Construction of a Smart Tourism Service Platform based on the Internet of Things under Computer-Aided Technology

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Abstract. In recent years, with the continuous development of the smart tourism industry, it has also faced some problems. On the one hand, tourist attractions are often faced with a series of problems such as difficulty in obtaining information, difficulty in personnel management, difficulty in department coordination, difficulty in service evaluation, difficulty in marketing decision-making, and difficulty in environmental protection. On the other hand, for tourists in scenic spots, it is necessary to solve the problems of untimely news, insufficient information, unsatisfactory experience, inadequate services, opaque complaints, and insecurity that may exist during the entire journey before, during and after the tour. In this context, by using new information technology to solve the problems faced by the scenic area, the scenic area can truly realize intelligent management, intelligent marketing and intelligent service in the construction of intelligent tourism, and further meet the needs of tourists in the scenic area, so that the entire tourist area The journey has become more intelligent, humane, distinctive and refined. In this paper, the smart tourism system is designed from the overall architecture of the system to the functional modules of the system, and with the help of the database E-R diagram, the database design is completed. At the same time, through the establishment of a tourist flow prediction model for the scenic spot, the mathematical method of weighted regression is used to analyze the passenger flow at different stages of the scenic spot, and the passenger flow forecast results of the scenic spot in the next seven days are given. Finally, based on the Android development platform, this article develops the smart tourism system of the scenic spot, realizes the related functional modules of the smart tourism system at the scenic side and the tourist side, and tests and verifies the function, performance and compatibility of the smart tourism system. The results show that the wisdom is the tourism system has basically achieved the expected goals and is operating stably.

Keywords: Computer-assisted; Internet of Things; Smart Tourism
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1 INTRODUCTION

Emerson et al. [1] think with the progress of society and the development of the times, people's living standards continue to improve, and there are more and more people going out to travel. When people go out to travel, they need to use a smart travel service system based on the Internet of Things to provide people with travel. However, the existing smart travel service system based on the Internet of Things still has some shortcomings. At present, the era of national tourism is quietly entering our lives. The smart tourism system is relying on cloud computing, Internet of Things and other high-tech, using information technology to integrate tourism resources, through full WIFI coverage, and with the help of portable terminal Internet devices. Liu and Ma [2] consider that actively perceive travel-related information, so that tourists can arrange and adjust travel plans in time. Simply put, it means that tourists interact with the Internet in real time, so that the itinerary will enter the era of wisdom. The smart tourism is shown in Figure 1.

The concept of smart tourism appeared in China in 2010, and the concept of smart scenic spots was first proposed at the Jiuzhaigou Tourism Summit Forum in May of the same year. At the same time, since 2011, the construction of smart tourism in Beijing and Jiangsu has started. Travel companies have also begun to launch related travel products and smart travel solutions. China's tourism industry has begun to shift from a traditional tourism industry development model to a smart tourism development model, extensively applying modern new information technology, realizing real-time sharing of tourism information, and further satisfying the requirements for the development of smart scenic spots. Encouraged by the national policy, relevant tourism departments and enterprises work together to not only vigorously develop the construction of smart tourism in the scenic area, but also fully consider the tourism needs of tourists in the scenic area to jointly promote the comprehensive upgrade of the smart tourism industry and realize the intelligentization of the tourism industry. And diversified services to realize the era of smart tourism for all people.

Figure 1: Smart tourism.

Judging from the actual development of smart tourism in China in recent years, the development model adopted by China in smart tourism has achieved good results. First, in Zhenjiang City, Jiangsu Province, the state established a smart tourism pilot project. Subsequently, each city proposed a continuous smart travel plan in line with their own characteristics, and achieved certain results. Many provinces and cities have begun to pay attention to the research of smart city communities and explore the transformation methods of smart cities and the ways that smart cities can obtain community resources. For example, Sichuan Province first proposed the idea of building a smart

tourism belt during the smart tourism summit. In addition, Fujian and China Unicom signed the "Digital Fujian, Smart City Group" agreement, and proposed to invest heavily in the future to build a smart city community in the province. In addition, domestic universities have also invested relevant resources in the research of smart tourism. For example, Southeast University combines GPS navigation technology with mobile Internet technology to build a smart tourism cloud platform.

Generally speaking, compared with foreign countries, due to the differences and complexity of regions and cultures in China, the situations that need to be considered are also more complicated, and there are still many problems that need to be solved. Although there are many mature tourism products, the development of informatization is relatively backward, and the traditional tourism industry generally has the effect of information islands. Haratian and Bagherzadeh [3] think the management of tour groups by travel agencies is relatively chaotic, and the emergency response is not timely and the handling is not in place; and at the same time, tourists' food, lodging, transportation, travel, shopping, etc. are all in an independent state, and the diverse and personalized service needs of tourists cannot be met.

Dong and Ai [4] think in the new environment of smart tourism, the resources of tourist attractions need to be unified and integrated. Muhammad considers [5] starting from solving the pain points of scenic spots, scientific analysis and forecasting and warning of passenger flow in scenic spots should be strengthened, so as to optimize the layout of tourism resources, rationally arrange reception capabilities, and implement tourist guidance and Diversion, improve the tourism environment and order, improve the quality of tourist tourism services, and provide data and service support for daily precision marketing. At the same time, it is also necessary to apply mobile Internet technology to the development of smart tourism, provide service support for tourists before, during and after the tour, and strive to provide tourists with important reference information for travel, enhance tourists' travel satisfaction, and fully satisfy tourists The actual needs of tourists provide more humane, richer and intelligent services for tourists [6-8].

However, the existing technology has the following problems: 1. The existing smart tourism service system based on the Internet of Things does not have a complete food recommendation module, which is not convenient for tourists to enjoy delicious food during the trip; 2. The existing smart tourism service based on the Internet of Things The system does not have a comprehensive solution recommendation module, which makes it difficult for users to choose the most suitable travel mode; 3. The existing smart tourism service system based on the Internet of Things is not convenient for tourists to find suitable toilets. In addition, if people travel in unfamiliar places and are unfamiliar with the surrounding environment, they cannot quickly select tourist attractions suitable for customers based on their hobbies and travel time, resulting in poor travel experience and inability to enjoy the fun of travel, and generally the travel services of China are more traditional and are not well integrated with modern Internet technology, so a smart travel service system based on the Internet of Things is needed [9,10].

2 SMART TOURISM SYSTEM DEMAND ANALYSIS

Smart tourism is an inevitable trend in the development of scenic spots, and an important means to promote business process optimization, tourism industry upgrading and economic benefit growth in scenic spots. The construction of smart tourism must closely focus on the goals of the 13th Five-Year Plan for the development of the tourism industry, and follow the construction guidelines of "unified leadership, overall planning, unified standards, comprehensive perception, information sharing, coordinated operation, distributed implementation, and diversified services". Under the premise of the overall planning of smart tourism in the scenic area, the cultural characteristics of the scenic area will be fully displayed to meet the comprehensive application needs of scenic area management and future industrial development. Using new technologies such as the Internet of Things, cloud computing, a new generation of communication networks, virtual reality, etc., to design a scenic area smart tourism system covering smart management, smart services, smart

marketing, and smart decision-making in scenic spots, and realize the informatization and intelligence of tourism services and management in scenic spots Integration and refinement.

The scenic area module is mainly to realize the functional requirements of the scenic area in the three aspects of intelligent management, intelligent marketing and intelligent service, in-depth analysis and solution of the pain points of scenic area management and service for tourists, and realize the informatization and intelligentization of scenic tourism management, marketing and service, Humanization, specialization, integration and refinement. Intelligent management of scenic spots mainly uses scientific and technical means to realize the intelligence of daily management of scenic spots and improve the operating efficiency of scenic spots. The specific performance is: use mathematical models to analyze the passenger flow and source of scenic spots, and combine the data of scenic spots to conduct passenger flow. Short-term forecasts provide a reliable basis for the scenic area in data scientific analysis and passenger flow forecasting and early warning. In daily management, especially when the passenger flow exceeds the reception capacity of the scenic area during major holidays, emergency plans are prepared in advance to better serve tourists; At the same time, in daily management, optimize the distribution of scenic resources, and provide data support and decision-making basis for the management of scenic tour buses, parking lots, emergency incidents, narrators, complaints and scenic activities. Smart marketing in scenic spots highlights key application modules such as scenic spot recommendation, route planning, featured products, tourism services (tour guides, sightseeing cars, catering, accommodation, etc.); supports booking and payment of tourist products and services such as tickets; providing tourist guides and content to scenic visitors Sharing, event information push and other functions. The intelligent service of scenic spot mainly provides intelligent services of intelligent tourism for tourists in scenic spots, meeting the needs of tourists from travel, play, accommodation and shopping from before, during and after the tour, including itinerary planning and recommendation, information collection and release functions. Tourist complaints and suggestions handling and other functions.

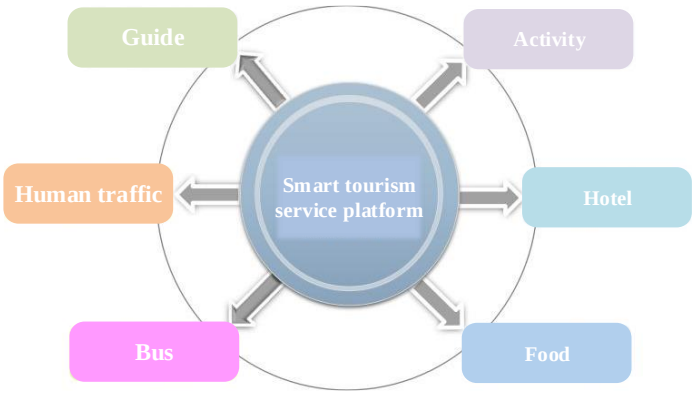

Figure 2: Demand analysis of smart tourism.

The tourist terminal is mainly to meet the functional needs of tourists before, during and after the tour. Before the tour, tourists need to obtain the relevant information of the scenic spot and the play strategy of the scenic spot. Through online ticket booking, it is convenient to quickly solve the problem of queuing at the ticket office of the scenic spot. , To buy time for play; and make a travel plan based on the weather conditions, passenger flow conditions and parking lots of the scenic spot on the day; when tourists arrive at the scenic spot, tourists need to plan according to their actual needs, including information such as play time and budget The play route in the scenic spot enhances the play experience of the entire journey. At the same time, it provides tourists with tourist guides, travel tips and surrounding services in the scenic spot to meet the needs of tourists for eating,

drinking, playing and having fun; when the visitor is over After the journey, you can make suggestions and comments on the services of the scenic area, organize and share your travel thoughts on this trip. In addition, when tourists encounter unexpected situations in the scenic area, they need to have a one-key alarm method to quickly notify the scenic area management personnel to help them solve problems.

Scenic area operators need to set up the system in the management background of the scenic area smart tourism system, which mainly includes travel notes management, tour route management, information management, personal information management, scenic spot introduction management, scenic spot real-time setting, supporting service management, weather information management, and one-key alarm Functional requirements for parameter settings, announcement management, system settings, travel tips management, address book information, team services, etc.

System non-functional requirements refer to judging the operating conditions of the system or the characteristics of the system based on some conditions, rather than the requirements for specific behaviors of the system, including security, reliability, interoperability, robustness, etc. The non-functional requirements of the system designed in this paper mainly need to meet the stability, security, portability, scalability and compatibility of the system. The scenic side and the tourist side of the system are mobile applications based on two types of identity logins, with a large number of users. In order to ensure the stable operation of the system, great attention must be paid to the stability of the system. During peak travel periods such as major holidays and holidays, it can ensure the normal use of users and ensure that the response time of the system is within the range allowed by the system. At the same time, if the user encounters abnormal operations in daily operations, corresponding prompts are required, and provide feedback channels. The system involves a lot of personal information and some sensitive data of users, and it is necessary to improve the security of the system. First of all, it is necessary to ensure the safe operation of the system to prevent the system from being maliciously attacked and illegally invaded, resulting in data leakage and other security incidents; secondly, the system needs to log in and manage by role permissions, and distinguish between the scenic side, the tourist side and the back-end management personnel. Different roles can only access their corresponding functional permissions; then, security updates to the system and database are required to fix vulnerabilities in a timely manner; under corresponding circumstances, data needs to be backed up and stored to prevent loss. The system currently supports the Android terminal, and future scalability and portability need to be considered. When porting to other platforms such as mobile terminals of the IOS system, the system should also reserve interfaces for future expansion of functions and secondary development. At the same time, the system should ensure a certain degree of reusability. When the business needs it, it can realize rapid reuse, only need to modify the corresponding data, and does not need to be developed separately to meet diversified business needs.

In addition, the system should be able to ensure compatibility with mainstream Android models on the market, so that most users can use their smart terminals. The server of each system needs to perform multiple information transmission interactions with the mobile terminal. At the same time, the server needs to support more functions, so the performance of the server also needs to ensure a certain degree of stability. The response time from the mobile end of the system to the server's response time cannot be higher than 3000ms. It should be ensured that the smart travel system can quickly respond to the needs of users and meet the normal use of users. During peak travel periods such as major holidays and holidays, the system needs to ensure a certain degree of stability under thousands of requests. Without data clustering, the concurrency that the server can carry should be able to reach more than 500. The overall structure is shown in Figure 3.

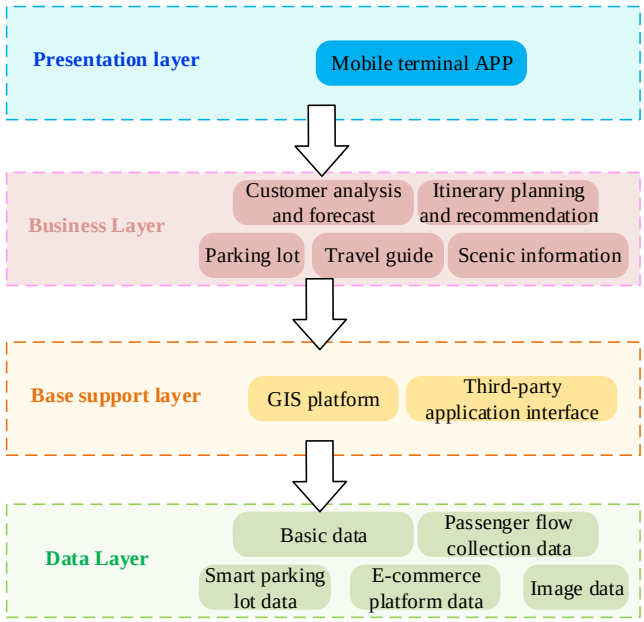

Figure 3: The overall structure.

3 SMART TOURISM SERVICE PLATFORM DESIGN

Aiming at the existing pain points of scenic area managers and tourists, this system effectively integrates the existing resources in the scenic area, coordinates the information sharing and distribution between the scenic area functional modules, combines the needs of the scenic area's relevant departments and business processes, and integrates the scenic area tourists from the front of the tour. , The actual needs of the entire travel process from the middle of the tour to the end of the tour, it is proposed to build a smart tourism system of scenic spots based on mobile Internet, modularize the smart tourism system of scenic spots, and effectively integrate various functional modules. Users obtain the corresponding functional modules according to their permissions. The user permissions are divided into scenic area managers and tourists. On the one hand, scenic area managers can manage scenic spots more efficiently and intelligently, and on the other hand, visitors can experience a more humane, Refined scenic area services. Based on the two identities of scenic area administrators and tourists, this part will design functional modules to provide intelligent tourist attractions with passenger analysis and prediction, explainer management, tour bus management, complaint management, emergency command management and other functions; for scenic tourists It provides special services such as itinerary planning and forecasting, travel guides, scenic spots surroundings, scenic spots travel guides, online ticket booking and one-click alarms. And design the database of the system to meet the requirements of stable operation of the system, and realize the informatization, intelligence, humanization, specialization, integration and refinement of scenic tourism services and management. The value in different data is compared in figure4.

The smart tourism system for scenic spots based on the mobile Internet complies with the standard three-tier Web system architecture, and the overall business system is based on the model-view-controller (MVC) model. In order to achieve the separation between the system levels, make a clear distinction between the functions of the system, and to reduce the coupling of the system to a certain extent, this article adopts a layered approach, by applying the MVC-based design ideas to the architecture design of the system.

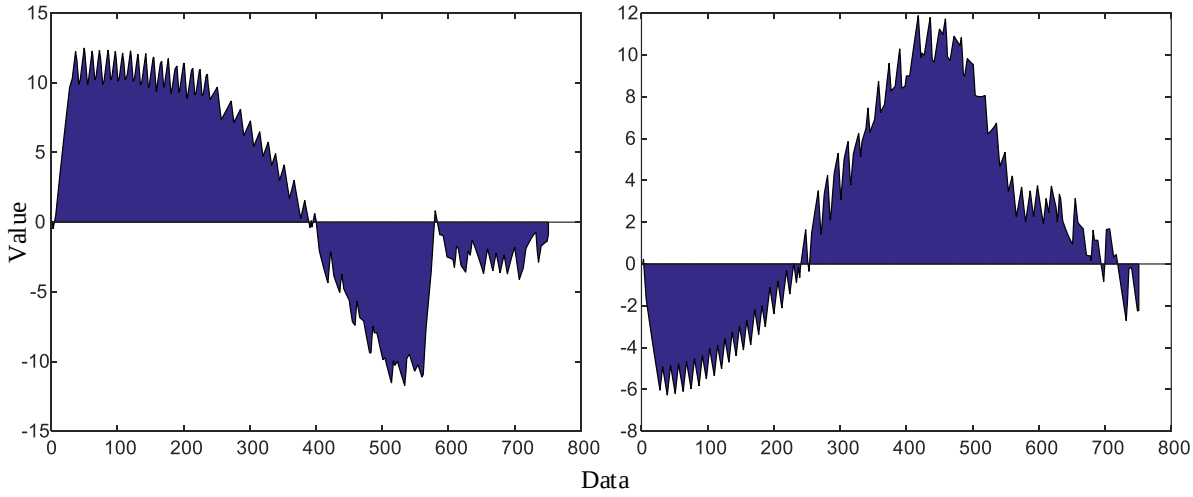

Figure 4: Value in different data.

From top to bottom, the entire system is divided into presentation layer, business logic layer and data access layer. In addition, when the business model of the system becomes more and more complex and more and more functional modules, the hierarchical approach can help system developers clarify business logic and clarify functions when designing and implementing the functional modules of the system. Division of labor and improvement of work efficiency facilitate the management of product functions in subsequent iterations. The division of labor of each layer of the system is as follows: User interface layer: It is mainly responsible for the system interface and interaction. The user's data input in the system and the display of the results after system execution are all done in the presentation layer. Business logic layer: Responsible for defining the business logic of the system, including business rules, workflow, and business data integrity. After the presentation layer sends a data request to the business logic layer, the business logic layer receives the data, then makes logical judgments, then submits the request to the data access layer, and finally the system passes the data access result to the user. In the whole process, the business logic layer is actually a middleware, which plays an important role as a link between the previous and the next, and is mainly responsible for all the services provided to users to ensure the stability of the system. Data access layer (data access layer): also known as the persistence layer, the system interacts with the database or other data storage methods mainly through the data layer, and the realization of data increase, deletion, modification, and query operations is mainly through the business logic layer Call the data to complete. For the smart tourism system, the standard three-tier architecture is improved according to the functional requirements of the system. The front end of the mobile terminal is used as the presentation layer. The business layer is mainly composed of various functional modules of the system, and the GIS platform, third-party application interfaces, etc. constitute the basic support The bottom layer involves the basic data of smart tourist attractions as the data layer. The data is shown in Figure 5.

By sorting out the related requirements of the smart tourism system, the function requirements of the sorting are expanded, optimized and modified, and finally a solution is formed to solve the pain points of the smart management, service, and marketing needs of the scenic spot, and to solve the practical problems of tourists before, during and after the tour. Demand, a smart tourism system that aims to enhance the tourist experience of tourists. Through the data center, supported by the basic data of the GIS platform, the passenger flow collection and guidance system, the smart parking system and the e-commerce platform, the design of the smart tourism system is divided into the scenic area and the tourist end.

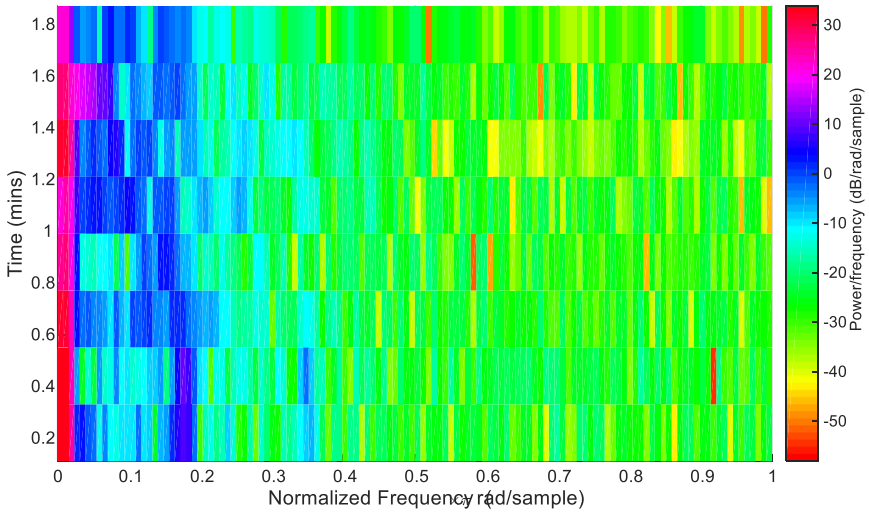

Figure 5: Time and power analysis.

The scenic area is mainly the scenic area. Daily management and operation provide related functions. The tourist terminal mainly provides services for the whole travel process of tourists from before, during and after the tour. The detailed design and explanation of each functional module will be carried out from the scenic side and the tourist side respectively. The Amplitude is analyzed in Figure 6.

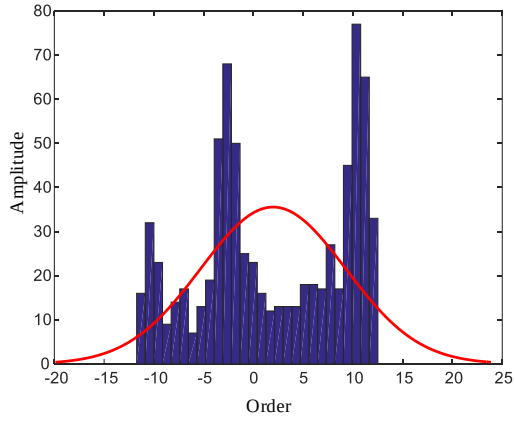

Figure 6: Amplitude analysis.

The functional module design of the scenic spot mainly includes: login, scenic spot map, real-time passenger flow query, real-time parking lot information query, real-time tour bus status, real-time commentator status, customer situation analysis, passenger flow forecast, team statistics, tour Car management, explainer management, parking lot management, complaint management, emergency incident management, scenic spot activity query, address book and "mine" these functional modules.

The functional module design of the tourist terminal mainly includes: login, scenic spot map, real-time passenger flow query, real-time parking lot information query, itinerary planning and

recommendation, travel guide, scenic spot surrounding services, scenic spot travel notes, online ticket booking, search, Several functional modules of mine and one-key alarm.

The storage and management of data in the database is carried out in a database-specific manner, and users can perform data increase, deletion, modification, and check operations in the database. The database can realize data sharing, which can reduce data redundancy; the database and the terminal application are managed separately to realize the independence of data storage management; at the same time, the database can keep the data flexible and safe. This paper analyzes the needs of the smart tourism system, and according to the results obtained after the demand analysis, the details of the data item design of the system are as follows: Based on the two user information of the scenic area administrator and tourists, the data item design is carried out. The basic data items included by tourists are: visitor ID, visitor name, visitor gender, visitor profile picture, visitor password, visitor contact information, creation time and modification time, etc. The quantiles of input sample are shown in Figure 7.

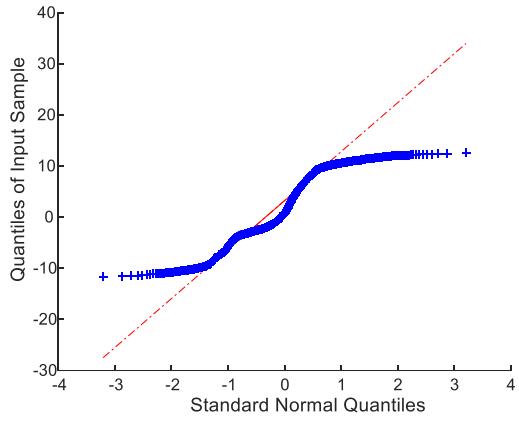

Figure 7: Quantiles of input sample.

The ER diagram of scenic area administrator information mainly includes in scenic area administrators are number, administrator name, management employee number, administrator account password, administrator contact information, administrator profile picture, administrator department, and create Time and modification time. The amplitude and magnitude are shown in Figure 8.

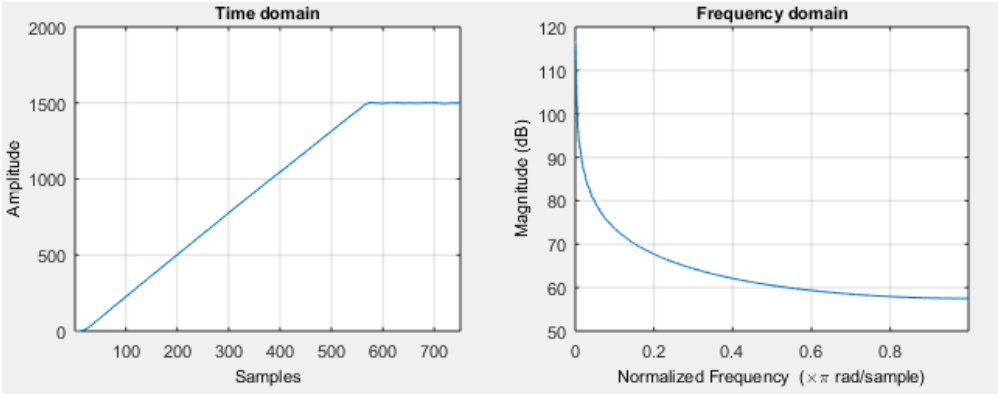

Figure 8: Amplitude and magnitude.

4 CONCLUSION

In the current environment of the development of mobile Internet, the application of the smart tourism system of scenic spots based on mobile Internet provides effective ways and means to realize the informatization of the national tourism industry and improve the travel experience of tourists and users. This article aims to solve the pain points of smart management, service, and marketing needs of scenic spots, and to solve the actual needs of tourists before, during and after the tour, and to improve the tourist experience of tourists. Using existing technology and methodology, the design and realization of mobile Internet-based the main tasks of the smart tourism system for scenic spots are as follows:

(1) According to the research background and significance of the subject, combined with the development status of smart tourism at home and abroad, research the application of relevant research foundation and technology in the field of smart tourism, thereby mining the demand for smart tourism system.

(2) Analyze the needs of the smart tourism system, based on the current market situation and the analysis of the needs of scenic spots and tourist users, and analyze the functional needs of the system in detail from the perspective of the identities of the scenic area administrators and tourists, and at the same time carry out non-functional system Sexual needs analysis.

(3) Carry out the overall plan design of the smart tourism system based on the demand analysis, design the system function modules based on the two identities of the scenic spot and the tourist side, and carry out the database design at the same time.

(4) Perform experimental simulation analysis on passenger flow analysis and prediction function modules and itinerary planning and recommendation function modules, and apply mathematical models and algorithms to actual problems to better solve actual needs.

(5) According to the system design plan, each functional module is realized, and the system is tested to verify the feasibility of the system function and the stability and compatibility of the test system performance.

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