Design and implementation of Brocade Ash Pile exhibiting platform using human-computer interaction and Web-based technologies

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Abstract. With the rapid development of human-computer interaction and Web-based technologies, there are more diverse forms of exhibiting intangible culture heritage in digital. The Brocade Ash Pile is a kind of Chinese acrobatic painting, which carries a deep cultural heritage and was selected as intangible cultural heritage of China. Due to the difficulty of painting Brocade Ash Pile, there are fewer and fewer skilled inheritors. So, the protection and inheritance of Brocade Ash Pile in digital ways is much more urgent than traditional ways. In this paper, we propose an intangible cultural heritage Brocade Ash Pile platform based on human-computer interaction and Web-based technologies, focusing on the introduction and exhibition of Brocade Ash Pile culture. Web-based technologies like Web front-end, Web3D and WebAR are applied on the platform to make users get a better experience of Brocade Ash Pile culture.

Keywords: Brocade Ash Pile; human-computer interaction; Web3D; WebAR

1   Introduction

Intangible cultural heritage is one of the important national cultural achievements and the common wealth of all mankind. Compared with tangible cultural heritage, intangible cultural heritage is constrained by its liveliness. So, the protection and transmission of intangible cultural heritage are particularly important [1]. Due to the high-level technique of drawing the Brocade Ash Pile, the inheritors of drawing Brocade Ash Pile are much fewer than before.

The rapid development of digital technology has brought unprecedented opportunities for the data collection, information storage and processing of intangible cultural heritage. It is becoming an important choice for the transformation of intangible cultural heritage protection [2].

We use human-computer interaction and Web-based technologies to design and realize an intangible cultural heritage Brocade Ash Pile cultural display platform. It systematically introduces the historical background, origin development and similarities and differences between the intangible cultural heritage Brocade Ash Pile culture

and Western collage art. The third part describes the design and development process of the platform. Finally, we make the conclusion in the fourth part of this paper.

2   The development status of intangible cultural heritage Brocade Ash Pile culture

The Brocade Ash Pile was first appeared on a snuff bottle in the Ming dynasty, which was originated from the Chinese tradition culture and influenced by Western material civilization. The Brocade Ash Pile is a kind of realistic drawing with the characteristics of three-dimensional(3D) visual art, as shown in Figure 1. This creative technique blends seemingly unrelated words with broken patterns to present a regrettable beauty skillfully [3]. In terms of subject, it refers the traditional birthday celebration and auspicious paintings as well as the emotional themes of nostalgia to present them in creative ways. It inspires us to learn and innovate on the basis of inheriting traditional culture in contemporary painting [4].

As a relatively independent type of painting, the decorative character of Brocade Ash Pile affects all aspects of social decorative arts. Brocade Ash Pile patterns were drawn on the snuff bottles, porcelains, jewelry boxes and other crafts for decorating in ancient times. With the development of society, Brocade Ash Pile patterns are also drawn on the fans and jade carvings in modern society. These new types of objects provide carriers for modern design and can further enhance the national and artistic nature of art works.

Fig. 1. An example of Brocade Ash Pile.

The integration of traditional culture and modern aesthetics inspires us to use traditional symbols in graphic design correctly, and add our own ideas when inheriting and promoting traditional culture [5]. The digital protection of intangible cultural heritage is the trend of today's social development, and it has the emotional, dynamic and intangible attributes. Digital protection relies on accurate and diverse data collection and storage. Interesting and professional visual design is also inquired for increasing user experience and enhancing immersion in many aspects [6].

3   Design and implementation of Brocade Ash Pile platform using human-computer interaction and Web-based technologies

In this part, we design and implement the intangible cultural heritage Brocade Ash Pile display platform using human-computer interaction and Web-based technology. The task flow chart is shown in Figure 2.
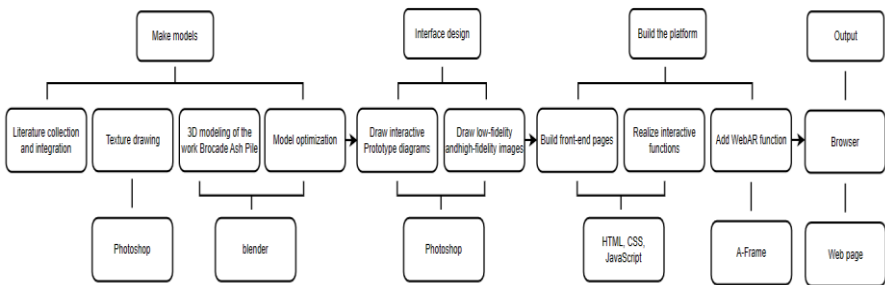

Fig. 2. Task flow chart.

3.1   The application of human-computer interaction in the platform

As shown in Figure 2, we use Web front-end technology to build the entire platform, mainly including hypertext markup language (HTML), cascading style sheets (CSS) and JavaScript. By utilizing related technologies and frameworks, we implement the user interface interaction of the platform. The specific tasks are as follows:

1). Platform content design

This design focuses on the origin, development and style characteristics of the intangible cultural heritage Brocade Ash Pile, and the framework diagram of the platform is shown in Figure 3.

The platform is mainly divided into four parts, which are homepage, work appreciation, origin development and Chinese VS western. In homepage, we present the Brocade Ash Pile works and some brief introductions to users by using Web3D technolo-

gy. In the work appreciation interface, Web3D and Web augmented reality (WebAR) are used to introduce the source and development status of the Brocade Ash Pile in detail, in which users can scan pictures for AR interaction and enjoy the charm of intangible cultural heritage. In the origin development interface, we introduce users to the development of the Brocade Ash Pile of the four typical dynasties. For the interface between China and the Western countries, we compare the Brocade Ash Pile with the Western collage art and analyze the similarities, differences and relevance.
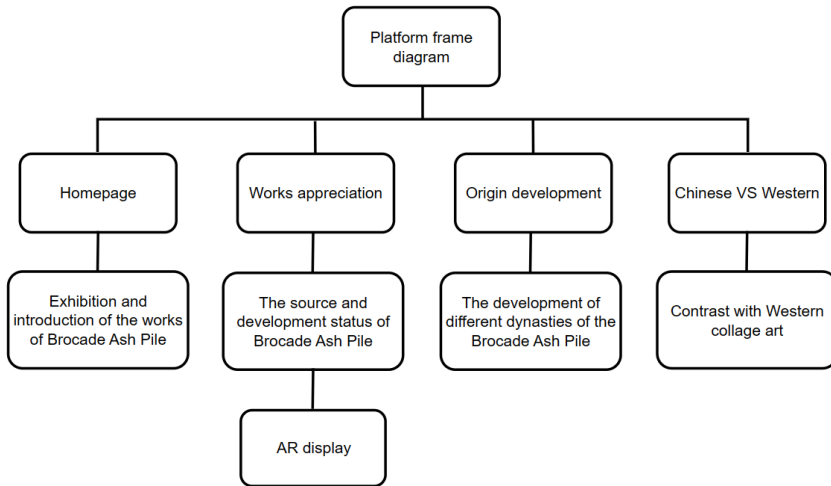
Fig. 3. Platform frame.

2). Draw interactive prototype diagram

In this part, we use Photoshop software to generate interactive prototype diagram. To make people have a better visual experience, we take consideration about the style, color and other aspects of the interface. The overall style is a combination of splashing ink and calligraphy with a lot of Chinese elements. And there are also many ancient Chinese paintings on the platform, which greatly increases the ornamentation. The interactive prototype is shown in Figure 4.

3.2   Application of 3D technique base on WebGL in the platform

WebGL is the emerging standard for 3D visualization in the Web. In recent years the Internet community has created a number of OpenSource frameworks that offer high-level application programming interfaces (APIs) on top of WebGL [7].

In this article, the homepage interface applies WebGL and Web3D technologies. We use the Three.js engine library to realize the animation of 3D graphics of web pages, and the flowchart drawn is shown in the Figure 5. By using Three.js, we realize animation effects like rotation by modifying their position and rendering them timely, as shown in the Figure 6.
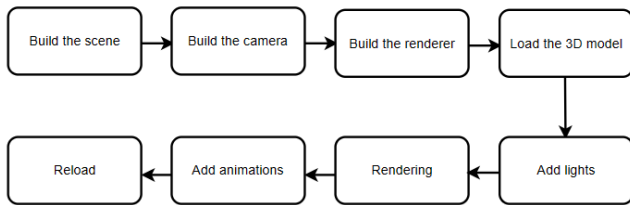
Fig. 4. Prototype interaction diagram.

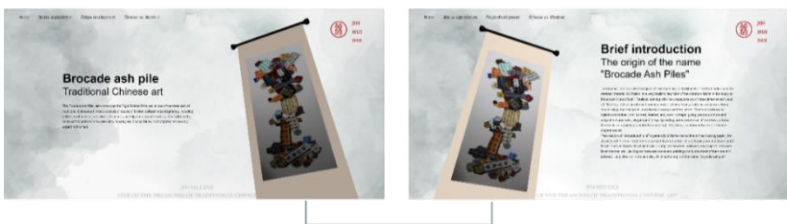**Fig. 5.** WebGL flow chart.

Fig. 6. WebGL realization by using Three.js.

3.3   Application of WebAR technology in the platform

Nowadays, augmented, or mixed, reality is a popular technology which is gaining in popularity among educators as well. The basic application of augmented reality (AR) to education is provision of visualization by visualizing computer models of systems and objects using general (a computer equipped with an integrated or external web-camera) and specific (AR goggles, VR helmets) tools, and adapted devices (mobile phones) [8]. Content that can be augmented can be anything that can be rendered on an HTML5 canvas. Therefore, 2D images, 3D models, text, even animations can be pro-grammed. Toolkits such as A-Frame can be used to rapidly prototype 3D content. [9]. WebAR only needs people to enter the uniform resource locator (URL) of the applica-tion in the browser for experiencing the AR application [10]. WebAR is easy to spread, and promotes the wide application of AR, while eliminating the need for high cost of developing smart phone applications. By using WebAR technology, people can scan pictures and display a variety of media forms in Web and interact with 3D models.

In our platform, the WebAR section was developed using the A-Frame framework, which is based on HTML and document object model (DOM). Since A-Frame is based on HTML, most existing tools and libraries like React, Vue.js, d3.js, jQuery can work with A-Frame. For using WebAR and other techniques to train the images needs to be divided into the following steps.

1). Collecting data.

We collect a variety of Brocade Ash Pile artworks and select the suitable artworks for AR recognition for displaying the Brocade Ash Pile culture intuitively.

2). Making models

We use Blender software to design and make models, select suitable material maps, and finally export the GL transmission format(glTF).

3). Identification and interaction

First, we transfer the images to into target recognition images and write them into the HTML codes. Then, we put the 3D models and introduction pictures into platform by using the A-Frame framework. In a web page, people can use a camera to scan and recognize the tagged images, and make some interaction like zoom in, zoom out and play audios. The WebAR effect is shown in the Figure 7.

4   Conclusion

In this paper, we propose an intangible cultural heritage Brocade Ash Pile display platform using human-computer interaction and Web-based technologies, which has a great significance for digital preservation and inheritance of Brocade Ash Pile. We use various digital means to integrate tradition and modern, which can restore the artistic vitality of Brocade Ash Pile. In this way, we are achieving the purpose of im-

proving people's awareness and inspiring more people to inherit intangible cultural heritage in both traditional and digital ways.

Fig. 7. WebAR operation effect.

Acknowledgments

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