CULTURAL HERITAGE VISUALIZATION USING PANORAMIC IMAGES

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ABSTRACT: This study uses a GigaPan EPIC PRO equipment to capture multiple photographs automatically and to generate panoramic image models of cultural heritage sites and objects. A stitching software is utilized to merge original photographs into a panoramic image station by station. All station-based panoramic images are then connected and presented on a website providing a virtual interactive pano-touring platform. A historical building at Kinmen is selected and demonstrated in the study. Results show that the panoramic images can visualize the characteristics of cultural heritage site and objects effectively. In addition, users can have a realistic feel about the site trough the virtual tour website.

1. INTRODUCTION

Cultural heritages are relic of ancient developments and have significant meaning in history, education, and many other perspectives. Preserving the cultural heritages may require different methods to record the appearance and characteristics of a monument or an object for presentation in a computer or web-based platform, such as photograph, laser scanning, video recording, texts, etc. After that, combining metadata can provide the further descriptions and information of cultural heritages. Photograph is one of the digital archive options to preserve the culture heritages. However, it is difficult to represent a large scene in detail because the photos only capture several thousand pixels.

To address this issue, panorama has been applied to record the cultural heritages in the study. Panorama provides the detailed information in a 360 degree of horizontal view and a 180 degree in vertical view (called 720 degree sometimes). Users can rotate or zoom to simulate that you are in that place. Thus, it provides a realistic view of the entire scene in detail that is helpful to preserve and observe the condition of cultural heritages. This study applies the GigaPan EPIC PRO equipment (DP REVIEW, 2013; GigaPan, 2013) to capture multiple photographs automatically around the targets. After that, Kolor Autopano Giga software (Kolor, 2015) is used to stitch original photographs into a panoramic image station by station, and using Kolor Panotour Pro tool to connect all station-based panoramic images for presentation on a website. The developed website not only shows a complete culture heritage, it can also be used as an interactive virtual touring platform for digital cultural heritage documentation and presentation.

2. METHODOLOGY

There are three steps to construct a panoramic dataset in the study. The first part is to capture the scene with photographs acquired at multiple stations. Then, this study stitches the photos to generate a panoramic image station by station. Finally, all station panoramic images are connected together. The quality of stitching panorama is very important. In order to obtain a better stitching result, the station's projection center, exposure level and the depth of field should be the same.

This study utilizes the GigaPan EPIC PRO equipment to capture photos. GigaPan EPIC PRO can automatically

change the attitude of camera and capture sufficiently overlapped photos to stitch them for panorama generation. After that, the captured GigaPan images are loaded to Kolor Autopano Giga software to generate the panoramic photo station by station. The process of Kolor Autopano Giga is based on the SIFT (Scale-Invariant Feature Transform) algorithm for extracting and matching the feature points and conjugate points of image pairs. Then a big panoramic image of hundred millions of pixels can be generated. Figure1 is an example of a panoramic image.

Figure 1. The generated panoramic image

For displaying panoramic images, Kolor Panotour Pro tool is adopted. Kolor Panotour Pro tool not only provides a virtual view by projecting the panoramic images but also connects the panoramic images which like a street map. In addition, users can design the webpage such as style of control bar, interface and additional functions (e.g. share on Facebook, Twitter, etc) without any requirement for programming.

3. RESULTS

A historical building (the shrine of Tsai's family) in Kinmen of ROC is selected as the study site. The constructed website and panorama results are displayed in Figure 2 (URL: http://140.115.110.233/webcon/). Clicking the yellow icon in the scene can change the panorama station (Figure 3). Furthermore, it provides other touring functions, such as zooming in to see the heritages in detail (Figure 4). The detailed scene of heritages may be helpful to investigate and preserve culture objects.
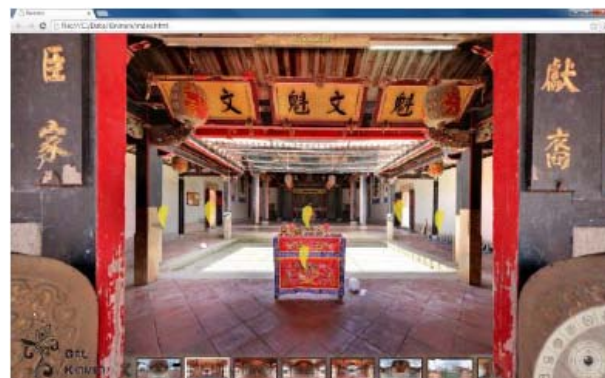

Figure 2. Website interface

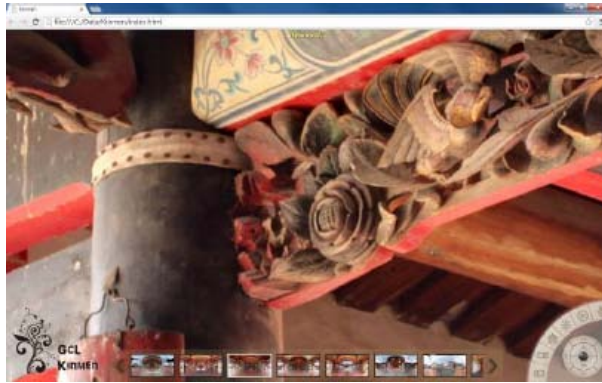Figure 3. Go to different panorama station by clicking the yellow icons

Figure 4. Zooming in the scene

4. CONCLUSION

The objective of digital cultural heritage (DCH) documentation is to record culture heritages for the investigation, preservation and application. This study applies the panorama technique to generate a web interface for digital documentation and presentation of a historical building on a web-based platform. Furthermore, the website is not only used as a visualization platform; it also connects all panorama stations to provide realistic presentation of cultural heritage site and objects in great details. It is noted that the projection center, exposure level and the depth of field should be consistent at every station in order to obtain high quality panoramic images. Based on the panoramic image documentation results of this study, future research may construct detailed three-dimensional models of cultural heritage monuments and objects.

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