and place on our castle model. The left image of (figure 6) is scrap version of the landscape of crowd and the right one is of the old ceremony. After placing scraps, we replace them with 3D characters. The final results are shown in (figure 7).

We get motion capture data from the actors to animate characters. The snapshot of the actor in motion is shown in the left image of (figure 8). The voices of characters

are dubbed by the professional voice actors and the special sound effect is added for feeling the mood of crowded environment. Voice actors are dubbing the animation like the right image of (figure 8).

Fig. 8. Recording motion data and voice dubbing

6 Conclusion

We develop a video avatar system for the interactive exhibition. We remove background from the video stream using Chroma key technique and send it to remote via Internet. The video avatar is superimposed on the animation that is restored using old scroll, clothes, knives, hats, bags, etc. First, we place the scraps of people's contour from scroll on the 3d model of environment. Then we replace the scraps with 3D characters and animate them. We use 4K resolution projector and 300 inch screen in our system and it provides the feeling of the ambience of the environment when and where the displays existed. In this research, the interactive, immersive and ambience-feeling exhibition can be developed using the video avatar system, huge screen and the animation restoration.

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