

Web-based Virtual Tour Guide Using Panoramas of Cultural Heritage Site at Kinmen

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ABSTRACT:

Heritages are relic from the process of development, and have significant meaning in history and educations. Preserving the heritages in a digital way provides several benefits, such as recording the appearance so far and providing a digital display platform. Based on previous studies, photograph is one method of the digital archives of culture heritage. However, it is difficult to represent a large scene in detail using photos that only about several thousand pixels. In this case, panorama was considered to overcome this problem. Panorama can provide a whole scene view and displayed clearly in details. This research uses GigaPan EPIC PRO to capture multiple photographs around the whole scene automatically. Then use Kolor Autopano Giga 3.6 software to stitch the photographs into a panorama image. Each station's photos can be stitched into a panorama image. Through the tools Kolor Panotour Pro provided, it is capable to link the related panorama of each station and design a website customized. The designed website not only preserves a complete culture heritage, but also provided a tour guide around the heritage. A case of cultural heritage site at Kinmen is demonstrated in this research. Using panorama image can display the characteristic of heritage more nuanced than 3D model and point clouds. Everyone can access the culture heritage visually in detailed on the website without being there.

1. INTRODUCTION

These days, government has devoted to preserve the culture heritage. Heritages are relic from the process of development, and have significant meaning in history and educations. Through the culture heritage preservation, can not only preserve historic records, but also learn from culture. Digital archives of culture heritage can be achieved using photograph, scanning, videos or text in a digital form. In addition, combining metadata provide further descriptions and information of heritage. All materials of digital archives can be combined and displayed in a platform, helping human to know more about our culture. Panorama provides the detailed information in a 360 degree of horizontal view and a 180 degree in vertical view, also be called 720 panorama. Users can rotate or zoom to simulate that you are in that place. If taking this kind of technique to the culture heritage preservation, it is available to have an application of guide.

2. METHODOLOGY

The goal of digital archives of culture heritage is to preserve and display all heritages in detail. However, the resolution of images limits the result of displaying all details in a photo with an ordinary digital camera. It is difficult to represent a large scene in detail using photos that only about several thousand pixels. In this case, panorama was considered to overcome this problem.

Taking advantage of panorama's properties, the resolution can be evaluated to needed after stitching multiple photographs to panorama. Through connecting multiple panorama photos by the relationship of each other, a system of the guide can be established. Setting a guide system of panorama can be divided into three parts: The first part is to take photos including the whole scene. Then, stitch the photos to a panorama image. Finally, link the related panorama images stitching from different stations.

The quality of the panorama stitching is closely related to the setting while taking photos. The main key to get a better stitching result is to make sure the projection center of each photos are at the same position. In addition, exposure level and the depth of field are also the same for each photograph. The consistency of projection center can ensure that there is no parallax no matter how far the object located. Therefore, the discontinuous situation would be avoided while stitching the photos. Besides, the consistency of exposure level ensures the continuity of hue and brightness. The same depth of field can make sure the panorama is consisting clear in every place.

In this study, we utilized GigaPan EPIC PRO as our panorama device. GigaPan EPIC PRO can electric adjust the attitude of the camera and capture sufficient overlap photos stitched in panorama. It can be set on a general tripod, or put on a platform directly. It is easy to handle and operation. Shooting a GigaPan image takes only a few and simple steps, via a simple LCD menu and a four-way motion controller. After obtained the GigaPan images, load the original images to Kolor Autopano Giga 3.6 to stitch the photos. Kolor is a company who committed to the development and supply of the best technologies and solutions for image stitching and virtual tours. Kolor Autopano Giga 3.6 is software that has a tool to stitch the photos into a panorama. The tool can stitch multiple images into a panorama image. Figure 1 is an example of panorama images. Using SIFT to find the feature points and conjugate point in images, then match images by those conjugate points. Furthermore, it provided the function to calibrate the tilt of head caused by the weight of camera while capturing. Also, the error of auto matching can be avoided. After the processing, a huge panorama image in up to hundred million pixels can be generated.



Figure 1. Panorama image

Finally, panorama images can utilize the Kolor Panotour Pro to display the result. Kolor Panotour Pro is a panorama tool which not only can have a virtual view by projecting the panorama images but can create a panorama guide map, like a street map. In addition, depending on requirements of users, the style of control bar, spots and so on can be designed customize. Without any programming, an easy and pretty panorama map can be generated.

3. EXPERIMENTAL RESULTS

This research follows the approach to preserve the cultural heritage, a family temple of Tsai, site at Kinmen. The result can be displayed in a website (Figure 2). The connections of panoramas in every station were already set in Kolor Panotour Pro. Click the spot in the scene can change the view to the specific panorama (Figure 3). While in the guide view, it is capable to zoom in to see the details of the heritage (Figure 4). Because panorama is a huge image stitched by multiple images, it can provide a high resolution display.

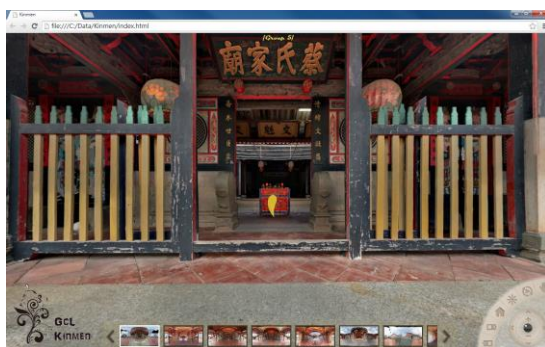


Figure 2. Interface of website

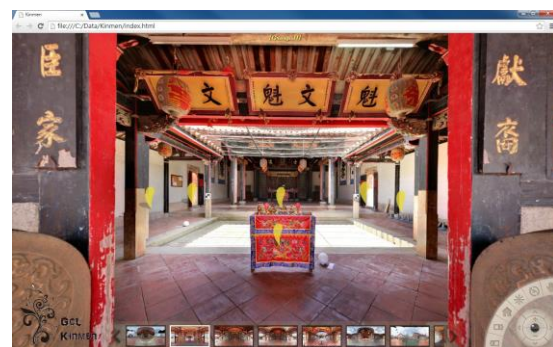


Figure 3. The next scene after click the spot in Figure 2.

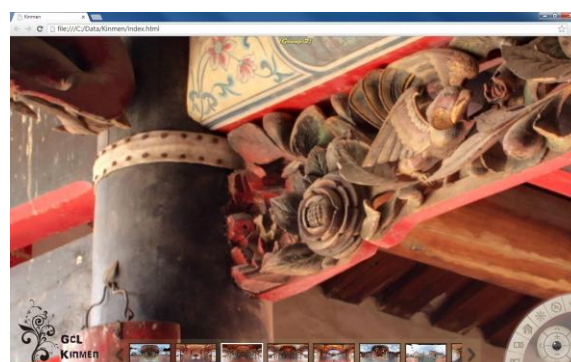


Figure 4. The details of the heritage.

4. CONCLUSIONS

Digital archives let the information preservation and sharing become more convenient and reliable. Furthermore, setting the complete information to a website can provide a platform that everyone can access by internet. Comparing with the 3D model from SketchUp or BIM, the pure image data can provide a more real feeling in visualization to the users, showing the characteristic details of heritage. On the other hand, panorama is more convenient than the data acquisition of LiDAR point cloud model. In the other hand, it is cheaper and more convenient to erect than LiDAR. However, the limitation of this procedure is the projection center should be consistent, especially capturing the heritage. Because of the range is shorter than outdoor situation, the accuracy of the projection center should be higher than the outdoor situation. This means, a slight error might cause the failure of stitching.

In the future, it is capable to include the attribute data into the guide part, such as combining videos, music or special visual effects. Therefore, the interactive between website and users may be improved, not only can rich the website but also give rise to the interest of the users to know more about the culture heritage. In the near future, the proposed approach is not just in a value of preserve the culture heritage. It can be integrated with culture promotion, education, even in the sightseeing. It can be expected that everyone can get the information more convenient and visual through this approach.

5. REFERENCES

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