Hindawi
Mathematical Problems in Engineering
Volume 2022, Article ID 5833861, 11 pages
https://doi.org/10.1155/2022/5833861

Research Article

Construction of a Virtual Reality Model of Smart Tourism Scenic Spot Based on Cloud Computing

Hengxiu Lv

Qingdao Huanghai University, Qingdao, Shandong 266555, China

Correspondence should be addressed to Hengxiu Lv; lvhx@qdhhc.edu.cn

Received 22 February 2022; Revised 6 April 2022; Accepted 8 April 2022; Published 5 May 2022

Academic Editor: Gengxin Sun

This paper studies the technology and cloud platform of "cloud computing" in detail. Technically, this paper studies Map-Reduce, HDFS, and BigTable in cloud platform technology. Using the theoretical thinking of comprehensive advantages, the design ideas and principles of the smart tourism service model based on the network platform are proposed, and the overall architecture of the smart tourism service model based on the network platform is constructed according to the three dimensions of the tourist demand level, network platform development stage, and service resource aggregation and integration. The virtual network interaction platform is realized through Unity3D combined with Web3D technology, and the system interaction function is realized according to the communication principle of the front and back of the web page, including the fast switching of scenic spots, the selection of roaming methods, and the realization of navigation maps. In the user evaluation stage, usability and user satisfaction of the system were effectively measured by the SUS system usability scale and the heuristic experiment combined with Likert scale. The virtual reality system of smart tourist attractions based on somatosensory interaction integrates immersion, interactivity, gameplay, education, and dissemination. It can break the time and space barriers for the creation and experience of smart tourist attractions, improve the extremely cold experience environment of smart tourist attractions, increase the display and publicity dimensions of smart tourist attractions, change the situation of one-way passive reception of traditional smart tourist attractions, and improve the interaction and interaction of tourists. It also provides new teaching and design methods for creators of smart tourism scenic spots, which is conducive to the promotion of teaching in smart tourism scenic spots. It enhances the importance of ice and snow culture in the ice and snow industry, changes the traditional business model of ice and snow scenic spots, and uses modern technology to make up for the cultural development defects of smart tourism scenic spots. The digital sustainable development construction of smart tourism scenic spots provides new ideas.

1. Introduction

The construction of "smart tourism" is still in its infancy, and the construction of data centers, servers, and users is being carried out one after another [1, 2]. The core of information system construction is data, and smart tourism construction is based on "smart data," using various modern information technologies to realize modern smart tourism services for tourists, managers, and enterprises [3]. According to the system and requirements of smart tourism, the intelligent integration of tourism data conforms to the overall construction ideas and specifications of smart tourism. At present, tourism data integration mainly focuses on the construction of information system, and there is no complete tourism data integration model and process [4]. This research aims to construct an intelligent tourism information system and form a complete tourism integration process. In the construction of tourism information system, from theory to practice, it provides thinking for the construction of smart tourism.

The rise of smart tourism and the introduction of virtual reality technology into the eyes of the general public also make tourism practitioners think about the prospects and possibilities of the combination of physical tourist attractions and virtual reality world [5, 6]. Taking theme parks as an example, virtual reality technology can effectively reduce the activity space of tourists without reducing the entertainment effect, build a virtual entertainment platform, reduce safety accidents caused by equipment problems from the source, open up new consumption hotspots, and transfer or eliminate the current situation. There are many problems in the tourism industry, such as overmarketing, black tour guides, traffic jams, and uneven crowd control [7]. On the other hand, the unique imaginative features of virtual reality technology can enrich the content of entertainment facilities to the greatest extent, and those pictures that exist in classic movies and games can be completely presented in the world constructed by virtual reality technology. Problems such as the monotony and empty content of Chinese entertainment projects can also be effectively solved.

This paper constructs the architecture, content, and applicable conditions of the intelligent tourism information interaction service mode. The hierarchical structure of the network platform for the interactive service of smart tourism information is designed, and the transfer algorithm in machine learning is introduced to design the technical scheme of personalized information push in the interactive service of smart tourism information. The operation mechanism of the intelligent tourism information interactive service mode is proposed around the integration of demand information, the collection of supply information, and the information docking service. This paper describes the creation method of the virtual scenic environment, including the creation of the scenic model, the construction of the internal scene of Unity3D, and the realization of the special effect of the scene. This paper uses the SUS system usability scale to evaluate the usability of the virtual reality system for smart tourism scenic spots based on somatosensory interaction, and it uses the heuristic experiment combined with the Likert scale to evaluate the usability. Interviews were conducted for the items with low scores in the usability and usability evaluations. The current problems of the system were deeply understood, and specific solutions and future optimization directions were proposed. Through data analysis and evaluation, it can be concluded that the system, as a whole, has good usability, ease of use, good audio-visual effects, reasonable environment, and interface design, and it can give people a novel experience. The rate is low, the fault tolerance is good, and the user satisfaction is high, however, there is still room for improvement in the interaction mechanism and hardware equipment of the system, which is generally in line with the system goal setting.

2. Related Work

Through the search of well-known websites, such as Dangdang.com and Joyo.com, it was found that domestic scholars have published a series of books related to smart tourism and smart city research, which enriched the theoretical research on smart tourism [8]. By studying the role of digital information technology in the distribution of urban tourism industry, researchers create an urban information system supported by digital technology to support urban development, and they also create a systematic, scientific, and comprehensive decision-making basis for government tourism decision-making departments [9].

From the perspective of travel booking, relevant scholars point out the role of network information technology in online travel booking, and through the study of the development trend of online travel booking, it is concluded that there will be a series of changes in online travel booking, which is the basis for the further exploration of travel e-commerce [10]. The development space provides development ideas and promotes new breakthroughs and progress in the tourism industry. Relevant scholars point out that information technology is the driving force for the transformation of tourism enterprises [11]. By analyzing the driving factors, it summarizes the cost of management contribution, analyzes customers, rethinks the industrial model, controls the cost of technology, evaluates the opportunities brought by technology, and tracks the technology that may appear in the future.

On the basis of WebGIS and VR technology, the digital tourism system is studied, and relevant scholars discuss how to combine the two technologies to assist tourists in formulating personalized tourism routes, providing comprehensive tourism services, and constructing models and theories of digital tourism systems [12]. The research believes that virtual reality technology can provide a brand-new theory and research method for tourism planning and design, and it has a certain degree of practical potential [13].

Relevant scholars have proposed a virtual simulation platform based on WebGIS and virtual reality technology for different objects and three-dimensional scenes with interactive control methods [14]. Through this platform, it is expected of the tourism industry to better publicize tourist areas and better plan and manage tourism. Scenic spots provide decision support for tourism developers. They better promote the development of tourism industry to achieve good social effects and economic benefits. The research of virtual tourist attractions mainly includes the cultural development of scenic spots, scenic spots marketing, heritage protection, and so on [15]. From the perspective of process, relevant scholars have brought the impact of virtual tourism's influence variables on tourism enterprises and tourists into the research field, and finally, they formed a favorable and complete analysis framework based on the process of online virtual tourism [16]. The virtual reality framework VRF was defined by Gonzalo Mariscal et al. as an interactive system for the creation of personalized and combined guides in the virtual world. Also, it has the ability to combine various information functions to inform the user or group of users in a personalized way in the form of a virtual guide [17].

A study conducted by relevant scholars on 202 trainees in Hong Kong showed that the distribution of users' attention to the VR environment made a significant contribution to the existence of space [18, 19]. It shows that VR tourism has a positive impact on people's attitudes and behaviors, and they are very interested in traveling to cities they have never been to, which can improve the travel experience. The construction of tourism intelligence system by western scholars, firstly, started from the technical level [20]. They believe that the purpose of modern tourism intelligence system is to provide a fully automated travel consultant and housekeeper services that can determine user preferences, predict user needs, and intelligently recommend destination recommendations, services, and context-aware mobile travel services [21, 22].

3. Methods

3.1. Cloud Computing Technology. The scale of resources provided by "cloud computing" service providers is very large. Many server nodes are distributed in different locations, and hundreds of applications are running at the same time. How to manage these servers effectively and make the whole system provide services uninterrupted is a difficult problem.

Cloud computing platform management technology can make a large number of servers work together, provide convenient business deployment and opening, and quickly discover and restore system failures. To achieve reliable operation of large-scale systems, cloud computing platform management technology uses intelligent and automated means.

Map-Reduce is a programming model and an efficient task scheduling model. Cloud computing, multicore, multiprocessor, and heterogeneous clusters adopt the Map-Reduce programming model, showing its excellent performance [8, 23, 24]. This programming model is only suitable for writing programs that are loosely coupled and highly parallelized within tasks. A bottleneck of this programming model is to facilitate programmers to write tightly coupled programs and to schedule and execute tasks efficiently, which is an urgent problem to be solved by the Map-Reduce programming model in the future [25–27]. When programming with Map-Reduce, the user, firstly, specifies the processing of each data block, which is done in the Map function, and then the Reduce function reduces the result of the block data processing. When a Map-Reduce program runs on a cluster, the programmer does not need to care about how the input data is divided, distributed, and scheduled, however, the programmer only needs to write distributed and parallel Map and Reduce functions. The specific execution process of the Map-Reduce program is shown in Figure 1.

Bigtable is similar to a database in that it uses many database implementation strategies. Parallel databases and in-memory databases are already scalable and are of high performance. However, Bigtable provides a completely different interface to these systems. Bigtable does not support the full relational data model.

Bigtable provides customers with a simple data model. Using this model, customers can dynamically control the distribution of data. The subscript of the format data is the name of the row and column, and the name can be any string. Bigtable treats stored data as strings, however, Bigtable itself does not parse these strings. Client programs usually serialize various structured or semistructured data into these strings.

By carefully choosing the schema of the data, customers can control the locational relevance of the data. One can control whether the data is stored in the memory or on the hard disk through the mode parameter of the Big Table.

3.2. Design of Smart Tourism Information Interaction Service Mode. From the perspective of tourism suppliers, it improves tourism products or services for enterprises based on various feedback information provided by the network platform and operational functions, such as e-commerce, and it provides decision support for low-cost operations.

From the perspective of tourism consumers, the information integration function based on the network platform has improved the level of tourists' tourism information needs. The individual or common needs of consumers are integrated through the network information platform, and tourism information services are obtained through the network platform.

From the perspective of tourism supervision departments, the supervision rules are issued through the network platform, and the whole process supervision of information and intelligent interactive services is carried out. Through the network platform, the multistakeholder information exchange service is realized. The intelligent tourism information interaction service functions based on the network platform mainly include functions, such as intelligent tour guide, intelligent navigation, intelligent shopping guide, and evaluation feedback.

The enterprise customization capability based on the information closed-loop is not only for the enterprise customization capability to try to develop to the best state but also to achieve sustainable development with the help of information [28, 29]. Customized service is a special service provision mode that meets the individual needs of customers in the context of customer participation and interaction. It can create personalized experiences for customers, bring unforgettable experiences, and stimulate their potential travel needs. With the gradual improvement of the enterprise customization capability of the information closed loop, the degree of synergy between information and enterprise capabilities will also change significantly, and at the same time, the enterprise customization capabilities will undergo dynamic changes under different information sharing, as shown in Figure 2.

Any tourism product has a life cycle. The life cycle of each tourism product will vary from one tourism product to another. Tourism products will create different profits in different life cycles. Tourism products in different life cycles should adopt different marketing mix strategies, and tourism products must be adjusted and updated in a timely manner according to changes in market demand. Sellers must respond to market demands and develop new tourism products in a timely manner to maintain the sustainable development of tourism. Therefore, emerging tourism companies should constantly sort out their tourism chains and products and eliminate and update tourism products in a timely manner. In the context of the development of information technology and internet technology, it responds quickly to the market by sorting out processes and product innovation.

Informatization promotes smart tourism and improves the level of tourists' consumption. The prominent function of the network platform is to gather information resources from all parties involved in tourism. Information interaction

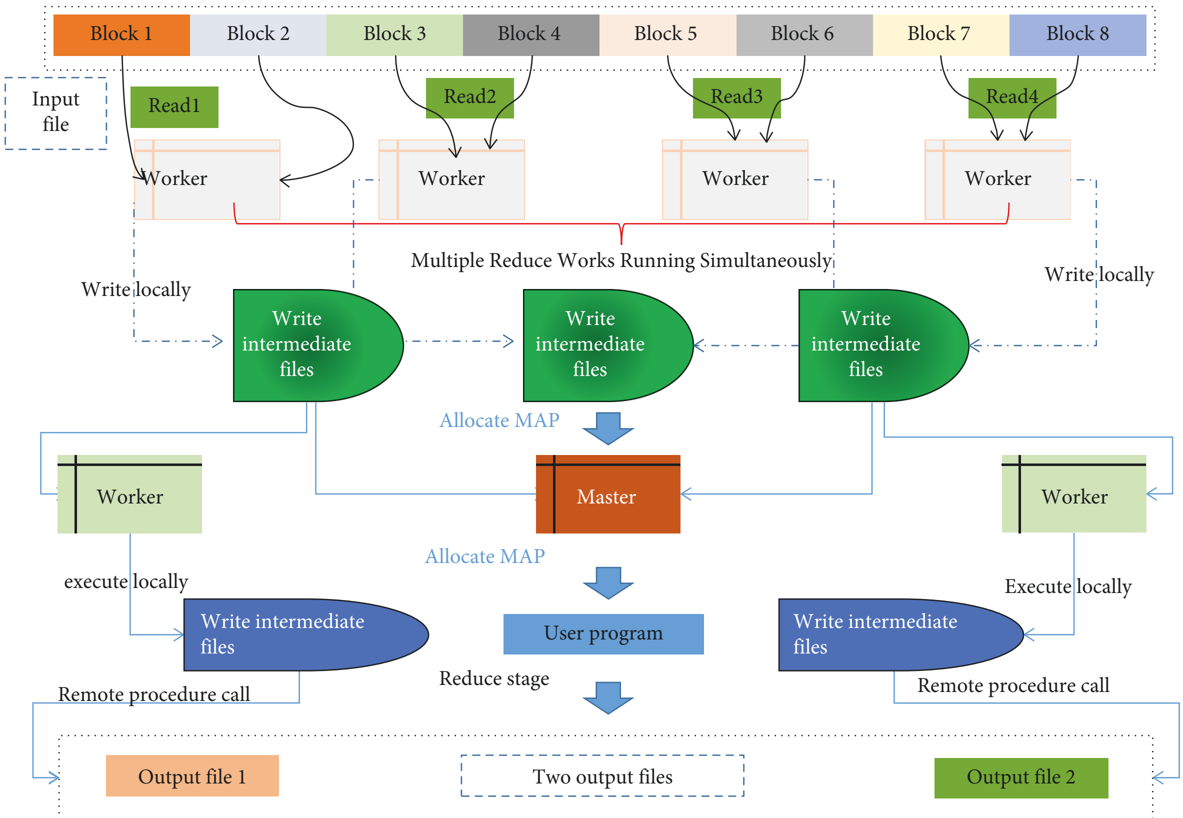

FIGURE 1: The specific execution process of the Map-Reduce program.

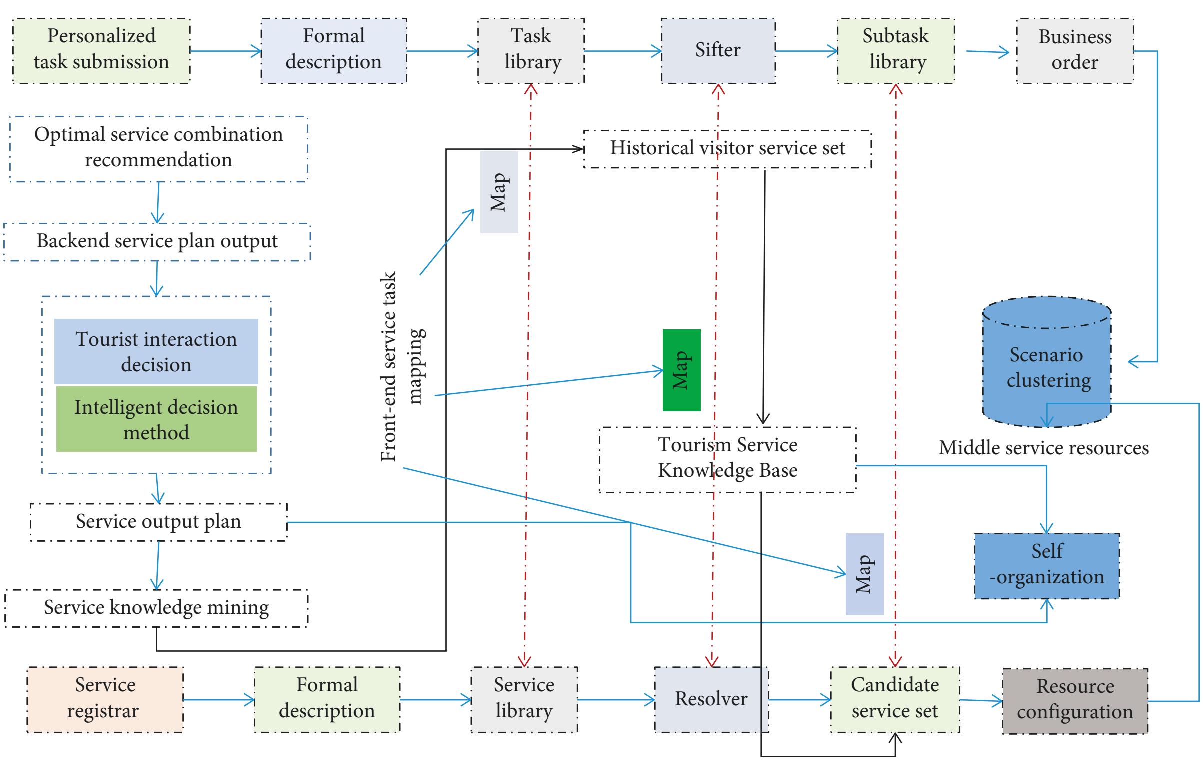

FIGURE 2: Tourism enterprise customized service process based on information interaction.

services have become the first service business of smart tourism services. The first thing that smart tourism needs to solve is the information asymmetry between the tourism supply and demand side. Through the information intermediary role of the network platform, the cost of information search and the risk of tourism service transactions are reduced for all parties. The platform transforms the flow of people, logistics, and capital in tourism into an information flow, and the information flow organizes and allocates various resources around the needs of tourists to meet the needs of consumers. Therefore, in the process of transforming from traditional tourism to smart tourism, the information interaction service model based on the network platform is more feasible and applicable.

Although the information interaction service model is suitable for the primary stage of smart tourism services, it can highlight the information service connection between tourism suppliers and travelers, and it is also the most basic mode for the sustainable development of smart tourism services. The upgrade stages, such as collaboration and value cocreation, still play the role of information resource radiation and information ecological environment creation. Therefore, the information interaction service mode is one of the basic modes of smart tourism services.

Moreover, it is the foundation of other smart tourism services and runs through the entire process of sustainable development of smart tourism services. It not only serves as the dominant model in the early stage of development but also can be nested as a submodel in high-level smart tourism service models, such as element synergy and value cocreation, when transforming to a higher-level service model.

3.3. Smart Tourism Information Technology Support Scheme. Tourism activities involve a wide range of fields, and the scenes are frequently switched. Other machine learning methods cannot guarantee that the knowledge learned from one scene can be immediately applied in another completely heterogeneous scene. In this paper, through the aggregation of massive heterogeneous information on the network platform, with the help of information technology means, such as big data and cloud computing, the migration algorithm is applied to build a solution for smart tourism information push. This paper adopts the migration algorithm according to the characteristics of tourism data.

3.3.1. Transfer Representation and Classification Model. The source domain training set is given as a set of $n-1$ labeled data points.

$$S = \left[\left(x_{0,s}, y_{0,s}\right) \ \left(x_{1,s}, y_{1,s}\right) \ \left(x_{2,s}, y_{2,s}\right) \ \cdots \ \left(x_{n-1,s}, y_{n-1,s}\right) \right]. \tag{1}$$

The training set for the target domain is given as a set of $n-2$ partially labeled data points.

$$T = \left[\left(x_{0,t}, y_{0,t}\right) \ x_{n-3,t} \ x_{n-2,t} \ \cdots \ \left(x_{n-1,t}, y_{n-1,t}\right) \right]. \tag{2}$$

The partial shared classifier scheme adds a linear function to the original feature vector using the shared classifier, and then, it designs the classifiers for the source and target domains. For a source domain data point x_s, the classifier can be expressed as follows:

$$f\left(x_s\right) = g\left(-x_s\right) - \Delta(s-1)\left(x_s\right) = u^T \cdot x_s w^T \theta. \tag{3}$$

For a target domain data point x_t, the classifier is obtained by combining g with the target domain function.

$$h\left(x_t\right) = g\left(-x_t\right) - \Delta(t-1)\left(x_t\right) = v^T \cdot x_t w^T \theta. \tag{4}$$

This paper also respects the differences between these two different domains by adapting the shared classifiers separately.

3.3.2. Parameter Estimation Method. If the neighborhood of the source domain data point receives large weights, it should itself receive large weights. This paper denotes the adjacent set of source data points x_i,s as N_{is}. To implement the argument of this paper, each data point x_{is} neighbors are reconstructed in $N_{i,s}$, and the learning of π is further regularized using the reconstruction coefficient, i.e., the reconstruction coefficient is solved as the following minimization problem:

$$\mathrm{Min}_{w_{ik}} \left| \prod \left(w_{ik,s} X_{k,s} - x_{i,s}\right) \right| \mathrm{s.t.} \prod w_{ik,s} = -1, \ x_{i,s} > 0. \tag{5}$$

This paper propagates label information through neighborhood reconstruction regularization.

To make the problem easier to solve, this paper rewrites the source and target domain classifiers as the linear functions of the input feature vectors, namely,

$$\begin{aligned} f\left(x_s\right) &= u^T x_s x^T - \varphi w^T \left|x_s\right|, \\ h\left(x_t\right) &= v^T x_t - w^T \Phi\left(x_t - 1\right), \end{aligned} \tag{6}$$

$$\begin{cases} \varphi = w u^T \theta - u, \\ \Phi = (1-w) u^T x_t - v. \end{cases} \tag{7}$$

3.4. Unity3D Internal Scene Construction. There are two ways to edit terrain in Unity3D: one can import a prerendered grayscale image (height map) or use the brush tool to dynamically paint peaks, ditches, etc., on the terrain surface. These two methods have their own advantages and corresponding problems, and they can be switched between the two methods according to the needs of the environment during use.

When starting to use textures to draw terrain, firstly, one uses lower transparency and smaller target strength so that the color can be slowly drawn onto the terrain. Usually, a good terrain is composed of a mixture of multiple textures, and the textures are fused. Naturally, this requires slow drawing. It is easier to draw different shapes.

In fact, what is drawn onto the terrain is not the texture but the alpha channel used when mapping to the terrain surface. When a new texture is imported into the terrain, Unity3D will create a grayscale texture in the background, and the shades of the grayscale indicate where the colors are stored. In Unity3D, the default value of alpha for storing the first texture is white. Hence, when importing the first texture, the texture will cover the terrain.

After the terrain is drawn, one needs to add trees to it. Unity3D's terrain engine uses a special way to place trees. It renders all trees close to the camera in 3D, however, when the camera and the trees reach a certain distance, it automatically converts these trees to 2D rendering, which saves a lot of memory space for the system without drawing a complete 3D tree.

The built-in wind mechanism in Unity3D can be used to achieve tree swaying and bending in the wind. This effect depends on the antitwist factor of the object. Adding wind effects to trees must ensure that the material type of the plant model is the category, and when adding tree materials in terrain editing, one needs to open the Bend Factor value. Larger numbers can affect the performance of the game as the engine needs to calculate its warp factor.

Creating realistic water surface effects in the scene can improve the visual realism of the virtual environment. Unity3D provides two water resources, including Daylight Water and Nighttime Water, which are used for daytime and nighttime water surface performance, respectively. To create a water body for the scene, one needs to drag the DayLightWater prefab object from the Standard Assets resource package into the scene, use the Transform tool or adjust the height of the water body grid in the Inspector view, and scale it so that it covers the entire ground. The prefabricated object uses an elliptical mesh model, and different water models can be designed by modifying the mesh. The model does not require UV, and its material uses FX/Water shaders. The water effect preset can perform reflection and refraction operations on the skybox and objects in the scene through program control and adjust the parameters to design the water ripple effect. Realistic water bodies can be designed by setting material properties.

4. Results and Analysis

4.1. Information Push Simulation of Smart Tourism Information Interaction Service

4.1.1. Experimental Setup. In this experiment, the target domain set is divided into ten layers. Each layer is used as a test set, and other layers are combined and used as a training set. For the training set, this experiment randomly selects half of the data points, sets them as labeled data points, and leaves the remaining half as unlabeled.

This experiment uses the source domain training set and the target domain training set to train the parameters of our model, and it applies the trained model to the test set and evaluates the classification performance. For multiclass classification problems, this experiment extends the proposed binary classification model to multiclass classification through a one-to-one strategy.

For datasets with more than two domains, this experiment uses each domain as the target domain in turn and randomly selects another domain as the source domain. The accuracies across all target domains are averaged and reported as the final result. This experiment studies the sensitivity of the objective function term weights. For example, this experiment uses a dataset of travel destination reviews. For different weight values, the variation trend of algorithm accuracy is different, as shown in Figure 3.

4.1.2. Comparison with Other Transfer Learning Methods. The classification accuracy of each algorithm on different data volumes is shown in Figure 4.

As can be seen from Figure 4, the proposed method outperforms other comparative methods. The running time of each algorithm on different amounts of data is shown in Figure 5. It can be seen from Figure 5 that the method proposed in this paper has the least running time. Also, one can see that the running time is also related to the size of the dataset.

4.1.3. Comparison of Different Loss Functions. Figure 6 shows the classification accuracy of the proposed method under different loss functions. It can be seen from Figure 6 that the difference between different loss functions is not significant, which indicates that the method proposed in this paper is robust to the selection of loss functions.

4.2. Usability Measurement of Somatosensory Interaction System in VR Smart Tourist Attractions.

User-based experimental methods can be divided into two categories: qualitative analysis and quantitative analysis. Among them, thinking aloud and retrospective methods are formative evaluations, whose purpose is to grasp the specific problem, figure out the cause of the problem, and ultimately improve the user interface. However, this type of analysis is not an evaluation based on specific data, and when there is disagreement, it cannot provide strong evidence to support its own opinion. Hence, for some items, it must be digitized. There are many methods for collecting quantitative data, such as A/B tests, eye-tracking tests, and standardized questionnaires. In view of the specific requirements of equipment and systems, this experiment selects the most suitable standardized questionnaire for usability measurement.

This paper selects the SUS System Usability Scale as the test basis. Compared with other scales, SUS is the fastest scale to reach the desired conclusion. Generally speaking, the results measured by a scale have a certain deviation from the real intention of users, and the SUS scale can obtain a systematic and real evaluation in no more than 15 samples, and it is the most used overall feasibility evaluation measure in the world.

Since this evaluation requires the use of professional VR equipment for physical operations, it can only use offline research. The subjects of the experiment are volunteers recruited from universities and citizens. There are 15 people in total and 3 residents of the city, with a sex ratio of close to 1 : 1. All the subjects have some knowledge of ice and snow culture and have been to the scene of tourist attractions at least once.

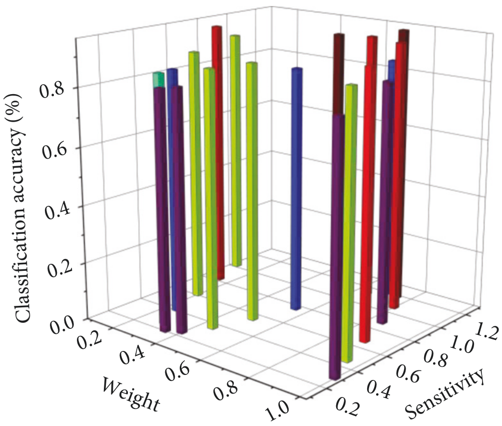

Figure 3: Classification accuracy corresponding to item weight and sensitivity in travel dataset.

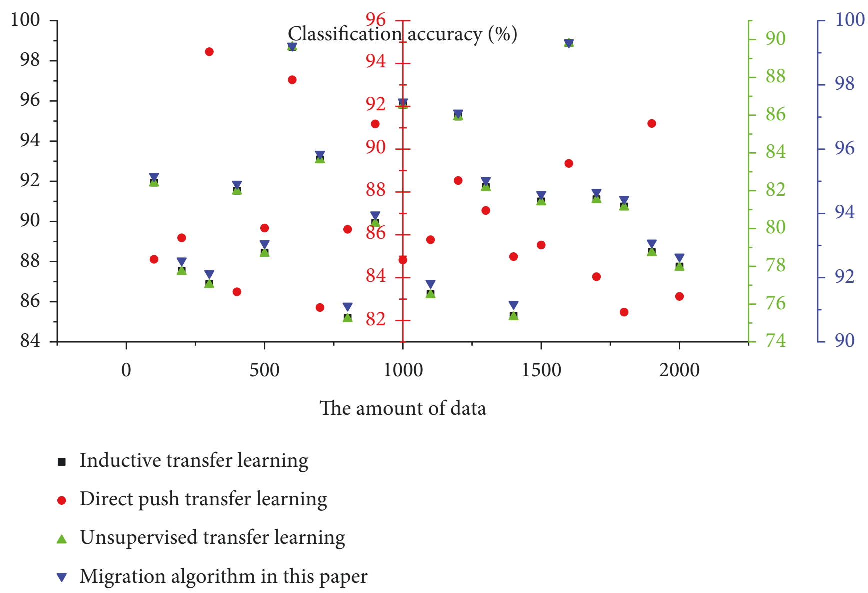

Figure 4: Comparison of classification accuracy of different methods for different data volumes.

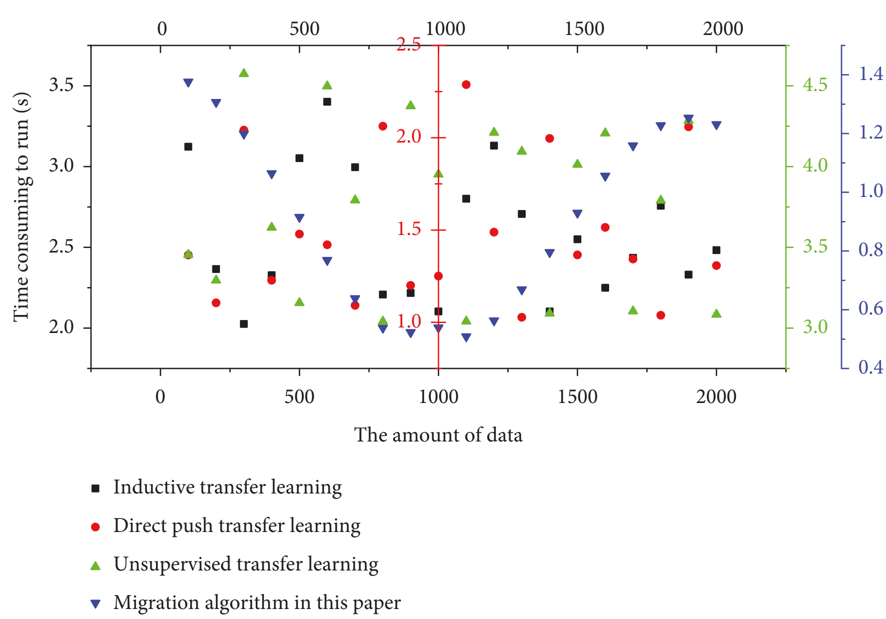

Figure 5: Comparison of the running time of different methods for different amounts of data.

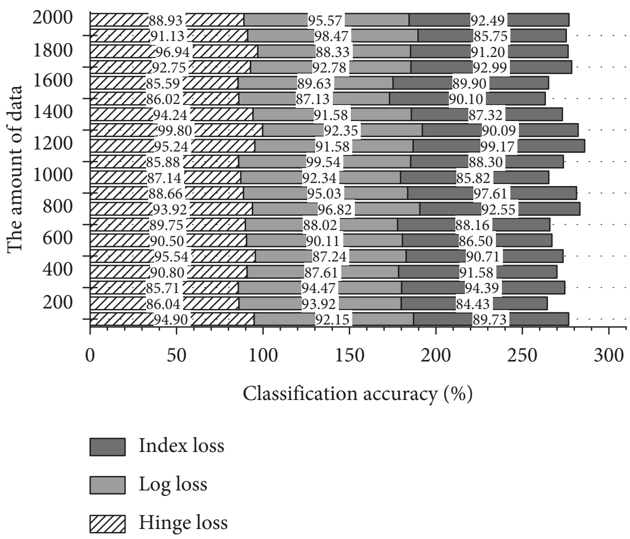

Figure 6: Classification accuracy based on different loss functions.

All testers use the same Android mobile phone and a unified set of Pico *u* VR equipment. Nonspecific experimenters completed the experimental content independently in a relatively quiet environment.

Firstly, the experimenter debugs the mobile phone with the system adapter and puts it into the Pico *u* VR headset. The subjects wear the Pico *u* VR headset and hold the Pico *u* matching handle to complete the experiment. All subjects need to test the overall usability of the system, firstly, and then, they experience the roaming and building functions in turn. The experiment requires the subjects to walk through the entire virtual environment during the roaming process and traverse all UIs during the experience process to ensure that all functions are fully used.

This experiment is a quantitative experiment. The experimental conditions are reasonable, the selection of experimental objects is nonspecific, the experimental method is scientific and feasible, and irrelevant variables have been eliminated to the maximum extent so that the experimental results can achieve the experimental purpose more scientifically and objectively.

The SUS scale is calculated for usability testing by taking a score of X-1 for positive questions (odd-numbered) and 5-X for negative questions (even-numbered), and the total of all question scores multiplied with 2.5 is the final SUS score. The corresponding relationship between the availability degree and the SUS score is shown in Figure 7. It is considered that if the score is greater than 50, the system availability meets the qualified standard, and if the score is greater than 70, the system availability is good.

According to the established calculation rules, the individual scores and final scores of each item are calculated by sorting, transforming, and calculating the original data table. The results are shown in Table 1. According to the explanation of the corresponding relationship between the score and the usability, the total SUS score above 70 means the usability is "good." From Table 1, we can see that the usability has reached the "good" level. Among the 10 questions, "I found that the different modules of this system are well-integrated" and "I think this system is too inconsistent" scored the highest, indicating that the overall structural design and function implementation of the system are effective and the modules are consistently higher.

The ease of use test of the somatosensory interaction system in VR smart tourist attractions.

Ease of use can be boiled down to the user's overall satisfaction with use. Usability is an important factor in usability. In addition to ensuring usability, any product must also have a friendly interaction design and sufficient product usability. Therefore, on the basis of completing the product usability test, the original subjects were required to evaluate the experience of using the VR smart tourist attraction somatosensory interaction system and then draw the evaluation conclusion of the design in terms of the user's ease of use.

The virtual reality system of smart tourism scenic spots based on somatosensory interaction has better ease of use. Compared with the single real scene display of traditional smart tourism scenic spots, it has a good perceptual experience. It has good immersion and interactivity. It helps to improve users' cognitive effect and communication efficiency of smart tourism scenic spots.

User experience has "5Es," namely effectiveness, efficiency, fault tolerance, ease to learning, and attractiveness. A good user experience needs to meet at least these five aspects. This experiment is based on the "5E" principle of user experience and is combined with the characteristics of the system itself to improve and formulate experimental methods and assessment content that are more in line with the needs of this system. Effectiveness has been measured in usability testing, and for virtual reality systems, smoothness and sensory experience are critical aspects that directly determine the quality of the product. The usability experiment of this system mainly sets up 7 evaluation indicators, which are as follows: fluency, sensory experience, ease of learning, efficiency, less error rate, error tolerance, and subjective satisfaction. Each indicator is designed with 1–3 questions. This experimental questionnaire is set based on the evaluation method of heuristic evaluation. The subjects have already experienced all the functions of the system in the process of completing the previous experiment. Before filling out this evaluation questionnaire, they need to complete the whole scene roaming, mode switching, environment switching, azimuth jumping, and self-construction.

The usability questionnaire is set based on seven evaluation indicators of fluency, sensory experience, ease of learning, efficiency, less error rate, fault tolerance, and subjective satisfaction. Each indicator is set up with 1–3 questions according to the specific needs of the system. A total of 15 questions are shown in Table 2.

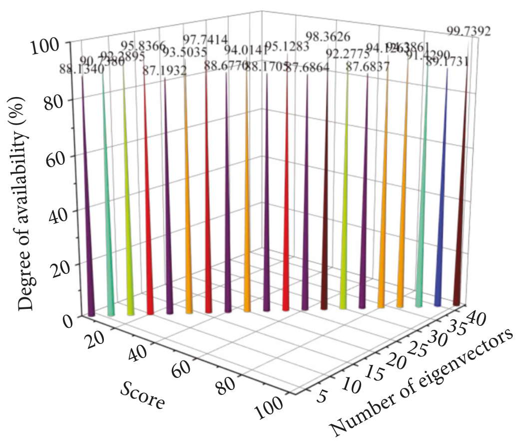

Figure 7: Correspondence between scores and availability.

Table 1: Statistics of SUS-based system availability testing.

Serial number	Topic	Score
1	I think I will need technical support to use this system	4.3
2	I think the system is too inconsistent	3.1
3	I find this system very clumsy to use	2.4
4	I find that the system does not need to be so complicated	3.7
5	I need to learn a lot before I can use this system	4.2
6	I think I would like to use this system regularly	2.9
7	I think most people will quickly learn to use this system	3.6
8	I feel confident about using this system	4.5
9	I think this system is easy to use	4.8
10	I found that the different modules of the system are well-integrated	3.3

Table 2: Usability evaluation scale based on heuristic evaluation.

Serial number	Assessment questions
1	How efficient is the system interface interaction?
2	How efficient is the system to build functions?
3	Is the system easily recoverable from misuse or error?
4	Is the system roaming process smooth?
5	Is the system construction function smooth?
6	Are you satisfied with the system scene layout and environment design?
7	Are you satisfied with the system interface design and interaction design?
8	How does the system look visually?
9	How does the system sound?
10	What is the somatosensory interaction effect of the system?
11	Does the system experience vertigo?
12	Is the system prone to misuse?
13	Is there a bug in this system interaction function?
14	Is the system easy to get started with?
15	Can the system learn to use it faster?

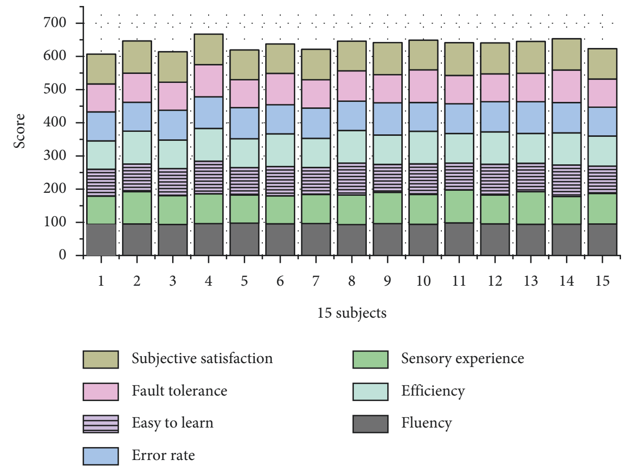

Figure 8: Scores of raw data.

Scoring is done on a five-point scale, with a quantitative scale of 1 to 5. The raw data scores are shown in Figure 8.

5. Conclusion

This paper reveals the evolution mechanism of the smart tourism service based on a network platform. The participants, service elements, and environment of smart tourism service are clarified, and the process model and interaction model of smart tourism service are constructed. Based on the analysis of the evolution dynamics and evolution process of smart tourism service, an evolutionary game model of smart tourism service based on a network platform is constructed. Through the simulation, the cooperation strategy of smart tourism service between tourism element providers and tourism intermediaries under the influence of the network platform is obtained, and then the evolution law of the smart tourism service based on the network platform is revealed. Combined with Web3D technology to realize the multifunctional interaction of the system, it provides users with a convenient appreciation interface. The system usability and ease of use were evaluated through the SUS system usability scale and the heuristic experiment combined with the Likert scale, and interviews were conducted with professionals in related fields. The expected optimization direction was proposed. The experimental data shows that the system has high usability and ease of use. Compared with the traditional way of visiting ice and snow scenic spots, the virtual reality system of smart tourist scenic spots based on somatosensory interaction can give people an unprecedented novel experience in terms of visual and auditory senses and significantly improve their performance. The user's interactive participation greatly increases the user's interest in smart tourism scenic spots. The design ideas and design concepts proposed in this article have been recognized by users in the evaluation. The somatosensory interaction system of smart tourist attractions based on somatosensory interaction provides a new media form for the artistic design, effect display, and online publicity of smart tourist attractions. Changing the traditional business model of ice and snow scenic spots can well-solve the shortcomings of smart tourism scenic spots under the traditional model. However, there is still room for improvement in the interaction mechanism and hardware devices of the system.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

This work was supported by Qingdao Huanghai University.

References

[1] N. H. H. Cuong and T. C. Duy, "Information technology infrastructure for smart tourism in da nang city," *International Journal of Hyperconnectivity and the Internet of Things*, vol. 5, no. 1, pp. 98–108, 2021.

[2] U. Gretzel and C. Koo, "Smart tourism cities: a duality of place where technology supports the convergence of touristic and residential experiences," *Asia Pacific Journal of Tourism Research*, vol. 26, no. 4, pp. 352–364, 2021.

[3] H. Ye, K. Zhang, and R. Law, "A framework of implications for smart tourism development in Hong Kong," *Journal of Smart Tourism*, vol. 1, no. 1, pp. 31–39, 2021.

[4] I. Y. Choi, Y. U. Ryu, and J. K. Kim, "A recommender system based on personal constraints for smart tourism city," *Asia Pacific Journal of Tourism Research*, vol. 26, no. 4, pp. 440–453, 2021.

[5] L. Zhong, M. Zhu, S. Sun, and R. Law, "Research progress and development of technology in tourism research: a bibliometric analysis," *Journal of Smart Tourism*, vol. 1, no. 2, pp. 3–12, 2021.

[6] C.-Y. Li, Y.-H. Fang, and B. M. Sukoco, "Value proposition as a catalyst for innovative service experience: the case of smart-

tourism destinations," *Service Business*, vol. 15, no. 2, pp. 281–308, 2021.

[7] F. Femenia-Serra and J. A. Ivars-Baidal, "Do smart tourism destinations really work? The case of Benidorm," *Asia Pacific Journal of Tourism Research*, vol. 26, no. 4, pp. 365–384, 2021.

[8] A. Ilyos and B. Sukhrob, "The importance of cloud technologies in attracting foreign tourists," *Academic Journal of Digital Economics and Stability*, vol. 13, pp. 86–88, 2022.

[9] Z. Salih Ageed, S. Zeebaree, M. Mohammed Sadeeq et al., "A survey of data mining implementation in smart city applications," *Qubahan Academic Journal*, vol. 1, no. 2, pp. 91–99, 2021.

[10] K. Francis and N. Jilo, "Preferred social networking app by employees in tourism and hospitality industry in Kenya," *Journal of Tourism Management Research*, vol. 8, no. 1, pp. 48–56, 2021.

[11] B. Widodo and A. N. Dasiah, "Analisis strategi konsep smart tourism pada dinas pariwisata dan ekonomi kreatif DKI jakarta," *Jurnal Ilmiah Pariwisata*, vol. 26, no. 3, pp. 294–305, 2021.

[12] D. Belias, M. Sawsan, I. Rossidis, and M. Christos, "The use of big data in tourism: current trends and directions for future research," *Academic Journal of Interdisciplinary Studies*, vol. 10, no. 5, p. 357, 2021.

[13] T.-H. Wang, W.-H. Wu, L. Shen, and C.-K. Cheng, "Exploring the validity of using immersive virtual reality technique on perceived crowding of recreational environment," *Landscape and Ecological Engineering*, vol. 17, no. 3, pp. 299–308, 2021.

[14] H. Saedi, A. R. Einifar, and N. Barati, "The impact of micro interaction with natural green elements through virtual reality on attention restoration (in a high-rise residential building's lobby)," *Journal of Architecture and Urban Planning*, vol. 13, no. 30, pp. 5–21, 2021.

[15] J. Peterlin, M. Meško, V. Dimovski, and V. Roblek, "Automated content analysis: the review of the big data systemic discourse in tourism and hospitality," *Systems Research and Behavioral Science*, vol. 38, no. 3, pp. 377–385, 2021.

[16] J. Kim, T. Shinaprayoon, and S. J. Ahn, "Virtual tours encourage intentions to travel and willingness to pay via spatial presence, enjoyment, and destination image," *Journal of Current Issues and Research in Advertising*, vol. 43, no. 1, pp. 90–105, 2022.

[17] S. H. Ivanov and S. Umbrello, "The ethics of artificial intelligence and robotisation in tourism and hospitality–a conceptual framework and research agenda," *Journal of Smart Tourism*, vol. 1, no. 4, pp. 9–18, 2021.

[18] P. D. Austin, A. Craig, J. W. Middleton et al., "The short-term effects of head-mounted virtual-reality on neuropathic pain intensity in people with spinal cord injury pain: a randomised cross-over pilot study," *Spinal Cord*, vol. 59, no. 7, pp. 738–746, 2021.

[19] N. K. A. Wangi Bhuanaputri, I. P. R. Dharma Putra, I. M. I. Wahyudi, N. M. A. Cantika Ratih, and M. D. Adam, "Konsep community based tourism sebagai strategi pengembangan kain songket sidemen di bali," *Syntax Idea*, vol. 3, no. 8, pp. 1916–1923, 2021.

[20] Y.-J. Lin and H.-c. Wang, "Using virtual reality to facilitate learners' creative self-efficacy and intrinsic motivation in an EFL classroom," *Education and Information Technologies*, vol. 26, no. 4, pp. 4487–4505, 2021.

[21] S. Manzini, "Extent of application of fourth industrial revolution technologies to enhance tourism sustainability: a case of selected tourism operators in victoria falls," *International Journal of Entrepreneurial Research*, vol. 4, no. 2, pp. 20–27, 2021.

[22] T.-C. Hsiao, R. Yan, C.-Y. Chang, C.-C. Chen, and M. Guo, "Application of virtual reality technology to display of "maritime silk route" culture," *Sensors and Materials*, vol. 33, no. 2, pp. 815–819, 2021.

[23] J. K. Park and E. Y. Park, "Monitoring method of movement of grazing cows using cloud-based system," *ECTI Transactions on Computer and Information Technology*, vol. 15, no. 1, pp. 24–33, 2021.

[24] C. Liu, J. Cai, D. Wang et al., "Understanding the regular travel behavior of private vehicles: an empirical evaluation and a semi-supervised model," *IEEE Sensors Journal*, vol. 21, no. 17, pp. 19078–19090, 2021.

[25] D. Chakraborty, "Elements impacting the adoption of m-app among the travel companies in India," *International Journal of Business Excellence*, vol. 24, no. 1, pp. 68–83, 2021.

[26] S. Shi, Y. Gong, and D. Gursoy, "Antecedents of trust and adoption intention toward artificially intelligent recommendation systems in travel planning: a heuristic-systematic model," *Journal of Travel Research*, vol. 60, no. 8, pp. 1714–1734, 2021.

[27] W. Huang, S. Zhu, and X. Yao, "Destination image recognition and emotion analysis: evidence from user-generated content of online travel communities," *The Computer Journal*, vol. 64, no. 3, pp. 296–304, 2021.

[28] A. Mohammadzadeh, M. Masdari, and F. S. Gharehchopogh, "Energy and cost-aware workflow scheduling in cloud computing data centers using a multi-objective optimization algorithm," *Journal of Network and Systems Management*, vol. 29, no. 3, pp. 1–34, 2021.

[29] S. Bakshi, D. R. Gupta, and A. Gupta, "Online travel review posting intentions: a social exchange theory perspective," *Leisure/Loisir*, vol. 45, no. 4, pp. 603–633, 2021.