

# Study on Construction of Tourism Security Early Warning System in Tourist Destinations - Take Yangshuo, China as an Example

Jianwu He\*

Guilin University of Technology, College of Tourism and Landscape Architecture, Guilin, Guangxi, 541004, China

**Abstract:** Tourism security is the necessary foundation for sustainable development of tourism destinations. The application of next-generation information technology for early warning of tourism safety can achieve the management goals of tourism destinations such as accuracy, economy, and rapid response. The tourist destination safety early warning system mainly consists of video surveillance-based passenger flow assessment, traffic safety early warning system, emergency intelligent guidance system and intelligent rescue simulation system.

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**\*Corresponding author:** Jianwu He, [hjw15577399320@sina.com.cn](mailto:hjw15577399320@sina.com.cn)

## 1 Introduction

As the cornerstone of the development of tourism, tourism security acts on the entire tourism process and plays an important role in the sustainable and healthy development of tourism. In addition to the impact of tourism security issues on tourism companies, it will also affect tourism destinations and the image of the country. Its practical value is mainly reflected in two points: the tourist security early warning system as a powerful tool in the management of tourist destinations, and has played a role in promoting the sustainable development of the tourist destination system; the tourist security early warning system as a predictive reporting tool It can objectively guide tourists' decision-making behaviours in tourism, and ensure that tourists

have a high-quality tourism experience and feelings when conducting tourism activities.

## 2 The necessity of constructing a tourism security early warning system for China's tourist destinations

### 2.1 It is the general requirement of China's relevant regulations and the development of tourism informatization

According to China's relevant tourism laws, the state has established a security risk alert system for tourist destinations. People's governments at or above the county level shall incorporate tourism emergency management into the government emergency management system in accordance with the law. Develop emergency plans and establish a tourism emergency response mechanism. In 2016, China proposed the establishment of a tourism environment monitoring and early warning mechanism and a tourism safety early warning mechanism, requiring the improvement of the tourism reservation system, the establishment of a mechanism for the linkage of tourist flow control and environmental capacity in scenic spots, the establishment of a national governance big data centre, and the promotion of the integration of the Internet in all areas of tourism Application to cultivate innovative formats such as smart tourism and smart leisure. In 2017, China proposed the tourism industry informationization development goal of "integrated information services, precise marketing, dataization of industrial operations, and functionalization of industry management". It is proposed to further promote the use of artificial intelligence, computer simulation

technology, social networks, tourism big data and tourism cloud computing.

## **2.2 An urgent need to resolve the contradiction between the rapid growth of the tourism economy and the frequent occurrence of tourism safety accidents**

In 2018, China's tourism economy achieved rapid growth. Domestic tourism was 5.539 billion, an increase of 10.8% over the same period of the previous year; total tourism revenue for the whole year was 5.97 trillion Yuan, an increase of 10.5%. However, in the process of rapid development of China's tourism, various risks and insecurity factors are becoming increasingly prominent. The various emergencies of tourism security not only affect the rapid and healthy development of China's tourism industry, but also generate many serious and adverse social impact. Therefore, the establishment of a scientific and reasonable security risk warning system for the tourism industry is an urgent need to promote healthy and stable development of China's tourism industry.

## **3 Problems with China's tourism safety management system**

At present, developing countries lack special working mechanisms for early warning information on tourism safety. Taking China as an example, the current release of tourism safety warning information is mainly managed as part of an emergency response mechanism for emergencies. The current problems of China's current tourism safety early warning information management are as follows: 1. The main body of information release is diverse, and tourism companies and tourists are often at a loss. Including news released by official agencies, tourism companies, netizens, etc.; 2. There are various channels through which enormous information gets released, and it is difficult for tourism companies and tourists to distinguish authenticity in a short time. Including information released by new media such as websites, traditional news media, and Weibo; 3. Information is published in a variety of contents, and it is difficult for tourism companies and tourists to distinguish between them. Including general safety notification information and major safety reminder information; 4. The information is published in various forms, and tourism companies and tourists cannot accurately judge. Including four-color grading warning, general warning, and some use

prohibited language, and some use advisory language; 5. The timeliness of information release is poor, and the guidance to tourism companies and tourists is weak. The official news is authoritative, but relatively lagging, the release and consumption of private channels is rapid and fast but it is not authoritative.

## **4 Overview of China Yangshuo tourism security early warning system**

The tourist destination studied in this article is Yangshuo County, located in southern China, with a county area of 1428.38 square kilometers. In 2016, Yangshuo was included in the national key ecological function zone and won the title of "China's Most Beautiful Leisure Resort", becoming the first batch of China's national comprehensive tourism demonstration zones. In 2018, 17.5195 million tourists were received, an increase of 27.5%; the total tourism revenue was 24.232 billion yuan, an increase of 33.7%. As one of the most popular travel destinations for inbound tourists after entering China, Yangshuo has a high reputation and popularity internationally. The large number of tourists and the relatively small county area have formed a contradiction. How to effectively solve the problem of tourist congestion in Yangshuo and establish a scientific tourist destination security early warning system. It is the key problem that needs to be solved urgently in the construction of tourism destination image and sustainable development.

Development and application of tourist security early warning system based on big data technology in Yangshuo, China, with an open early warning management platform. According to the data collected by the Internet of Things, security warning expert knowledge, natural and social environmental data of tourist destinations, Hadoop technology, Oracle cloud database, GIS technology, GPS technology, Web services, deep learning, data mining, and massive data visualization technology and computer network and other technologies, developed a Hadoop big data analysis technology based on Yangshuo China's tourist destination security early warning management system to solve the three stages of data analysis, early warning information push, and intelligent decision-making in the tourist destination safety early warning management. Informatization management issues, realizing the functional modules of tourist destination traffic early warning, emergency response and simulated rescue, and achieving the management goals of accurate,

economical, and fast response of Yangshuo tourist destination safety early warning.

## **5 Composition of tourism security early warning system for tourist destinations in Yangshuo, China**

### **5.1 Passenger traffic assessment of tourist destinations in Yangshuo, China based on video surveillance**

Passenger flow is an important indicator of tourism destinations and the basis for realizing tourism security early warning. It is necessary to design a high-precision and efficient passenger flow assessment function in the tourism security early warning system. The system uses a passenger traffic statistics algorithm based on video scenarios to count passenger traffic in real time.

Human target detection is responsible for detecting moving target objects from video sequence images, which is the basis of target recognition and tracking. First, the system establishes a training sample database, extracts the HOG features of the images in the sample database, and uses support vector machine (SVM) training to obtain a classifier for classifying and identifying the pedestrian targets extracted from the video image. After the video surveillance equipment obtains the image data, the system uses a sliding window to slide through the entire image line by line. Each time it slides, the HOG feature in the image covered by the scale search window is extracted, and the classifier is used to determine the target. Human target, and can extract human target position and related information.

The target track records the movement track of the human target. A statistically recorded straight line is set in the video scene, and the human target in two frames of images is used for comparison and calculation. When the human target crosses this line, it is considered that this human target forms a flow of people. The system calculates the number of human targets that cross the line in the scene, and then the statistics of the flow of people can be used for the evaluation of flow of people.

### **5.2 Tourist destination traffic safety early warning system**

The traffic safety early warning system combines advanced information technology, communication technology, sensing technology, network control technology and artificial intelligence technology to

reflect the current traffic situation comprehensively, in real time, accurately and efficiently. Effective warning is given to tourists who are in the tourist area or who are going to this area.

The traffic early warning system obtains the vehicle's location information, road basic information, traffic information, traffic weather information, and other information that may affect traffic from the system data acquisition layer. All data is transferred to the database server via computer network communication technology. The data management layer is responsible for pre-processing, storing, processing, and fusing the data. The data analysis layer uses big data analysis methods such as data mining, machine learning, and deep learning to mine the useful information hidden behind the data to predict future traffic conditions. The decision support layer evaluates the traffic status in real time based on the data provided by the data analysis layer, and provides a basis for management decisions. The application layer is used to provide early warning information services to managers and travellers. According to the analysis result of the decision support layer, the application layer displays the visual display and pushes it to traffic managers and tourists through WeChat or large screen display.

The prediction result of the traffic state is an important content to be issued by the early warning system. The system uses the traffic state category prediction method of the maximum entropy model to provide early warning of possible traffic safety problems in the future. The maximum entropy model algorithm is divided into two parts: the model training process and the real-time prediction process. The model training process is to analyse a large amount of historical data, extract features that can fully reflect the traffic status, and use the traffic status category at the next moment as the classification result of this set of features to build a model training sample database. Then, the post-IIS algorithm iteratively calculates the samples to obtain the weight values of each feature.

### **5.3 Intelligent emergency guidance system for tourism safety**

In order for tourists to reach the scenic area safely and quickly, it is necessary to design an efficient and real-time traffic grooming system. Based on the comprehensive information database of GIS system and road conditions and traffic early warning, combined with real-time and dynamic information of traffic (GPS,

pedestrian flow, monitoring system, signal lights, etc.), a guidance model is derived. The tourism security emergency intelligent dredging system consists of a traffic flow dredging system and a tourist dredging system.

The derivation of the vehicle grooming model is an important part of the system. It is planned to use mathematical analysis methods for research, based on road condition information and real-time traffic information, with the minimum overall grooming time as the optimization goal. The derivation steps are: forming a directed map of the road network and calculating the traffic cost, calculating the vehicle flow and remaining flow of each arc, deriving adjustable arcs, adjusting according to rules and calculating the adjusted cost to find the optimal, repeat the above process to form the optimal solution.

In order to solve the problem of crowds in the scenic spots during the holidays, it is planned to build a tourist grooming subsystem based on 3D scene modelling technology and group motion simulation technology. Tourist evacuation is divided into two parts: dense crowds leading to sparsely crowded spots and evacuation in response to emergencies. For crowded people, real-time on-site information is obtained through the passenger flow evaluation system, combined with the number of people in each scenic spot, and comprehensive consideration of scenic spots and road carrying Factors such as ability, distance of people from expected attractions, etc., design the evacuation plan, and guide tourists to evacuate through guides, mobile phones, information boards and other methods.

#### 5.4 Tourism intelligent rescue simulation system

After an accident at a tourist destination, inadequate rescue coordination between various departments or improper rescue methods may result in serious consequences of the accident. The RoboCup Rescue Simulation System (RCRSS) is applied to the emergency command system of tourist destinations, which can provide decision support for emergency handling in tourist destinations, and minimize the occurrence of malignant events and personnel property loss. First, establish an environmental model of the tourist destination, and then simulate various types

of accidents. After the accident, various departments in the system coordinate rescues, record rescue plans and evaluate rescue effects, and provide guidance for decision-making. The Robo Cup rescue simulation system uses a C / S structure. The server includes an emulator, kernel, monitor and ground information system, and the client includes an agent. The simulator is used to simulate accidents; the monitor is responsible for dynamically mapping all simulation actions occurring in the simulation system, and displaying the world model of the simulation system through a graphical interface. The kernel is the core of the entire simulation system and is responsible for controlling communication with each module and managing the entire simulation process. The geographic information system is responsible for reading the corresponding geographic information from the map configuration file, and analysing the map parameters to construct the geographic information model of the simulation system. Clients are intelligent individuals in the rescue environment, such as police, citizens, etc.

Through the rescue simulation system, to simulate an accident in a tourist destination, according to various external conditions and social resources available, coordinate relevant agencies and departments, make the best rescue plan, and guide the implementation of the final rescue process.

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