A Panoramic View System of Guilin Tourism Based on Interactive Projection Technology

Ke Yu, Zhuo Shi*, Ye Feng, Tianlong Shen, Zhixiong Huang, Yinwei Gu, Yingzhuo Deng and Yushi Liang

Guilin University of Electronic Science and Technology, Guilin 541004
Emails: shzh@guet.edu.cn, *Corresponding Author: Zhuo Shi

Abstract: This paper introduces a panoramic view system of Guilin Tourism based on virtual reality and infrared image tracking. Users interact with images on the ground through body movements, the system can achieve unattended, interactive guided, automatic voice interpretation function, with virtualization, high efficiency, easy maintenance, good interactive experience and so on. Suitable for placing in exhibition venues, scenic spots exhibition hall and so on, so that tourists can enjoy Guilin landscape without leaving home.

1. Introduction
In recent years, interactive projection technology has become a hot technology in projection industry. Because of its outstanding technology and great commercial potential, it has gradually developed from a branch technology of projection industry to a new professional field. This interactive projection technology has the advantages of VR technology and human body motion capture function. It is a product of in-depth research of virtual reality technology. The difference with virtual reality technology is that although it does not have VR technology to build near real scenes, so that the operators seem to be immersive and in-depth experience, the actual cost and risk of using interactive projection technology in the exhibition process are also much smaller. The advantages of interactive projection system are good display effect, rich pictures, more humanized overall design, simple and interesting interactive process, interactive, interesting and entertaining. When the guide system of Guilin tourism using interactive projection system is placed in various exhibition halls or leisure places, it can quickly attract passers-by's attention, and at the same time, it can also let the audience immerse in the interaction, so as to understand the scenic spots of Guilin more comprehensively and increase the interest of the audience in Guilin tourism.

Interactive projection system is to project a specific virtual scene on the curtain, wall or ground, so as to bring dynamic and interactive real fun experience to the plain animation. When the user's body parts (such as hands and feet, or even the whole body) enter the projection area, the system tracks and captures the occluded area of the user's body through the infrared camera, and transmits the location data of the occluded area to the system. In the system, several groups of image sequences change with time are constructed and sampled. The background part of the image is the constant part, the human part is the variable part, and then the difference processing is carried out. The processed image sequences are filtered in the frequency domain and pass through the position coordinates and contour information of each target are obtained by the target extraction algorithm. Finally, the tracking target position information is converted into control signal to realize the interactive action feedback of the control virtual reality screen.

This project mainly uses interactive projection system and ActionScript 3.0 technology to build Guilin Tourist Attraction guide system. It takes infrared sensor technology as the basis of interactive
implementation and projector as the visual presentation device, so that users can interact with the images projected to the ground. Flash and Photoshop are used for software interface design, audition is used for recording and post-processing, and Premiere is used for video editing. On the one hand, the subject is the innovative research on the way of Guilin scenic spots publicity, on the other hand, it explores how to make users get better virtual tourism experience effect. Because the capture accuracy of the interactive projection system is not accurate enough, how to obtain better interactive effect under the condition of ensuring the accuracy is the difficulty of this topic.

2. Analysis of Interactive Projection Guide System of Guilin Tourism

2.1. Demand Analysis
Young people like to contact and accept new things, and have strong curiosity. Therefore, people of this age are selected as the main group. Interactive projection technology is a new technology product, which can effectively attract a large number of young users. At the same time, people of this age are active in thinking and have a large demand for product content. Therefore, the ground interactive projection guide of Guilin tourism not only provides an attractive introduction to scenic spots, but also provides users with recommended playing methods of tourism routes, so that users can get a better virtual tourism experience.

2.2. Analysis of System Hardware Composition and Principle
The tourism guide system is developed by using virtual reality and infrared image recognition technology.

(1) Virtual reality, also known as mirage, is a virtual world that uses computer simulation to generate a three-dimensional space. It can provide users with real sense simulation of vision, hearing and even touch, so that users can experience immersion, interaction and imagination, and a virtual world with strong real feelings.

(2) Infrared signal camera for dynamic acquisition of target image; infrared filter installed in front of the infrared signal acquisition part and used for filtering visible light; connected to the infrared signal acquisition part for analyzing the collected target image and dynamically changing the image processing part of virtual background according to the data generated after analysis; connected to the image processing part And is used to present the imaging part of the changed virtual background. It can solve the problem that human body and virtual background cannot be separated, so as to improve the accuracy of the picture and eliminate the interference of local shadow.

(3) The infrared sensor receives the interactive signals from the feet or other parts of the interactive person and the area (mainly foot action and virtual background) and processes them as position coordinates and other data to the control host. The host then restores the image. The projector switches the processed image and scene to the ground for interactive display and real-time update.

The ground interactive projection system needs to run on a 32-bit or 64 bit Windows 7 or above operating system, with a memory of more than 2G and a processor frequency of 2.66GHz or above. The PC end shall be equipped with video output as projection output and USB interface as infrared sensor data input. It is better to use a projector with zoom function, because zoom function is easier to adjust the size of projection to the ground picture and coincide with the infrared sensing area.

2.3. Technical Analysis
For the above five software needed in this system: Photoshop, PtGui, Audition, Premiere, flash, the author has all involved, and has advantages. Use Photoshop to design and make interfaces, buttons and pictures, PtGui to synthesize and export multiple pictures, audition dubbing and sound post-processing, premiere to clip and export videos, flash to control and realize interactive functions and animation by writing AS3.0 script language.

3. Design and Production of Interactive Projection Guide System for Guilin Tourism
The development process of this system is roughly divided into two parts: the early process and the later process. The early development includes the collection of materials, interface design, button de-
sign and image synthesis; the later development is the interactive design of buttons, audio processing, video editing, the realization of transition animation and the introduction of projection function.

The architecture of system engineering is designed with the idea of layered design. The integrated development environment of the system uses flash for development, and the hardware equipment of interactive projection system is used for software delivery and interaction.

3.1. System Data Flow Diagram

Data flow graph is also called DFD graph. The data flow diagram of the system is shown in Figure 1 and Figure 2. The infrared sensing device transmits the infrared signal to the interactive projection system, which outputs the signal to the projector. When the operator interacts with the ground, it will block a part of the picture projected by the projector to the ground, and the blocked part will be detected by the infrared sensing device, and then continue to feed back to the projection system.

![Figure 1. Top DFD](image1)

![Figure 2. DFD of the first floor](image2)

3.2. System E-R Diagram

As shown in Figure 3, the entities in the E-R diagram of the system are developers, scenic spots, navigation software, interactive projection system and audience. Each entity has corresponding attributes, and the entities have mutual relevance. The developer has the name and password of the projection system, which can only be modified by the developer. And the developers design the scenic spot, add pictures, introductions and buttons to it. At the same time, the developer also makes the navigation software, which includes pictures, buttons, video and audio attributes, and the navigation software uses interactive projection system for projection. The audience can interact with the system.
3.3. System Structure Diagram
The main structure of the system is as follows, after opening the software, enter the main interface, and then the software automatically plays the background music. At this point, the viewer can choose the "instructions" button to enter the instructions interface, which describes how to use the ground interactive projection guide; or select the "start" button to enter the scenic spot selection interface, in which the viewer can choose four different scenic spots according to their own needs: Longsheng, Xingan, urban area and Yangshuo. After selecting the scenic spot to enter the scenic spot video introduction scene, the viewer can choose to watch the video, and then the software will automatically jump to the scenic spot introduction interface, or the viewer will choose the "skip" button, then the software will skip the video directly into the scenic spot introduction screen. After entering the introduction scene, there will be different scenic spots, the viewer only need to put their hands on the scenic spot button to understand, the software will automatically pop up the corresponding text explanation and narration dubbing. The system structure of the ground interactive projection navigation software is shown in Figure 4.

3.4. System Production
Open Tencent map, and search for "Guilin ", click on the" satellite "button, the map will show the satellite map of Guilin area. Subsequently, the map of each scenic spot in the satellite map is enlarged, and then the enlarged area is captured using the system's own screenshot tool. open the PTGui software, click "load image ", select the six pictures of the previous screenshot in the pop-up selection box, then click the" alignment image "button, the software will automatically synthesize the six pictures to get the complete satellite map of Guilin urban area. Click the Create Panorama button to place the full satellite image in the specified folder. Similarly, Guilin complete satellite map, Longsheng, Xingan, Yangshuo satellite map are also synthesized by the above methods.
After designing the interface, we should start making the interface. After the author has collected the corresponding material, use the PhotoShop to process the corresponding picture, transform it into flat style. Flat style processing can eliminate the excess color on the picture, let the viewer see the important content at a glance, and the whole picture is more concise and beautiful. The meaning of flat concept is: remove redundant, heavy and complicated decorative effects. At the same time, the flat style above the use of ink style collocation, highlight the landscape style of Guilin, so in the design of most buttons are used ink style buttons.

After setting a unified style, the production of "start interface"," area selection interface "," scenic spot selection interface" and "scenic spot introduction interface" is also completed accordingly. Add the corresponding pictures into the library in the Flash, put into the stage to complete the interface construction work. The finished product effect of the corresponding interface is shown in figure 5.

**Figure 4.** Structure chart of interactive projection guide system of Guilin Tourism

**Figure 5.** Start interface product drawing installation

### 3.5. Implementation of Interactive Functions

Since the Flash files have the characteristics of short and tough, friendly design interface and convenient operation, the system adopts Flash technology development, uses ActionScript scripting language
to write programs, embeds them in the ground interactive projection software, and converts the multimedia information of Guilin tourism into the information of pictures or videos as the material for Flash development. Flash generated files to be made into a exe format, open Flash release files to be a full-screen way, while hiding the mouse pointer, interactive projection of the special effect is the mouse over the special effect. To simplify the development, directly use the network open Guilin tourist scenery pictures, using software such as PC and Photoshop to process and produce 360-degree panorama. Then we need to develop Flash programs as required to solve bug problems and achieve the best user interaction experience.

![Figure 6. Ground interactive projection installation](image)

FlashPlayer running the system, you can listen to the mouse events, perform scene switching and display the architectural introduction image operation. This system is realized by the control mode of mouse movement. The controls of the experience shadow section are equivalent to mouse sliding. The concrete implementation is: first camera to capture and collect participant image and action data. Secondly, the data collected is processed by the data processor to realize the synchronous interaction of the participants roaming, to analyze and process the image and action data collected by the camera, and to synthesize these data and the original data of the processor. Then the synchronized interaction is projected onto the ground.

After jumping to the interface of scenic spot introduction, the interactive design and implementation of scenic spot introduction are realized. In this scene, the main implementation is the image rotation effect. The collected pictures are first placed in sequence and set to the corresponding film clip, and then a new film clip is created to place these animations, and named "zx" and "nx", respectively to achieve the forward and reverse rotation of the picture. By placing it into the scene of scenic spot introduction, and using ActionScript 3.0 to realize the control of picture rotation.

4. Installation and Debugging of Interactive Projection Guide System of Guilin Tourism

The installation of interactive projection on the ground is suitable for large-scale interactive mode, and there are certain requirements for the ceiling distance, generally more than three meters. If the projection area is not enough, you can also add a short focus lens to the projector, or choose a short focus projector. If the effect of projection on the ground is not good, you can choose reflective film to increase the brightness of projection. The assembly of the ground interactive projection is shown in Figure 6 below.

After the installation of interactive projection on the ground, it is necessary to calibrate and debug it. Open the interactive projection software on the ground, click "Settings", and a video setting dialog box will pop up, as shown in Figure 7. At this time, if the viewer moves in the infrared camera, there will be a white area moving in the identification box, which is the action of the infrared in identifying the human body. If the white area is not obvious or the white area is larger than the actual person moving, then the recognition is not accurate, at this time, you need to set the exposure rate of the infrared camera in the "optical machine setting", which is generally between 25 and 40.
After the infrared camera identification is calibrated, the next step is to calibrate the screen. The significance of this step is that only through calibration can infrared accurately identify where the viewer is, so as to make the viewer interact with the software more accurately. The initial interface of the ground interactive projection software is to select calibration points. The default optical machine is 4-point calibration. The interactive 4-point calibration can achieve the most accurate state no matter how the camera is placed. If it is the splicing of 2 cameras, select 4-point representation, which means that each camera is 4-point, that is, 8-point. Then, click calibrate. In the pop-up video setting dialog box, first check whether the camera has completely covered the projection screen. Turn on the infrared light, and put small pieces of paper or other things on the four corners of the projector, which can be clearly seen in the video source, or use the fingers to project the four corners of the image to see whether the video source can see the fingers, as shown in Figure 8. If it is a single projection, place the red cursor on the four corners of the projector in turn (the viewer cannot see the corners of the projector, you can mark the corners with your fingers or other objects), then click OK to place it, the blue circle will go to the next one, and then click finish. If it is a dual camera, there will be 8 points. Put the red cursor in the center of the blue circle, and then click them in turn. For multiple camera calibration, make sure that the left side of the video source is aligned to the left side of the screen, and the right side of the video source is aligned to the right side of the screen. If it is the opposite, replace the positions of the 2 USB camera head sockets. So far, the calibration of interactive projection system has been completed.

5. Conclusion
The ground interactive projection adopts a unique and novel non-contact interactive operation mode. The user steps on the ground, put the hands or other parts under projection for operation. It can create surreal light and shadow effects and novel experience, which cannot be achieved by simple lighting or
traditional games. After testing, the interactive guide system of Guilin Tourism Based on flash script language runs stably, with the functions of simple operation, low operation cost, unattended, interactive guide and automatic voice interpretation, advanced technology and novel and unique interactive mode.

Because the interactive projection system is limited by hardware facilities, its communication mode is similar to mouse click operation, rather than multi-point touch mode, the function of interaction will be relatively single, hoping to make a more functional system after the technology of interactive projection equipment is updated in the future, which can provide better virtual tourism experience for tourists.

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