Tourist Behavior-based Early Warning Scheme for Wisdom Tourisms

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ABSTRACT

In this paper, we propose a warning scheme for behavior early warning in scenic spots. In the scheme, it determines whether to send an alarm reminder based on the current location of the visitor's mobile terminal. The warning scheme includes obtaining the warning location information based on preset dangerous location data, as well as obtaining the current location information of the visitor at a preset time interval, and setting the current location of the visitor. The location information is compared with the warning location information, and if the comparison results are consistent, a virtual alarm operation is triggered. By comparing the current location of the tourist with the warning location information, it is determined whether the virtual warning operation is triggered, so that tourists can obtain real-time warning information in the scenic spot, for reducing the probability of uncivilized or dangerous behaviors in the scenic spot, improving the warning operation, and making sure that it is safe and civilized to travel in the end.

Keywords: *Tourist Behavior, Early Warning, Wisdom Tourisms.*

1. INTRODUCTION

In the context of Smart Earth, the Wisdom Tourism industry has developed rapidly and has become an important part of the construction and development of smart cities. With the transformation and continuous upgrading of the tourism industry, it has become an effective way to promote the improvement of people's livelihood and quality of life, which has attracted widespread attention from all walks of life. With the rapid development of network information technology, Internet information technology and traditional service industries are also cooperating and rapidly merging, which has resulted in more creative industrial forms, and has explored a development path for information transformation and intelligent upgrading.

The "Thirteenth Five-Year" National Tourism Informatization Plan specifies that by 2020, China's tourism infrastructure should be gradually improved. In the continuous innovation and application of technology, the perfect combination of tourism and information technology will be achieved, and tourism will be digitalized and networked to achieve the full implementation of integration, intelligence, and individualization. According to data from China Tourism Research Institute, the number of domestic tourists in the first half of 2018 reached 2.826 billion, an increase of 11.4% over the same period of the previous year, and domestic tourism revenue was 2.45 trillion YUAN, an increase of 12.5% over the same period of the previous year. The comparison of the data over the same period directly reflects the vigorous development of the domestic tourism industry and the demand for national consumption. The tourism industry is not a single field. It has affected a series of industrial chains of "food, housing, transportation, travel, shopping, and entertainment". How to promote each other and influence each other has become a problem for us to think about. China vigorously promotes the "Wisdom Tourism" approach, shifts the tourism industry from a high-speed tourism growth stage to a high-quality tourism development stage, focuses on the integration and innovation of life, tourism, culture, creativity, and technology, and strives to improve the quality of tourism

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and meet the needs of users. It is not that digitization and networking can represent Wisdom Tourism, but centring on user experience, exploring the needs of different users, looking for new entry points where needs be converted, and achieving true intelligence and personalization [1-5].

"Wisdom Tourism" refers to the use of high-tech science and technology, through the terminal Internet equipment, to organize tourism information, so that tourists can understand the information dynamics in real time, after reasonable selection of tourism information, convenient use, to achieve personalized, intelligent The effect of reasonable arrangements for sex travel. Traditional tourism is a single group for sightseeing, and tour guides explain related content. With the continuous improvement of the national economy and the gradual improvement of people's quality of life, the tourism industry is booming. Self-driving tours, outdoor adventures, and free travel are gradually being recognized by people. However, traditional tourism products in the current market have serious shortcomings such as serious patterning, outdated forms, oversupply of products, and insufficient supply of new products [6-10].

At present, when tourists visit scenic spots, they often have some inappropriate or dangerous behaviors. The management part of scenic spots adopts various measures to regulate the above-mentioned behaviors. It is mainly to set up warning signs or staff in places where the flow of people in the scenic area is relatively concentrated to stop the above-mentioned behaviors, but due to the excessive passenger flow, it is impossible to stop various behaviors. In order to solve the above-mentioned problems, we have designed an operation for providing the alarm information corresponding to the location at different locations through geographic information matching, thereby improving the effectiveness of the alarm operation.

2. RELATED WORKS

2.1. Foreign Wisdom Tourism

The implementation of the concept of "Wisdom Tourism" has become popular in foreign countries earlier than in our country. The "Smart Earth" first proposed by IBM has led to the development of "smart cities". Smart cities include public services such as transportation, medical care, education, food, electricity, and urban planning. In general, Wisdom Tourism is an important part of smart cities. . Dubuque, the United States, is the world's first smart city in cooperation with the municipal government and IBM. It uses Internet of Things technology to connect every resource in the city, intelligently connecting water, electricity, gas, public transportation, medical health, and tourist attractions. Data collection, monitoring, analysis, and integration of public services and public services are used to respond to the needs of citizens and reduce energy consumption and costs in the city. [11-16]

During the 2012 London Olympics, the concept of "smart city" was also derived into actual practice. In order to relieve the traffic congestion and pressure on the flow of people during the event, the big data of CCTV cameras, subway cards, mobile TV, and social networks were collected in real time. , Cloud computing and other technical analysis and calculations to provide citizens with the status, traffic conditions and relative suggestions of hot spots to guide users to adjust their travel plans. Since 2013, The Walt Disney Company has spent US$1 billion to develop the My Magic+ system. My Magic+ is connected to Magic Bands wrist devices to intelligently record user information in real time, and at the same time monitor the flow of people to help the park make better Decisions, such as when to add more employees in a certain place, the placement of merchandise in the souvenir shop, and the introduction of products that users welcome, the use of data can also help users know the updated information of restaurants, shops, and amusement facilities, as well as the degree of crowded queues. At present, Disney has developed its own App for users to view the map of the scenic spot after entering the park and to know the queue time of each amusement facility as soon as possible. This is a smart travel system that uses big data and real-time data to the depths, which is enough to change the market, completely change the way of communication between users and companies, and bring users a better personalized gaming experience.

2.2. Domestic Wisdom Tourism

China's earliest application of the concept of "Wisdom Tourism" was Zhenjiang City, Jiangsu Province, combining urban characteristics and historical and cultural characteristics, and using modern technology to achieve a leap-forward development of the city. In the context of increasing product volume, increasingly fierce market competition, and increasing user demand, in order to ensure the healthy and rapid development of the tourism industry, it is necessary to rely on the new generation of science and technology.

Wisdom tourism is an advanced form of tourism development. Domestic research on wisdom tourism is relatively late. However, with the emphasis and application of big data technology and the increase in user needs, research on Wisdom Tourism in China is increasing. For the first time in the 2010 Shanghai World Expo, the concept of "smart city" was applied to the park design and planning, and the application of information technology was visualized and controlled. The park brings together real-time information of internal and external passenger flow, public transportation, and rail transit in the park for comprehensive coordination and command, and integrates real-time information on safety, transportation, ticketing, events, energy, facilities,

sanitation, logistics, visitors, organizers, etc. Coordinated operation with the police system inside and outside the park improved work efficiency and quality. Tourism is one of the most important and dynamic industries. It needs to adapt to the changing needs of users every day. Today, with the continuous maturity of technology, more and more cities and scenic spots have begun to join the attention and development of wisdom tourism.

3. TOURIST BEHAVIOR-BASED EARLY WARNING SCHEME

In order to protect the personal safety of tourists, we propose a tourist behavior-based early warning scheme for wisdom tourisms in this section.

The mobile terminal determines whether to send warning reminders according to the current location of tourists, including: obtaining warning location information based on preset dangerous location data; setting a time interval to obtain the current location information of the visitor. It compares the current location information of the visitor with the warning location information, and if the comparison result is consistent, a virtual alarm operation is triggered.

In the implementation, in order to be able to improve the effectiveness of warnings, especially to provide warnings to every tourist in the scenic area as much as possible, the warning method proposed in this article is based on the mobile terminal that every tourist, especially adult tourists, will be equipped with. , By pre-installing an application on the mobile terminal, each mobile terminal obtains its own current geographic location and combines the pre-stored warning location information in each scenic spot in the scenic spot to determine the current tourist equipped with the mobile terminal Whether it is in a position where an alarm is needed, if it is, then a virtual alarm operation is triggered.

Specifically, the application program first obtains the warning location information that requires an alarm operation based on the stored preset dangerous location data, and the information is usually the longitude and latitude information obtained based on the global positioning system. The current latitude and longitude of the mobile terminal, that is, the current location of the tourist, is compared with the warning location information. If the comparison result shows that the tourist is at the warning location, the warning operation for the warning location is pre-stored, especially the virtual warning operation.

Through the trigger conditions, first judge whether there is a position trigger. When the trigger conditions are met, the system will formally enter the animation demonstration module.

The working principle of position triggering is specifically by using a mobile terminal to move and control the camera position in Unity, placing an empty object in the corresponding position in the virtual scene, named kong1, tick the “Is Trigger” in the Box Collider of kong1, and pass in the code. The function of OnTriggerEnter executes the trigger content.

The specific virtual alarm operation is mainly based on the animation demonstration module. The working principle of the animation demonstration module: mainly by inserting an animation demonstration video in the scenic area App. The animation video will guide tourists through case descriptions and correct behaviors to educate tourists to avoid inappropriate and dangerous behaviors in the scenic area and achieve safe and civilized tourism.

If the virtual alarm operation is not triggered within the preset time, the virtual alarm insertion operation based on the time variable will be triggered; when it is detected that the virtual alarm operation is not triggered within the preset time, the current time is recorded as the initial time, and the button starts from the initial time. Perform virtual alarm operations at standard time intervals until the number of virtual alarm operations meets the standard within a preset time period starting from the initial time. Or the triggering of the virtual alarm insertion operation based on time variables also includes: when it is detected that the virtual alarm operation is not triggered within a preset time period, recording the current time as the initial time, and simulating every standard time interval from the initial time Variable counting operation; when the value of the analogy variable counting reaches the standard threshold, the virtual alarm operation that has not been triggered is randomly selected.

In practice, due to the randomness of tourists browsing scenic routes, considering that some mobile terminals may disable or have no positioning function, in order to provide virtual warning services to tourists corresponding to these mobile terminals, it also provides Virtual alarm insertion operation based on time variables. Set the time variable or analogy count variable. When the warning simulation counter reaches a certain count at a certain time variable, the system will randomly insert an unlearned warning simulation trigger.

In terms of specific implementation methods, it predicts the user (or node) position. We uses Newton interpolation to estimate the position (x_t, y_t) of the node at time t (that is, the current time) based on the location (x_{t-3}, y_{t-3}) , (x_{t-2}, y_{t-2}) and (x_{t-1}, y_{t-1}) , where the mobile node is at the first three historical moments $t-3$, $t-2$ and $t-1$. The calculation formula is as follows:

$$\begin{aligned} x_t &= x_{t-3} + 3 \quad (x_{t-2} - x_{t-3}) + 3 \quad (x_{t-1} - 2x_{t-2} + x_{t-3}) \\ y_t &= y_{t-3} + 3 \quad (y_{t-2} - y_{t-3}) + 3 \quad (y_{t-1} - y_{t-2} + y_{t-3}) \end{aligned} \tag{1}$$

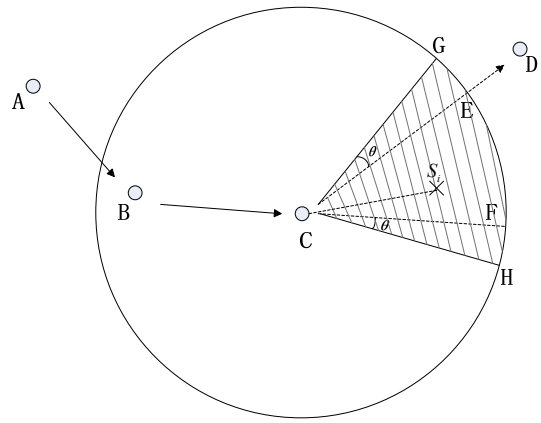

Fig. 1. Trend prediction of node movement

In Fig. 1, the three points A, B, and C are the positions of the nodes at the three moments $t-3$, $t-2$ and $t-1$ respectively. According to the derivation formula (1), the position of the moment can be calculated (as shown in D in the figure). Then, take point C (location at time $t-1$) as the center of the circle, and the maximum speed $v_{\max}$ of the node movement (the maximum distance that can be moved between two times) as the radius to make a circle (called "circle C"). The equation for circle C is:

$$(x-x_{t-1})^2+(y-y_{t-1})^2=v_{\max}{}^2 \tag{2}$$

The line segment CD (the extension of CD when $v_{\max}>CD$) intersects the circle C at point E, and the extension line of line segment BC intersects the circle C at point F. Let the angles between the direction $\overrightarrow{CF}$ and $\overrightarrow{CE}$ and the positive axis of D be θ_{CF} and θ_{CE} respectively. Rotate the line segments CE and CF to both sides by an angle θ (θ can be selected between 1 and 10 degrees) to obtain CG and CH. The angles between the directional line segments $\overrightarrow{CH}$ and $\overrightarrow{CG}$ and the positive direction of the x axis are θ_{CH} and θ_{CG} respectively. There will be the following angular relationships:

$$\theta_{CH}=\theta_{CF}-\theta,\theta_{CG}=\theta_{CE}+\theta \tag{3}$$

The line segments CH, CG and HG arc enclose a "key weighted area" (the shaded area in the figure). The so-called "key weighted area" means that the location of the mobile node at the moment t is more likely to be in this area.

The algorithm will randomly select a large number of sample points in circle C during the Monte Carlo sampling stage, and weight the sample points for the first time in this process. When a sample point falls in the "key weighted area", the weight of the sample point is designated as $q(q>1)$; and if the sample point falls outside the "key weighted area", the weight is set to 1. Assuming that a sample point is S_i and the coordinate is (x_i,y_i), and the angle between the directed line segment $\overline{CS_i}$ and the positive direction of the x axis is θ_{CS_i}, the following relationship is obtained:

$$(x_i-x_{t-1})^2+(y_i-y_{t-1})^2\le v_{\max}{}^2 \tag{4}$$

$$\theta_{CH}\le\theta_{CS_i}\le\theta_{CG} \tag{5}$$

$$\theta_{CG}\le\theta_{CS_i}\le\theta_{CH} \tag{6}$$

As long as S_i can satisfy both Eq. (3) and Eq. (4), or both Eq. (5) and Eq. (6), it can be determined that B falls within the "key weighted area".

(1) Virtual alarm operation

This part includes virtual scene interaction and warning model video playback. In the implementation, the warning model video is mainly based on the animation demonstration module. Mainly by inserting an animated demonstration video into the scenic spot-related application after installation in the mobile terminal, the animated video will guide tourists through case descriptions and correct behavior to educate tourists to avoid improper and dangerous behaviors in the scenic spot, and achieve safe and civilized tourism.

In order to strengthen the warning simulation learning, the system adds the function of virtual scene interaction after the warning simulation module. The virtual scene interaction includes interactive sub-functions and reward sub-functions. Specifically, the warning simulation count variable and the interactive priority variable are added. The warning simulation count is the calculation of the number of warning simulation education that has been triggered currently, and the interaction priority is the priority judgment of the simulation warning education content in the scenic spot. When the count value exceeds a certain value, the system will load the interaction of the corresponding scene by judging the priority level. If the count value does not exceed a certain value, the interactive function will not be activated. A typical flowchart is shown in Fig. 2.

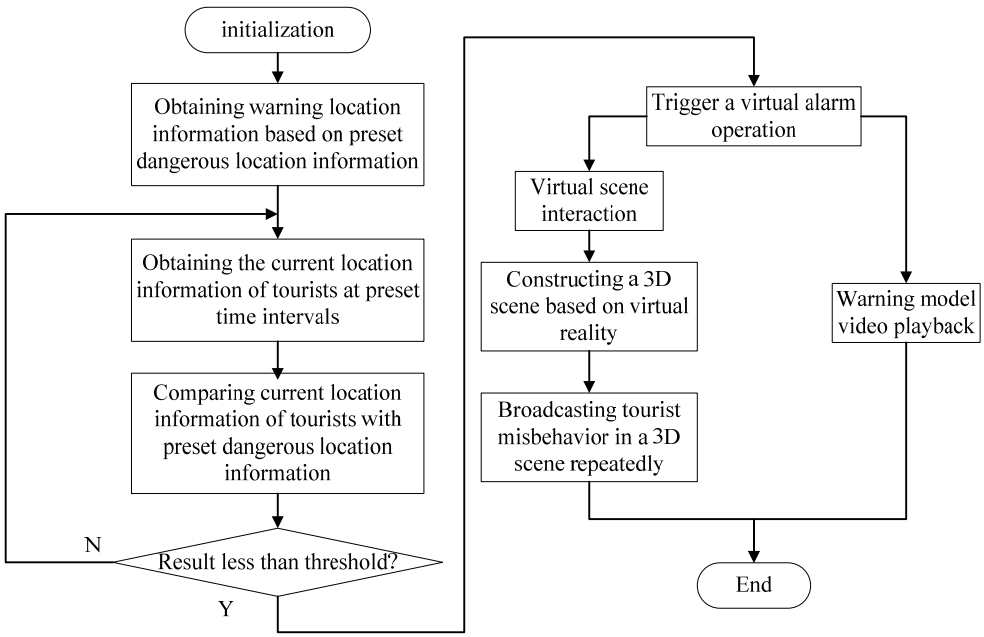

Fig. 2 Flow-chart of Tourist Behavior-based Early Warning Scheme

(2) Virtual scene interaction

This part includes: constructing a three-dimensional scene based on virtual reality, repeatedly playing videos of tourists' improper behavior or dangerous behavior in the three-dimensional scene; obtaining tourists' deterrent actions to deter improper behavior or dangerous behavior, based on the effectiveness of the deterrent actions based on tourist points rewards. In the implementation, the working principle of the interactive function of the virtual scene: When the trigger condition of the interactive module is met, the interactive scene is displayed in the system by displaying a virtual reality three-dimensional scene, which simulates the warning simulation that tourists have learned and has a high priority scenes. In the simulation scene, the occurrence of improper or dangerous behaviors of tourists will be reproduced. At the same time, some props will be placed in the simulation scene. Tourists can stop these behaviors by clicking on the props. For example: In a forest scene, a tourist smokes in the scene and throws a cigarette butt in the scene. At this time, the flame has not been completely extinguished, and the grass next to it touches the flame. At this time, in the scene, we placed a mineral water bottle that has not been drunk on the ground not far away. At this time, we can click on the water bottle, open the lid, and pour water on the fire sprout. The danger was stopped at this time. The working principle of the reward module: mainly through tourists to stop the occurrence of improper or dangerous behavior, the system will give a certain point reward. The points can be used in applications in the scenic area.

4. CONCLUSION

This paper designs a warning plan for behavior early warning in scenic spots. In the solution, according to the current location of the tourist's mobile terminal, it is determined whether to send an alarm reminder, which specifically includes the preset location data of the dangerous location, obtains the warning location information, obtains the current location information of the visitor at a preset time interval, and calculates the current location information of the visitor Compare with warning location information. If the comparison results are consistent, a virtual alarm operation is triggered. If they are inconsistent, further compare the current location of the visitor with the virtual warning location information to determine whether to trigger the virtual warning operation, so that tourists can obtain real-time warning information in the scenic spot, and reduce the probability of uncivilized or dangerous behaviors in the scenic spot, in order to improve the effectiveness of the warning operation, and ultimately achieve a safe and civilized tourism.

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