

## An Exploration of Digital Tourism Design Based on Virtual Reality

LIU Yuan<sup>1,2</sup>, LIU Hong<sup>3</sup>, Choi Chris<sup>4</sup>, CHEN Rukai <sup>\*1, a</sup>

1 College of Crop Science

Fujian Agriculture and Forestry University, Fuzhou Fujian 350002, China

2 Faculty of Tourism

Jiangxi Science and Technology Normal University, Nanchang Jiangxi 330013, China

3 Jiangxi Water Resources Institute

Nanchang 330013, China

4 Hospitality, Food, and Tourism Management, College of Business and Economics

University of Guelph, Guelph, Ontario, Canada N1G2W1

<sup>a</sup>fafu948@126.com

**Abstract** — The emergence of virtual tour also eased some of the social problems, reduce travel in the tourism peak traffic, scenic capacity to protect the environment, improve the safety factor in travel, entertainment lifestyles to enrich people, so that people can feel various groups tourism, achieve truly harmonious society, the study has a virtual tour and social necessity. Thesis aims to explore and research techniques and methods for constructing tourist attractions virtual reality system, the establishment of a digital tourism system based on virtual reality technology, combined with urbanization background, to develop rural and cultural tourism in a region of cultural tourism for enhancing the competitiveness of industry as a whole has the significance of the status quo based on rural tourism, cultural tourism into the virtual technology to achieve rapid development of rural and cultural tourism. The system is to provide a new means of propaganda scenic and platform, but also to verify the feasibility of constructing tourist attractions based on virtual reality system, which lays the foundation for further study in more depth.

**Keywords** - Virtual Reality; Rural Tourism; Digital Tourism

### I. INTRODUCTION

With the improvement of people's living standard, tourism has gradually become a national necessity to improve the quality of life choice, but a huge change in consumer attitudes development of tourism and science and technology has also accelerated the nationwide upgrade tourism, promote tourism to information technology, international, Localization, diversification, intensification, intelligent direction [1]. Compared with the traditional rural and cultural tourism in the form of mass tourism, with distinctive characteristics of its biggest selling point to attract consumers in the then rural and agricultural landscape and rural traditional culture, specifically in the beautiful rural scenery, laid-back pace of life, simple The rural lifestyle, folk culture, traditional crafts and so on [2]. Today's society, people work and study under increasing pressure, urban living environment is getting worse, everyone is yearning for a paradise, to get rid of the hustle and bustle and worry, for most ordinary consumers, out of travel costs, time, etc. comprehensive consideration of aspects, will rationally choose the nearest surrounding suburbs to travel, there is a huge potential for development of rural tourism, and with the advance of urbanization in rural areas, can be predicted that the future development of cultural tourism industry will be the focus of rural transfer [3-4]. However, subject to the ideas behind the majority of rural areas, poor infrastructure and many other factors, the development of cultural tourism industry cannot be carried out, leading to the development of

rural cultural tourism industry is lagging behind the overall low level, in order to play the subsequent advantage, we must seize an opportunity to bring IT policy opportunities and extraordinary leaps and bounds.

Based on the exploration and research techniques and methods for constructing tourist attractions virtual reality system, the establishment of a digital tourism system based on virtual reality technology, combined with urbanization background, to develop rural and cultural tourism in a region of cultural tourism for enhancing the competitiveness of industry as a whole has an important meaning that the status quo based on rural tourism, cultural tourism into the virtual technology to achieve rapid development of rural and cultural tourism. The system is to provide a new means of propaganda scenic and platform, but also to verify the feasibility of constructing tourist attractions based on virtual reality system, which lays the foundation for further study in more depth. Including an analysis of specific virtual tour of the combination of theory, to system design and detail design of theoretical discussion and feasibility analysis.

### II. ANALYSIS OF THE DEVELOPMENT NEEDS OF RURAL TOURISM

Developing rural tourism is to adapt to new changes in urban and rural consumer demand. Development of rural tourism, agricultural tourism, farming experience, ecological leisure, natural landscape, farming culture combine to meet the people back to nature, return to consumer psychology and quality of life in the pursuit of nature [5-7]. Both to meet

the urban residents of respect for nature, return to nature and enjoy the natural needs, but also to promote the rise of rural tourism. Development of rural tourism is to promote the transfer of employment of farmers new channels. Agricultural labor force and tertiary industries to industrialization, urbanization an inevitable phenomenon. Due to the constraints of farmers' quality, skills and investment capability doors abuse and other factors, to the secondary and tertiary industries employment difficult [8].

The development of rural tourism is a new way to optimize the adjustment of agricultural structure. Currently, agricultural resources and the environment of economic development is facing increasing pressure, adjust and optimize the agricultural structure, the transformation of agricultural economic development, development of resource-saving and environment-friendly industry has become an inevitable choice to promote the sustainable development of agriculture.

The development of rural tourism is a new demand for urban and rural development. Rural tourism is a put industries, but also a communication between urban and rural, public and farmers, agriculture and leisure tourism complex industry. On the one hand for the city residents into the countryside, close to nature, savor the joy of pastoral opportunity, deepen exposure to agriculture, rural areas and farmers, understanding agronomic knowledge, reflect farm life, enjoy the idyllic scenery; it also brings to rural flow, logistics, capital flow, information flow; and then hand a large number of urban residents come for sightseeing, advanced concepts, urban civilization, market awareness, lifestyle into the rural areas, promote ideas farmer update, ecological awareness, environmental awareness, market awareness enhance the degree of civilization increase, narrowing the gap between urban and rural areas, urban and rural interactive development of the situation.

Development of rural tourism is the new development of related industries. Since rural tourism covers a wide range, long industrial chain, strong impetus characteristics related degree, in addition to its direct contribution to the development of the agricultural industry, but also to promote the agricultural product processing industry tours, retail trade, transportation, catering hotel services and other related industries, the agricultural economy has become a new growth point

### III. THE KEY TECHNOLOGY OF VIRTUAL REALITY

Virtual Reality (VR) is the use of a computer-generated simulation environment, and through a variety of special equipment enables users to "input" into the environment, to achieve the user and the environment interact directly technical nature; technology allows users to use the person's natural skills for virtual world objects to inspect or operate, while providing vision, hearing, touch and other real-time intuitive and natural perception [9-12]. The architecture is shown in figure 1.

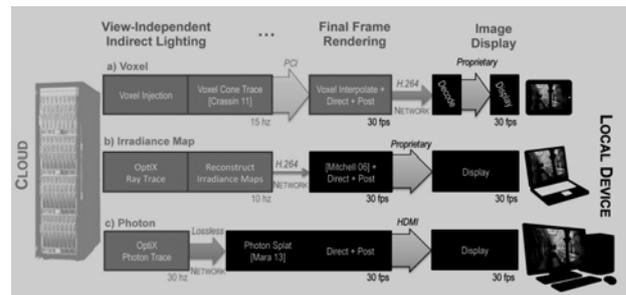


Figure 1. Generic virtual reality software systems architecture.

Desktop virtual reality systems. Desktop virtual reality system is the use of laptops, desktops, workstations, and low-level simulation, the computer's screen as a window for the user to observe the virtual world, a variety of external devices generally used carriages and virtual realm, and helps to manipulate various objects in a virtual scenario. Desktop virtual reality system has not totally immersive, easy to achieve characteristics. Incomplete immersion that is observed when the user inputs a virtual environment is not entirely due to a small observation window, wearing glasses Angle ° visual range is only between °, will still be subject to interference environment surrounding reality not threw himself into the virtual environment.

Immersive virtual reality system. Immersive virtual reality systems typically use some external device so that users with the real world is completely isolated from outside influence, fully invested immersive environments, real-time and highly immersive. Bu this evening, as it also requires the use of advanced hardware, software, technology, good integration of multiple devices interact with a variety of related software, support multi-input and output devices and work.

Superimposed virtual reality system. Modular virtual reality system is penetrated by a computer head mounted display virtual image is superimposed on the real world, which is used to enhance or supplement the human eye to see things, provides for the operator he sees the reality of the environment, the information stored in the computer, thereby enhancing the operator's] perception of the real environment. Enhanced virtual reality systems can add virtual objects in the real environment, enhance or supplement the visual effects to enhance the common desktop virtual reality system has a graphical display of the system based on monocular display-based systems, based on optical see-through head blue display systems, based on the video see-through display systems.

Distributed virtual reality system. Distributed Virtual Reality System is the number of users from geographical and restrictions, communicate with each other through the Internet platform to explore the virtual environment system, more common, such as online games, virtual war simulation. Distributed Virtual Reality system is more suitable for multi-user, remote collaboration activities or decisions, facilitate communication between different users, improve work efficiency.

IV. PROCESSES ANALYSIS OF DIGITAL RURAL TOURISM SYSTEMS

Online virtual rural tourism system through an event-driven mechanism to implement process control system via XML configuration file to achieve integration and dynamic loading, the system main function modules and resource files through Flash file format and XML documents between the various modular system packaging and preservation [13]. Based on the needs and functions of the system, design the overall system development process:

(1)The preparatory work and the corresponding data model by collecting scenic spots planning plan, architectural design information, as well as site photographs and other ways of gathering information. And the object to be modeled organize and division of labor, for the different models and scenarios were modeled utilizing 3dsMax classification. Part of which scenario modeling, using baked texture way pre-rendered. The resulting ASE files and map files for each model, and complete each hotspot system production and generation.

(2)The model documents and materials to optimize file processing, generate the corresponding file library according to specific requirements and formats. The relationship between the two documents by certain associates, according to the model file and textures files can be done to build a virtual scene. Hot on the scenic location and attributes to configure and save the hotspots during the configuration XML file. Planning plan scenic mark, and mark points of connection points, depending on whether the individual can be directly connected, according to the coordinates of the connection points and adjacent points by a certain algorithm to generate the shortest path to the file, and save it in XML file.

(3)Based on Alternativa3D engine, the use of Flash and Flash script ActionScript3 online virtual tour systems integration and development, in order to achieve construct 3D scenes, optimization and rendering, interactive roaming control, map design, menu design, load and manage hotspots. And provides users with a simple, beautiful and useful user interface, user-friendly interaction.

V. THREE-DIMENSIONAL SCENE MODULE DESIGN

For an online virtual tour system, the three-dimensional scene module is the system is the most important, is the maximum amount of data a module, often become the online virtual tour system bottleneck, so the three-dimensional model of the scene module construction, materials, design, model loading, to build the entire process optimization scenarios and scenes are loaded on the performance of the system plays a vital role. Three-dimensional scene module design flowchart shown in Figure 2.

Mainly through the three-dimensional scene modeling tools to complete in 3dsMax. Construction of the main process usually includes the construction of three-dimensional model of the model, making the texture, texture mapping, lighting production, rendering and model outputs these few steps, but the model constructed by this step, contains a lot of useless information or price is not high,

especially for online 3D scenes systems. Therefore, the need for system modeling process of implementation of the optimization process as much as possible, so as to achieve the best price.

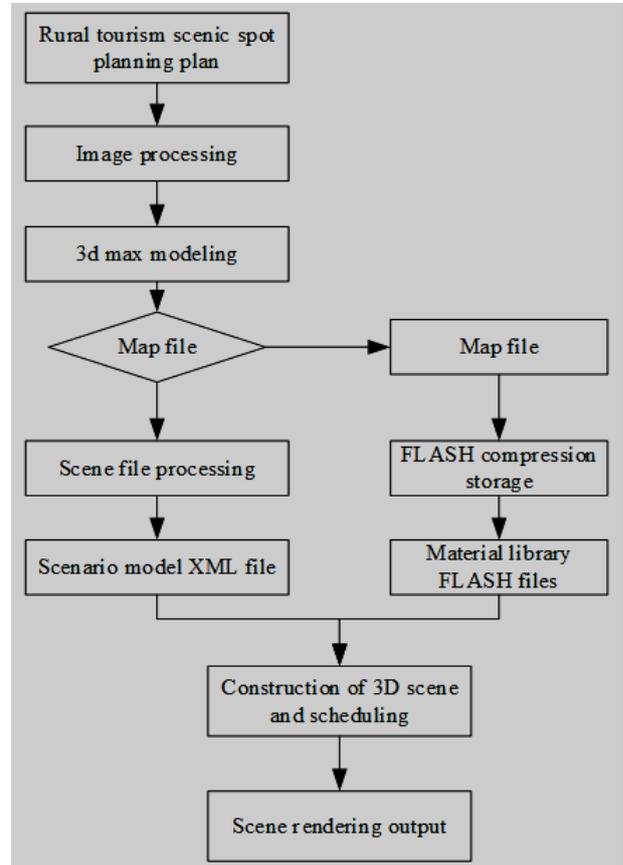


Figure 2. 3D scene module design flow chart.

1. The three-dimensional scene modeling and optimization. In this system, three-dimensional scene mode and built a good texture and lighting to complete the basic deal, first conduct a pre-rendering process, namely baking map. By baking textures way, three-dimensional rendering of the scene does not need to achieve a variety of dynamic lighting effects into other textures, so that is saving the time-consuming calculation of time radiosity renderings, but also avoid the time and radiosity Animated possible jitter. In this way, not only reduces the time users of the system and render rendering time requirements, further reducing the model file useful information to optimize the model file to create the conditions. Detailed three-dimensional scene modeling process is as follows: First, the information obtained plan area planning, architectural design and site photographs and other information obtained in the collation and analysis, and modeling to determine how the object to be modeled, and consider whether you can refer to external The model file. Secondly, for different model objects, according to the needs of the system, roughly the number of models to determine the surface finish of the model architecture,

construction, and completion of the textures in the design and production based on the effect of the actual needs of the various model objects and textures. Finally, according to the texture of the material, and external lighting and other information, is accomplished by baking textures pre-rendered models and models based on the need for export.

2. The three-dimensional model to optimize the design file. 3dsMax final exported model file includes two parts, one is related to the model information document, part of the basis of texture image and baked textures files. Models are mainly related file formats 3DS and ASE. 3DS format in which the information contained in more, particularly textures and other aspects of information, documents relatively large, can accurately recover all the information of the original model, the information is mainly used to store binary format. ASE file format is an XML-like storage specifications, ASE format of various models and materials and other information stored in text format with txt, so regular text editor to open for editing, but you cannot re-import 3dsmax, reply model. This system ASE as the export model.

First ASE file system structure and organization were analyzed, and extracted with the model which includes information related to key information needed to build the model point, surface, UV coordinates and key attributes, abandon other light, reflection, have already been baked map handling or performance impact on the three-dimensional scene little information. Secondly, it will extract useful information, in accordance with efficient data structure defined by the system to save, save the file as a binary file format. In this manner, both for three-dimensional scene data optimization, so a large degree of data compression, reducing the amount of data users need to download and wait times, and is simple and easy to obtain and crack ASE files into a three-dimensional model encryption processing binary files, there is no internal data structures and formats, even get a file, the file cannot complete the analysis, improved data security.

Digital rural tourism service system design.

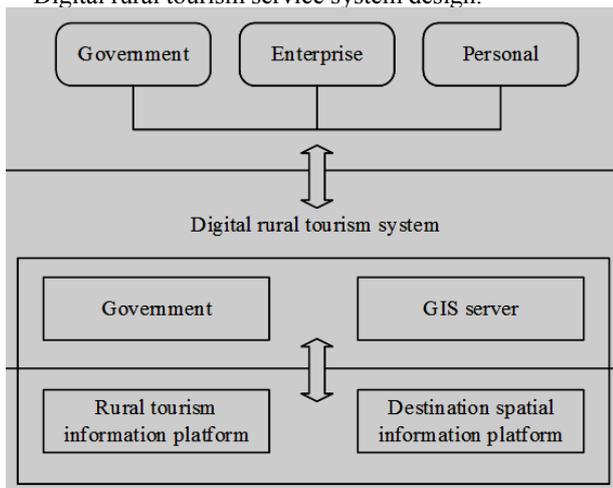


Figure 3. Digital rural tourism system framework.

It provides visitors with information inquiry, such as providing scenic spots map information based on the needs of tourists, many attractions optimal access route inquiry, room, ticket reservation, etc. Provide the latest tourist information for visitors to dynamic reports, such as weather, just the introduction of tourism policies and regulations, the latest tourism activities. It offers visitors to tourist tourism evaluation, platform and other complaints. Use of the database and network technology, the recent acquisition of travel information through a series of professional decision-making model for travel managers to publish information about recent travel forecast, provide decision-making information to assess tourist route, most tour schedule and the like; for tourism enterprises tourism sales forecast, travel guides prosperous dispatcher of tourist attractions, tourist attractions planning decision-making information. Based on the general framework shown in Figure 3 digital virtual reality system of rural tourism.

Digital tourism system directly to end users, the provision of services of tourism, is the core of the whole system. It is divided into two levels: general server and GIS server, each function module digital tourism system are set at this level server. Among them, the ordinary is generally stored in the server software applications developed for handling general attribute data; and GIS server is stored in GIS development tools such as the development of specialized applications Super Map, for processing spatial data. Tourist information platform and destination spatial information platform: It is located three B / S structure of the database server (Data Base Server), to provide data storage space for digital tourism system. Among them, the tourist information platform database includes a variety of spatial and attribute database; destination spatial information platforms (such as Web GIS), in addition to outside the system as an application, but also that the upper server provides shared space-based information and support. Because the database server is stored in the spatial data and attribute data is quite complex, in order to fully and effectively utilize a variety of data, it is necessary to take some advanced database support technologies, such as: broadband networks, geographic information systems (GIS), remote sensing (RS), Global Positioning System (GPS), multivariate data fusion and mining technologies such as three-dimensional information presentation. Their convergence, integration, in order to establish a data-sharing, easy to maintain, easy to expand, we can develop a deeper level of advanced digital tourism system.

As it can be seen in Figure 3 above the overall framework, digital tourism system is the core of the whole system, is a concrete manifestation of the overall functionality and services. It uses Geographic Information System and Management Information System combines technology, real-time management of the tourism network. As shown in chart Figure 4 below.

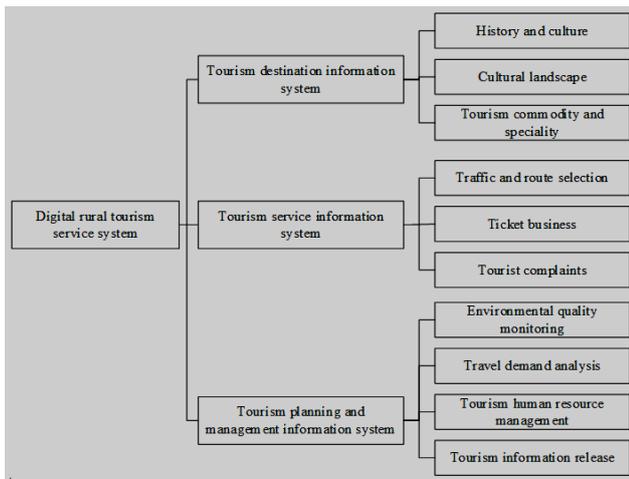


Figure 4. Function structure of digital rural tourism system.

**Tourism Destination Information System.** Including scenic historical and cultural background, the natural and cultural landscape features, social customs and tourism goods and other reports, so that the tourists and potential visitors to learn more about the various features and resources of a tourist destination, causing their strong interest.

**Travel service information system.** Including traffic conditions, the main attractions tours and quotes, weather reports, tourist complaints, various reservation system. Which also includes the Travel Business digitizing subsystem, which is open for public business network for tourism enterprises to provide information exchange, consultation, booking and payment services such as e-commerce and tourists and tourism enterprises.

**Tourism Management and Planning Information System.** To provide professional analysis tools, such as environmental quality monitoring, analyzing the needs of tourists, tourism human resource management, information dissemination and other travel, tourism administration, advice and planning, training of tourism professionals to provide online decision making. Including tourism official digital subsystem, which is the core layer of ordinary dense public network, tourism management information between each other docking network security and confidentiality.

## VI. CONCLUSION

In order to promote the sound development of rural tourism to rural tourism market demand, improve the rural tourism service levels, to promote rural tourism industry to upgrade, this article from the "digital tour" construction research project starting on the current status of development of rural tourism and development process Problems in the analysis discussed, and background, purpose and significance of rural tourism development of wisdom and necessity and possibility of the development of wisdom. When the wisdom of rural tourism development research, new technology will process the "digital tour" used in the operation and development of rural tourism combine to enhance the technological content of rural tourism, promote

rural tourism transformation and upgrading, speed up the wisdom of rural tourism the pace of construction, the construction of the national digital rural tourism play an exemplary role.

By drawing in conjunction with the "digital tour" to the construction process in the use of new technology, necessity and possibility of the background to the development of rural tourism wisdom and wisdom is a prerequisite for development, for rural tourism development process problems From the perspective of social science to determine the wisdom of rural tourism development solutions, provides guidance and advice for other cities the development of digital rural tourism. This paper analyzes the digital tourism system, tourism services, management and spatial information is classified and summarized, elaborated digitized its meaning and significance. And on this basis, the composition and function of the entire system for the overall design. Insufficient information for existing tourism products, the system adds a virtual tour of the features, the introduction of virtual reality technology to build tourism complex and roaming virtual scene. Digital tourism system is an information application systems, this paper analyzes the digital tourism system and the overall design, and from the perspective of virtual reality technology for tourism rural tourism information provides some technical solutions.

## REFERENCE

- [1] Denegri - Knott J, Molesworth M. Concepts and practices of digital virtual consumption[J]. Consumption, Markets and Culture, 2010, 13(2): 109-132.
- [2] Hudson-Smith A, Milton R, Dearden J, et al. The neogeography of virtual cities: digital mirrors into a recursive world[J]. Handbook of Research on Urban Informatics: The Practice and Promise of the Real-Time City, Information Science Reference. IGI Global, Hershey, 2009.
- [3] Hyun M Y, Lee S, Hu C. Mobile-mediated virtual experience in tourism: concept, typology and applications[J]. Journal of Vacation Marketing, 2009, 15(2): 149-164.
- [4] Minucciani V, Garnerio G. Available and implementable technologies for virtual tourism: a prototypal station project[M]//Computational Science and Its Applications—ICCSA 2013. Springer Berlin Heidelberg, 2013: 193-204.
- [5] Huang H, Liu W. Development of three dimensional digital tourism presentation system based on Google Earth API[C]//Spatial Data Mining and Geographical Knowledge Services (ICSDM), 2011 IEEE International Conference on. IEEE, 2011: 300-302.
- [6] Morgan C L. (Re) Building Çatalhöyük: Changing Virtual Reality in Archaeology[J]. Archaeologies, 2009, 5(3): 468-487.
- [7] Chalmers A, Howard D, Moir C. Real virtuality: a step change from virtual reality[C]//Proceedings of the 25th Spring Conference on Computer Graphics. ACM, 2009: 9-16.
- [8] Linaza M T, Marimón D, Carrasco P, et al. Evaluation of mobile augmented reality applications for tourism destinations[M]. na, 2012.
- [9] Gutting D A. Virtual reality: Applications and implications for tourism[J]. Tourism Management, 2010, 31(5): 637-651.
- [10] Bruno F, Bruno S, De Sensi G, et al. From 3D reconstruction to virtual reality: A complete methodology for digital archaeological exhibition[J]. Journal of Cultural Heritage, 2010, 11(1): 42-49.
- [11] Kounavis C D, Kasimati A E, Zamani E D, et al. Enhancing the tourism experience through mobile augmented reality: Challenges and prospects[J]. International Journal of Engineering Business Management, 2012, 4(10): 1-6.

- [12] Traxler J. Learning in a mobile age[J]. International Journal of Mobile and Blended Learning (IJMBL), 2009, 1(1): 1-12.
- [13] Huang Y, Liu Y, Wang Y. AR-View: An augmented reality device for digital reconstruction of Yuangmingyuan[C]//Mixed and Augmented Reality-Arts, Media and Humanities, 2009. ISMAR-AMH 2009. IEEE International Symposium on. IEEE, 2009: 3-7.