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A Digital Cultural Heritage Tourism Information Statistics System Based on Image Feature Extraction Technology

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Abstract. In order to improve the statistical effect of digital cultural heritage tourism information, based on image feature extraction technology, this paper constructs a digital cultural heritage rate information statistical system based on image feature extraction technology. Moreover, this paper explores the non-linearity of the stored image and the lighting conditions captured by the camera, t the small core denoising of the image, the detection method of saturated or high-bright areas, the poor performance of the traditional bilateral filter and the superiority of the bilateral grid, and the expansion method of the dynamic range. In addition, this paper proposes a linear function related to brightness to extend the dynamic range of the LDR image. Finally, the system function modules are constructed on the basis of algorithms, and experiments are designed to verify the performance of the digital cultural heritage tourism information system. The research results show that the cultural genetic tourism information system constructed in this paper is very effective and has certain practical effects.

Keywords: Image feature extraction; feature recognition; Digital cultural heritage; tourism information
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1 INTRODUCTION

Heritage resources are a kind of tourist attraction. There are many research results related to tourism development and utilization abroad, mainly focusing on the evaluation of heritage resources, the factors that affect the development of heritage resources, the impact of the development of heritage resources on the local economy and heritage communities, and the heritage The choice of the path of land resource tourism development and other aspects.

The Chinese civilization has a long history, and the vast administrative area is filled with brilliant and rich cultural heritage resources. With the development of productivity, a large number of cultural heritages and the heritage sites they rely on are under tremendous pressure from urban development and tourism development, and are facing the threat of disappearance and fragmentation.In recent years, the concept of "global tourism" has emerged, and the integrated utilization and development of local heritage resources has become a research hotspot. Under such a background, carrying out research on the suitability of regional cultural heritage resources for tourism development to optimize the evaluation system of heritage resources and constructing an evaluation system that measures the suitability of regional cultural heritage for tourism development are helpful for all relevant subjects to evaluate the value of heritage resources. Moreover, it not only meets the needs of local cultural heritage protection, but also the needs of local governments to integrate and develop regional heritage resources and promote the activation and utilization of heritage resources [1].

Cultural tourism development not only contributes to the protection and development of heritage resources, but also enriches and perfects the value and content of local characteristic tourism products, and plays an active role in promoting the transformation, upgrading and development of the regional economic structure and the inheritance of traditional culture. Judging from the current situation of domestic and foreign tourism development, it can be seen that the concept of cultural tourism has gradually been recognized by tourism-related subjects and the emphasis on cultural tourism has become one of the mainstreams in the development of modern tourism, and its contribution to GDP has also steadily increased. At the central level, the positive effect of the development of cultural tourism on the social economy has been affirmed and supported [2].

Scientific tourism development of cultural heritage resources is the top priority of the sustainable development of cultural tourism industry. At present, academia has developed a variety of evaluation systems for various tourist destinations and their resources, but qualitative research on individual resources occupies most of them, and there are few studies on the suitability evaluation of tourism development of heritage resources with regional characteristics. therefore,the process of introducing new technological perspectives exploratorily based on optimizing and innovating the evaluation system of the suitability of regional heritage resources tourism development and conducting relevant calculations for the research destination cultural tourism development potential has special significance [3].

Based on the above analysis, it is necessary to construct the statistics of cultural heritage tourism information. On this basis, it is convenient to carry out further planning of cultural heritage tourism, to make full use of the resources of cultural tourism heritage, to improve the development of cultural heritage tourism, and to improve the protection effect of cultural tourism heritage.

2 RELATED WORK

The literature [4] believed that heritage tourism is a manifestation of cultural commercialization. The literature [5] analyzed the attraction of cultural heritage resources as tourist attractions to tourists. The literature [6] discussed the sustainable path of the world cultural heritage tourism development. Literature [7] explored the relationship between the quality of heritage city tourism products, tourism development status and regional economy, and proposed the Vicious circle model of heritage destination tourism development, and proposed corresponding countermeasures according to the different resources of heritage sites. Literature [8] studied the evolutionary path model of the tourism industry in heritage sites with the optimization of cultural heritage development models. The literature [9] analyzed the logical relationship between heritage resource management and tourism utilization, and pointed out the interdependent relationship between heritage protection and tourism development. The literature [10] studied factors such as heritage quality, community aboriginals, heritage associations, market layout and local government in the development of cultural heritage tourism, and proved the multiplicity of factors influencing the development of regional heritage tourism. The literature [11] analyzed the factors that affect the sustainable development of Piton Mountain tourism based on the stakeholder theory, and pointed out the impact of community dependence, environmental attitudes, and participation levels on the sustainable development of regional tourism. The literature [12] discussed the path selection of resource protection and theme packaging of Georgetown cultural heritage in the process of urbanization development from the perspective of tourism. The literature [13] believed that the growth of regional cultural tourism development lies in high-quality cultural heritage resources, and the driving force lies in the macro-control of the government. The literature [14] proposed that online simulation technology can be introduced into the tourism development of cultural heritage resources to bring tourists a better tour experience. The literature [15] studied the development potential of cultural heritage tourism and fully affirmed the positive significance of the activation and utilization of resources in heritage sites to the local economy and cultural inheritance. The literature [16] proposed a plan for the potential tourism functions of architectural cultural heritage resources in the community reconstruction. The literature [17] studied the impact of the three factors of motivation, opportunity, and ability on community participation in tourism development of heritage site residents. The literature [18] discussed the important impact of the rise of cultural tourism in heritage sites in developing countries on cultural heritage resources in the region.

The research on the evaluation of cultural heritage resources comes from the fields of art history, archaeological management, preservation and maintenance of historical sites, and the research system is relatively complete. The evaluation perspective is more to take regional cultural heritage resources as tourist attractions in a specific area, so as to construct new value connotations of cultural heritage resources. The literature [19] defined a set of value system, using cultural value, socio-economic value and other elements to reconstruct the value of cultural heritage resources. The literature [20] put forward a new perspective of cognition of resource cultural value, which summarizes heritage value into three different types: intrinsic value, instrumental value and organizational value. Moreover, it pointed out that the value of cultural heritage has the nature of being constructed, and people in society interpret the value of heritage for their own purposes. Foreign cultural heritage resources tourism development evaluation research has gone through the development process from simple visual quality evaluation to monetary value evaluation as the main method. The visual evaluation method once occupied the mainstream of research, but it was gradually abandoned because it simply paid attention to the visual experience of tourists and ignored the intrinsic value of cultural heritage, and failed to fully measure the value of heritage resources. With the improvement of the tourism discipline system, the Travel Charge Method (TCA) and Conditional Value Method (CVM) have gradually taken the lead in resource evaluation, but their theoretical support and persuasiveness are still controversial. At the end of the 20th century, computer technology was widely popularized, scholars using geographic information systems for tourism development research gradually increased, and the results of heritage resource evaluation research based on GIS technology were also increasing. The literature [21] used digital technology to draw a distribution map of the development potential of tourism resources in Texas, USA, and evaluated the value and development potential of tourism resources in the region from the perspective of cultural changes and historical interpretation. The literature [22] studied the spatial distribution of cultural heritage resources based on GIS technology and constructs cultural heritage corridors. The literature [23] used geographic information system to analyze the concentration of cultural heritage in Seville, Spain, and draw a risk map of cultural heritage protection, which provides reference for analyzing the suitability of heritage development in this area.

3 HDR IMAGE GENERATION TECHNOLOGY BASED ON SINGLE FRAME IMAGE

The basic idea of the HDR image generation method based on a single frame image is to perform special processing on the image, and then use the dynamic expansion function to expand the dynamic range.At present, the technologies for generating HDR images from a single frame image are mainly divided into six categories. The first category is the global model, that is, the global function is used to directly expand the dynamic range of the entire image to generate an HDR image. The second category is the classification model, which divides the image into several parts or divides the image into several categories, and uses different expansion functions to expand the dynamic range respectively. The third category is the extended mapping model, which uses the inverse tone mapping operator to generate an image, and generates the extended mapping from the bright area of the image, and then merges the first two steps and the original image to generate an HDR image. The fourth category is the brightness function enhancement model, which detects the over-exposed area of the image, then generates the brightness enhancement function, enhances the over-exposed area, and finally uses the dynamic range expansion function to expand the dynamic range to generate an HDR image. The fifth category is the image restoration model, and the parameters of the expansion function are selected by the user. The sixth category is a pseudo-multi-exposure model, which generates a multi-frame image from a single frame image from the S-curve, and then selects a certain weight to fuse the high-quality information in each frame image to generate the final HDR image.

Through a series of experiments, the influencing factors of HDR image are judged. The first experiment is to prove whether HDR images are of higher quality than LDR images. Three sets of images are provided to the observer, namely HDR acquisition and HDR display, HDR acquisition and LDR display, and LDR acquisition and LDR display. 10 different scenes are selected to be provided to different observers, and the results are recorded and the average value is calculated. Experimental results show that the quality of HDR acquisition and HDR display is the highest, but the quality of HDR acquisition LDR display and LDR acquisition LDR display quality is not significantly different. The second experiment is to prove which dynamic range and brightness are the decisive factors that determine the observer's observation experience. The experiment also uses three sets of images, namely an HDR image with appropriate brightness, an LDR image with the same brightness as the HDR image, and an LDR image with increased brightness. The dynamic range of the latter two types of images has not been expanded, but the brightness has been increased. The first type of dynamic range expansion is shown in formula (1).

$$L' = k\left(\frac{L - L_{\min}}{L_{\max} - L_{\min}}\right)^{\gamma} \tag{1}$$

L is the brightness value of the pixel to be expanded, $L_{\max}$ and $L_{\min}$ are the maximum brightness value and the minimum brightness value of the image, k is the maximum intensity value of the HDR display, and γ determines the nonlinear expansion characteristics. When $\gamma = 1$, it is linear expansion, and when γ is other values, it is nonlinear expansion. Experimental results prove that brightness can be a more decisive factor than dynamic range. Only when the brightness of the two images is the same, the observer considers the image with high dynamic range to be of better quality. At the same time, the experiment proved that the linear expansion effect of the dynamic range is the best. But later experiments by others have shown that if the image has an overexposed area, the quality of linear expansion is very poor.Experiments prove that when the image contains overexposed areas, the non-linear expansion of $\gamma = 2.2$ has a better effect.

An automatic global anti-tone mapping operator based on gamma expansion is proposed, which calculates various parameters through image information. First, the RGB value is linearized, and then the image brightness L is calculated using the following formula:

$$L = Y = 0.2126R + 0.7152G + 0.0722B \tag{2}$$

After that, the arithmetic mean and geometric mean of the brightness are calculated. L_{avg} and L_H are respectively calculated by the following formulas.

$$L_{avg} = \frac{1}{N}\sum_{i=1}^{N} L(i) \tag{3}$$

$$L_H = \exp\left(\frac{1}{N}\sum_{i=1}^{N}\log\left(L(i)+\varepsilon\right)\right) \tag{4}$$

ε is a very small positive value set to prevent the singularity of black pixels. The key value k of the image is generated by the following formula:

$$k = \frac{\log L_H - \log L_{\min}}{\log L_{\max} - \log L_{\min}} \tag{5}$$

$L_{\max}$ and $L_{\min}$ are the maximum brightness value and the minimum brightness value, respectively. k_5 and k_1 are the key values calculated by considering the outliers of 5% and 1%, respectively. After that, the overexposed pixel area n is calculated again, that is, the area where L is greater than or equal to $254/255$. Using multiple linear regression and robust regression, the final calculation function of γ is calculated, as shown in the following formula. Finally, formula (1) is used to expand the dynamic range of the image to generate HDR images.

$$\gamma = 2.4379 + 0.2319\log L_H - 1.1228k_1 + 0.0085p_{ov} \tag{6}$$

The image is divided into two parts, namely the diffuse reflection part and the specular reflection part. The specular reflection part of the image contains the highlighted area of the image, and the diffuse reflection part of the image contains the other areas of the image except the highlighted area, as shown in Figure 1.

The threshold value of the highlight area adopts the maximum diffuse reflection white value ω . The extension function is shown in the following formula.

$$f\left(I(p)\right) = \begin{cases} s_1 \cdot I(p) & I(p) \le \omega \\ s_1 \cdot \omega + s_2 \cdot \left(I(p) - \omega\right) & I(p) > \omega \end{cases} \tag{7}$$

$$s_1 = \frac{\rho}{\omega} \tag{8}$$

$$s_2 = \frac{1-\rho}{I_{\max} - \omega} \tag{9}$$

I is the normalized brightness, $I_{max}=1$, and ρ is the brightness ratio assigned to the diffuse reflection part. Through a series of experimental verification, it is found that $\rho=0.66$ is the best percentage.

Figure 1: (a)Original Image, (b)Diffuse Reflection Part, (c)Specular Reflection Part.

Hsia proposed a model based on image brightness classification. The flowchart is shown in Figure 2.

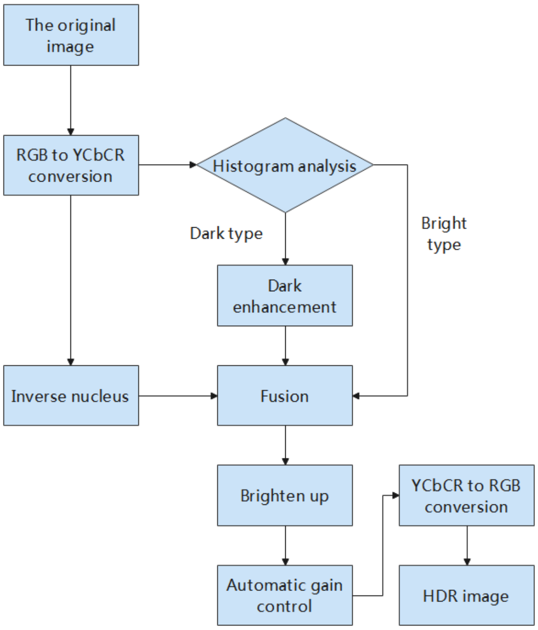

Figure 2: Hsia Algorithm Flow Chart.

First, the color space of the original image is converted from RGB to YCbCr. Luminance channel Y is used for histogram analysis. Moreover, the image is classified into a dark type, a light type, an extreme type, and a normal type. The inverse kernel generation is composed of three steps: 2×2 maximum value filling, 3×3 low-pass filter and inversion process. The inverse kernel is used to fuse the dark-enhanced image. After brightness enhancement, AGC is used to control the global brightness of the image. Furthermore, the result is converted into RGB color space by YCbCr to generate the final HDR image.

Use histogram analysis to estimate the brightness distribution of the image. Based on the results obtained from the histogram analysis, the image is divided into four categories: dark type, light type, extreme type and normal type. The dark type means that most areas of the image are at a darker level, the bright type means that most areas of the image are at a lighter level, and the extreme type means that most areas of the image are at a lighter or darker level. The normal type is except for the above three. In this case, the histogram analysis is used to estimate the brightness distribution of the image.Based on the results of histogram analysis, the image is divided into four categories, namely dark type, light type, extreme type and normal type. The dark type means that most areas of the image are at a darker level, the bright type means that most areas of the image are at a lighter level, and the extreme type means that most areas of the image are at a lighter level or a darker level. The normal type is the type other than the above three cases. This method designs two parameters Hi and Lo for classification, as shown below:

$$Hi=\sum_{i=Th3}^{Th4} h(i)+\sum_{i=Th4}^{255} h(i)\times 2 \tag{10}$$

$$Lo=\sum_{i=0}^{Th1} h(i)\times 2+\sum_{i=Th1}^{Th2} h(i) \tag{11}$$

$h(i)$ is the i-th order of the histogram. The figure below shows the histogram's brightness range threshold distribution.

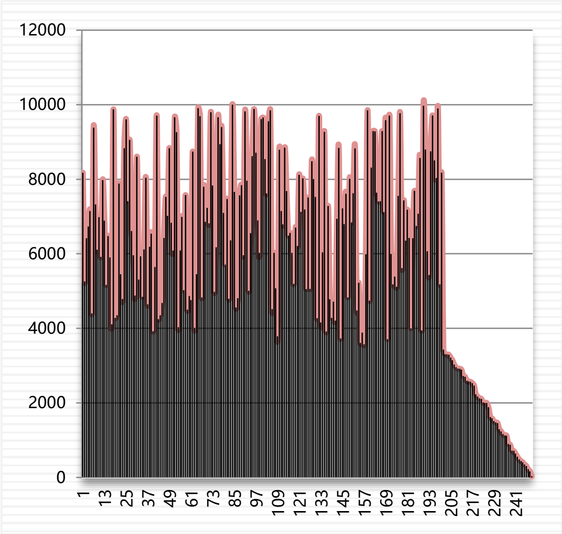

Figure 3: Histogram of Threshold Distribution.

The parameter Hi represents the proportion of all pixels of the entire image in the highlighted area whose brightness value is between the threshold $Th3$ and 255. The parameter Lo represents the ratio of the dark area with the brightness value of the image between the threshold value 0 to $Th2$ to all the pixels of the entire image. The threshold values $Th1$、$Th2$、$Th3$ and $Th4$ are 15, 50, 205, and 240, respectively. When Lo is greater than $2Hi$, it is a dark type. When Hi is greater than $2Lo$, it is a bright type.

The inverse kernel is generated in three steps, 2×2 maximum value filling, 3×3 low-pass filter and inversion process.

In the first step, the maximum filling is used to preserve the information of the finer objects in the image. The value in 2×2 block is used for maximum filling, and $Y_{\max}$ is the maximum gray value in 2×2 block, as shown in the following formula.

$$Y_{\max}=\max.\left(f_{i,j}, f_{i,j+1}, f_{i+1,j}, f_{i+1,j+1}\right) \tag{12}$$

$$\begin{bmatrix} f_{i,j} & f_{i,j+1} \\ f_{i+1,j} & f_{i+1,j+1} \end{bmatrix}=\begin{bmatrix} Y_{\max} & Y_{\max} \\ Y_{\max} & Y_{\max} \end{bmatrix} \tag{13}$$

In the second step, 3×3 low-pass filter is used to smooth the 2×2 maximum filling result. $y_{\max}(i,j)$ is the result of filling the 2×2 maximum value, as shown in the following formula:

$$y_{lpf}(i,j)=\frac{\sum_{k=-1}^{1}\sum_{l=-1}^{1} y_{\max}(i+k, j+l)}{9} \tag{14}$$

The third step is to invert the results generated in the first two steps. The purpose is to enhance the dark areas while avoiding oversaturation. Improve the quality of dark areas of the image by using a square linear function. For an 8-bit image, the details are as shown in the following formula.

$$y_{inv}(i,j)=\frac{\left(255-y_{lpf}(i,j)\right)^2}{255} \tag{15}$$

Merge

In order to compensate for dark and extreme types of dark areas, dark area pixels are enhanced with the following formula.

$$y_{dark}=\begin{cases} y_{in}(i,j)+\left(Th_{dark}-y_{in}(i,j)\right)\times 0.05 & y_{in}(i,j)<Th_{dark} \\ y_{in}(i,j) & y_{in}(i,j)\geq Th_{dark} \end{cases} \tag{16}$$

The threshold Th_{dark} is shown in the following formula.

$$Th_{dark}=\begin{cases} 128 & y_{in}=Dark\ type \\ 50 & y_{in}=Extreme\ type \\ 0 & y_{in}=Bright\ type \end{cases} \tag{17}$$

y_{in} is the input Y channel.

In type LCD backlight theory, y_{dark} is the original low dynamic range image, and y_{inv} is similar to the backlight signal. The formula (15) and formula (16) are merged as shown in the following formula.

$$y_{mix}(i,j) = y_{dark}(i,j) \times y_{inv}(i,j) \times k \tag{18}$$

k is the key parameter of the adaptive HDR image. Increasing the value of k can get a significant HDR enhancement effect. As the value of the backlight y_{inv} is higher, the dark areas will also become brighter. Conversely, a smaller value of y_{inv} can darken bright areas and avoid overexposure. Through a series of experiments, the k value is determined, as shown in the following formula.

$$k = 1.82 \times 10^{-8} \times Lo \times 0.009 \tag{19}$$

HDR image generation

The following formula is used to generate HDR images.

$$y_{HDR}(i,j) = \begin{cases} y_{mix}(i,j) + \left(y_{dark}(i,j) - 50\right)^2 \times 0.005 & y_{dark}(i,j) \geq 50 \\ y_{mix}(i,j) & y_{dark}(i,j) \leq 50 \end{cases} \tag{20}$$

A model based on the scene classifier is proposed, and the flowchart is shown in Figure 4.

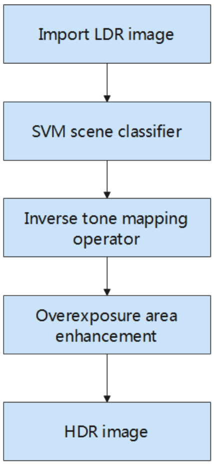

Figure 4: Kuo Algorithm Flow Chart.

This algorithm uses Schlick's tone mapping operator, and by reversing it, an inverse tone mapping operator can be obtained, as shown in the following formula.

$$L_{\omega} = \frac{L_d L_{\max}}{p(1 - L_d) + L_d} \tag{21}$$

The algorithm uses LIBSVM to train the scene classifier. In general, the application of SVM needs to extract features from training data and labels. After training, the output model should be usable to classify data. The data set SUN is used as training data.The output of the SVM scene classifier is of three types. The three types are bright, medium, and dim. These three categories represent three levels of scene brightness, namely high brightness, medium brightness, and low brightness. Due to the three brightness levels and dynamic range, image pixels can be mapped to match the scene according to parameters. For example, scenes under the moonlight will be classified into the dim category. The medium category is usually the brightness of indoor scenes, and the bright category usually contains the brightest scenes such as sunlight. In other words, the classification of the image is related to the brightness level and histogram, not the objects in the image.The ambient brightness under the sun is about $10^5\, cd/m^2$, the indoor light ambient brightness is $10^2\, cd/m^2$, and the moonlight ambient brightness is $10^{-1}\, cd/m^2$. We assume that $L_{\max}$ in the three cases is 10 times the ambient brightness.

The SVM scene classifier can work normally in most cases. However, under the boundary conditions of scene changes, it will lead to false detections. In order to compensate for this effect, use lens detection to improve. Assume that all frames of the shot should be the same scene.

The overexposed area of the image is processed by Rempel's method. A method of enhancing the saturation region based on a semi-automatic classifier is proposed. The flowchart is shown in Figure 5.

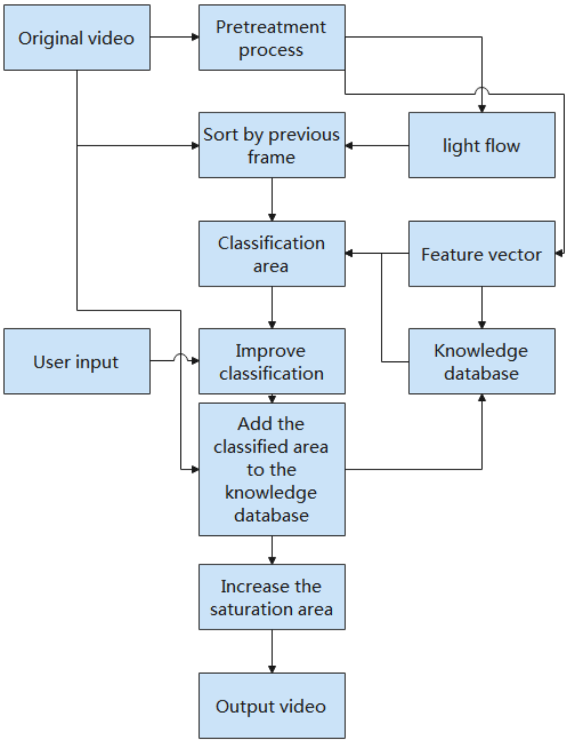

Figure 5: Flow Chart of Didyk Algorithm.

The original video is first preprocessed to avoid time delay. In the preprocessing process, calculating the density motion flow, detecting the saturated area, and calculating the feature vector, these will be used in the classification process.In the user-assisted step, the saturated area is first classified automatically. If the previous frame is available, the application stream of the previous frame is used to match the area to improve the classification.

If the saturated area cannot be tracked, that is, there is a new object or scene switching, the automatic classifier based on the previously calculated feature vector is used to classify the area.After that, the classification result is displayed to the user, and the user decides whether the classification needs to be modified. User input is used to update the knowledge database and used to train the classifier. Finally, the areas classified as light or reflective are enhanced.

4 STATISTICS OF CULTURAL HERITAGE TOURISM INFORMATION BASED ON IMAGE FEATURE EXTRACTION TECHNOLOGY

Based on self-media online tourism geographic information, this paper conducts in-depth research on the mining method and visualization method of tourism geographic information from theoretical research and practical application.GIS secondary development technology, traditional framework construction, AutoNavi map service and HTML+CSS front-end technology are combined to visualize the mining results. After that, a visualization platform for tourism information mining results based on self-media is constructed, and information collection and statistics are carried out through the image feature extraction technology in this paper.

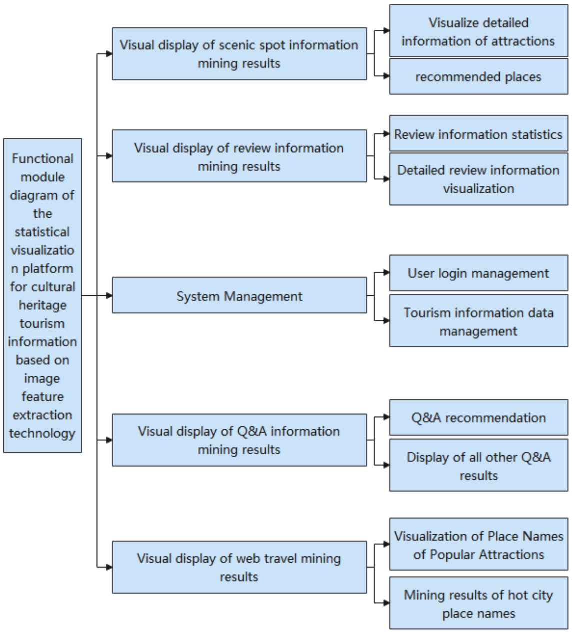

Figure 6: Functional Module Diagram of the Statistical Visualization Platform for Cultural Heritage Tourism Information Based on Image Feature Extraction Technology.

As shown in Figure 6, it is a functional module diagram of a cultural heritage tourism information statistical visualization platform based on image feature extraction technology.

The platform is divided into modules to display tourism information mining results, which are mainly divided into scenic spot information mining result visualization module, review information mining result visualization display module, system management module, question and answer information mining result visualization module, and web travel mining result visualization module. Each functional module includes two functional modules

Due to the different types of cultural heritage resources that can be developed for tourism products and the differences in cultural cognition and the needs of tourists, the product system structure established should also have a rich level to meet the needs of tourism products of different levels of tourists' cultural cognition and learning ability, and to achieve the sustainable development of cultural heritage. With reference to related scholars' research on the cultural tourism product system architecture, it is believed that the cultural heritage tourism product system architecture can be roughly divided into three levels: basic, critical, and core (Figure 7). Constructed the cultural heritage tourism product system architecture (MES), including cultural heritage material recognition tourism products (M), cultural heritage behavior experience tourism products (E), cultural heritage spiritual cultural learning tourism products (S) three types of product combinations

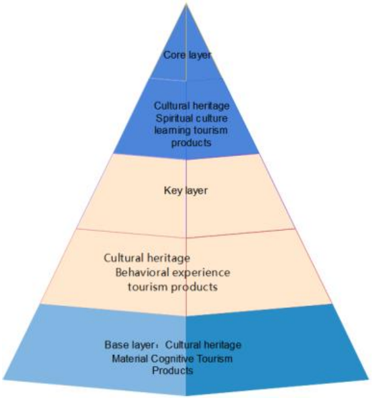

Figure 7: Cultural Heritage Tourism Product System Architecture.

5 PERFORMANCE VERIFICATION OF CULTURAL HERITAGE TOURISM INFORMATION STATISTICAL SYSTEM BASED ON IMAGE FEATURE EXTRACTION TECHNOLOGY

This paper combines image feature extraction technology and constructs a cultural heritage tourism information statistical system. Moreover, this paper constructs an image feature recognition module based on actual needs, applies it to cultural heritage tourism, and builds a corresponding system. Next, this paper needs to verify and analyze the performance of the system. This article uses this system to analyze the video surveillance system of cultural heritage tourist attractions for a total of three months from November 1, 2020 to January 31, 2020, and collect relevant information. In addition, this paper conducts manual check on the tourism information results obtained to judge its accuracy. The obtained results are shown in Table 1 and Figure 8.

Data	*Accuracy(%)*	*Data*	*Accuracy(%)*	*Data*	*Accuracy(%)*
2020/11/1	*89.63*	*2020/12/1*	*89.93*	*2021/1/1*	*86.75*

2020/11/2	*87.13*	*2020/12/2*	*88.36*	*2021/1/2*	*84.45*
2020/11/3	*83.38*	*2020/12/3*	*86.02*	*2021/1/3*	*87.38*
2020/11/4	*84.51*	*2020/12/4*	*86.39*	*2021/1/4*	*87.80*
2020/11/5	*85.94*	*2020/12/5*	*89.87*	*2021/1/5*	*81.91*
2020/11/6	*93.53*	*2020/12/6*	*93.80*	*2021/1/6*	*79.27*
2020/11/7	*80.39*	*2020/12/7*	*81.57*	*2021/1/7*	*90.42*
2020/11/8	*91.60*	*2020/12/8*	*91.19*	*2021/1/8*	*87.97*
2020/11/9	*80.21*	*2020/12/9*	*81.49*	*2021/1/9*	*89.05*
2020/11/10	*93.84*	*2020/12/10*	*87.40*	*2021/1/10*	*92.70*
2020/11/11	*89.40*	*2020/12/11*	*92.76*	*2021/1/11*	*94.07*
2020/11/12	*84.49*	*2020/12/12*	*86.66*	*2021/1/12*	*88.16*
2020/11/13	*91.49*	*2020/12/13*	*91.96*	*2021/1/13*	*85.44*
2020/11/14	*81.99*	*2020/12/14*	*89.32*	*2021/1/14*	*86.56*
2020/11/15	*91.83*	*2020/12/15*	*92.29*	*2021/1/15*	*93.91*
2020/11/16	*82.97*	*2020/12/16*	*91.75*	*2021/1/16*	*86.76*
2020/11/17	*86.08*	*2020/12/17*	*89.24*	*2021/1/17*	*94.63*
2020/11/18	*89.81*	*2020/12/18*	*90.52*	*2021/1/18*	*81.93*
2020/11/19	*90.63*	*2020/12/19*	*89.96*	*2021/1/19*	*86.79*
2020/11/20	*90.32*	*2020/12/20*	*87.12*	*2021/1/20*	*80.51*
2020/11/21	*83.00*	*2020/12/21*	*82.34*	*2021/1/21*	*83.59*
2020/11/22	*87.44*	*2020/12/22*	*88.82*	*2021/1/22*	*91.55*
2020/11/23	*82.98*	*2020/12/23*	*83.48*	*2021/1/23*	*90.84*
2020/11/24	*88.21*	*2020/12/24*	*80.83*	*2021/1/24*	*89.54*
2020/11/25	*79.77*	*2020/12/25*	*94.85*	*2021/1/25*	*79.19*

2020/11/26	*87.00*	*2020/12/26*	*92.17*	*2021/1/26*	*81.74*
2020/11/27	*88.90*	*2020/12/27*	*91.45*	*2021/1/27*	*92.55*
2020/11/28	*94.09*	*2020/12/28*	*79.26*	*2021/1/28*	*81.04*
2020/11/29	*79.51*	*2020/12/29*	*92.54*	*2021/1/29*	*84.33*
2020/11/30	*92.98*	*2020/12/30*	*85.27*	*2021/1/30*	*90.99*
	89.93	*2020/12/31*	*88.61*	*2021/1/31*	*92.84*

Table 1: Statistical Table of the Statistical Accuracy of Tourism Information of the Cultural Heritage Tourism Information Statistical System Based on Image Feature Extraction Technology.

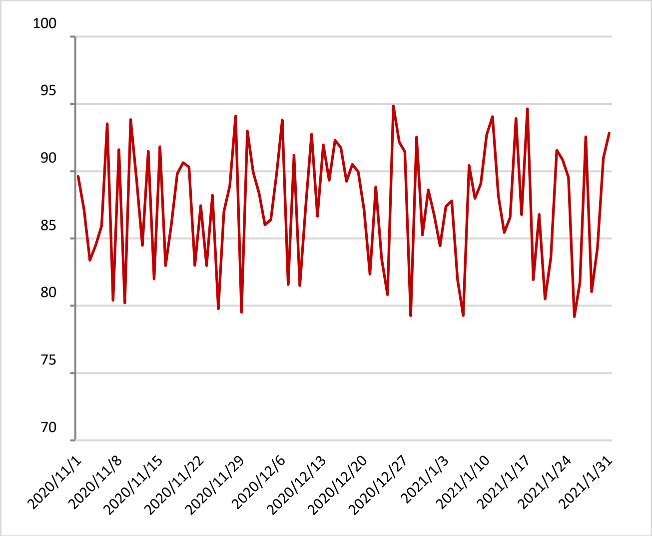

Figure 8: Statistical Diagram of the Statistical Accuracy of Tourism Information of the Cultural Heritage Tourism Information Statistical System Based on Image Feature Extraction Technology.

After using this system to analyze the video surveillance system of cultural heritage tourist attractions for a total of three months from November 1, 2020 to January 31, 2020, we can see that the cultural heritage tourism information statistical system based on image feature extraction technology constructed in this paper meets the actual needs of information statistics. Next, this paper analyzes the data mining effect of the system constructed in this paper, and data mining can provide a more reliable resource utilization strategy for the cultural heritage tourism industry. The results are shown in Table 2 and Figure 9.

Data	*Scores*	*Data*	*Scores*	*Data*	*Scores*
2020/11/1	*73.56*	*2020/12/1*	*79.34*	*2021/1/1*	*81.65*

2020/11/2	*73.28*	*2020/12/2*	*81.74*	*2021/1/2*	*82.40*
2020/11/3	*82.85*	*2020/12/3*	*72.40*	*2021/1/3*	*71.86*
2020/11/4	*71.85*	*2020/12/4*	*76.50*	*2021/1/4*	*84.52*
2020/11/5	*73.85*	*2020/12/5*	*73.15*	*2021/1/5*	*78.79*
2020/11/6	*81.02*	*2020/12/6*	*73.43*	*2021/1/6*	*75.33*
2020/11/7	*82.22*	*2020/12/7*	*73.33*	*2021/1/7*	*79.24*
2020/11/8	*83.63*	*2020/12/8*	*73.40*	*2021/1/8*	*71.66*
2020/11/9	*73.83*	*2020/12/9*	*71.79*	*2021/1/9*	*77.71*
2020/11/10	*77.99*	*2020/12/10*	*73.56*	*2021/1/10*	*73.13*
2020/11/11	*84.83*	*2020/12/11*	*71.38*	*2021/1/11*	*71.88*
2020/11/12	*82.81*	*2020/12/12*	*82.79*	*2021/1/12*	*74.69*
2020/11/13	*74.80*	*2020/12/13*	*76.30*	*2021/1/13*	*77.58*
2020/11/14	*84.80*	*2020/12/14*	*75.71*	*2021/1/14*	*81.50*
2020/11/15	*73.22*	*2020/12/15*	*73.75*	*2021/1/15*	*79.43*
2020/11/16	*73.73*	*2020/12/16*	*78.58*	*2021/1/16*	*78.09*
2020/11/17	*74.54*	*2020/12/17*	*80.43*	*2021/1/17*	*83.68*
2020/11/18	*76.50*	*2020/12/18*	*79.26*	*2021/1/18*	*82.33*
2020/11/19	*72.08*	*2020/12/19*	*82.06*	*2021/1/19*	*75.69*
2020/11/20	*73.90*	*2020/12/20*	*77.36*	*2021/1/20*	*84.92*
2020/11/21	*77.56*	*2020/12/21*	*82.31*	*2021/1/21*	*74.10*
2020/11/22	*76.70*	*2020/12/22*	*80.17*	*2021/1/22*	*73.44*
2020/11/23	*72.19*	*2020/12/23*	*78.47*	*2021/1/23*	*72.29*
2020/11/24	*81.08*	*2020/12/24*	*76.68*	*2021/1/24*	*79.52*
2020/11/25	*80.17*	*2020/12/25*	*84.77*	*2021/1/25*	*84.18*

2020/11/26	*83.05*	*2020/12/26*	*71.36*	*2021/1/26*	*81.05*
2020/11/27	*73.05*	*2020/12/27*	*73.08*	*2021/1/27*	*74.23*
2020/11/28	*73.37*	*2020/12/28*	*83.94*	*2021/1/28*	*72.57*
2020/11/29	*74.02*	*2020/12/29*	*80.97*	*2021/1/29*	*79.00*
2020/11/30	*80.87*	*2020/12/30*	*73.27*	*2021/1/30*	*80.85*
		2020/12/31	*79.30*	*2021/1/31*	*80.21*

Table 2: Statistical Table of the Data Mining Effect of the Cultural Heritage Tourism Information Statistical System Based on Image Feature Extraction Technology.

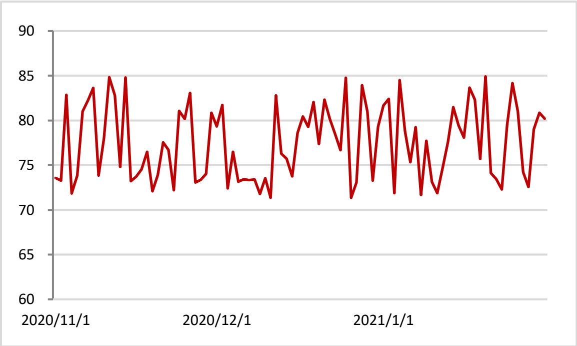

Figure 9: Statistical Diagram of the Data Mining Effect of the Cultural Heritage Tourism Information Statistical System Based on Image Feature Extraction Technology.

It can be seen from the above chart that the cultural heritage tourism information statistical system based on image feature extraction technology constructed in this paper performs well in tourism information data mining, so the system constructed in this paper can be applied to tourism information statistics.

6 CONCLUSION

With the development of social economy, people's living standards are constantly improving, and the requirements for tourism quality are also increasing. How to promote the sustainable development of tourism through tourism management informatization has become an important issue that the government, tourism management departments and tourism industry are paying more and more attention to. In the protection of historical and cultural heritage, the spatial distribution, geographical factors and the impact of human activities should be fully considered, and an appropriate zoning plan should be selected on this basis. This paper builds a cultural heritage tourism information statistical system based on image feature extraction technology, visualizes the mining results, and builds a visualization platform for tourism information mining results based on self-media, and uses the image feature extraction technology in this paper to collect and count information. The performance of the system constructed in this paper is verified through experimental research, and the research shows that the system constructed in this paper has a certain practical effect.

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REFERENCE

[1] Soleymanpour, M.; Marvi, H.: Text-Independent Speaker Identification Based on Selection of the Most Similar Feature Vectors, International Journal of Speech Technology, 20(1), 2016, 1-10. https://doi.org/10.1007/s10772-016-9385-x

[2] Mohammad Mojaveriyan.; Hossein Ebrahimpourkomleh.; Seyed Jalaleddin Mousavirad.: IGICA: A Hybrid Feature Selection Approach in Text Categorization, International Journal of Intelligent Systems Technologies & Applications , 8(3), 2016,42-47. https://doi.org/10.5815/ijisa.2016.03.05

[3] Aghdam, M.H.; Heidari, S.: Feature Selection Using Particle Swarm Optimization In Text Categorization, Journal of Artificial Intelligence & Soft Computing Research, 5(4), 2015, 38–43. https://doi.org/10.1515/jaiscr-2015-0031

[4] Zahra Robati.; Morteza Zahedi.; Najmeh Fayazi Far.: Feature Selection and Reduction for Persian Text Classification, International Journal of Computer Applications, 109(17), 2015, 1-5. https://doi.org/10.5120/19414-9005

[5] Tehseen Zia.; Qaiser Abbas.; Muhammad Pervez Akhtar.: Evaluation of Feature Selection Approaches for Urdu Text Categorizatio, International Journal of Intelligent Systems Technologies & Applications, 07(6), 2015, 33-40. https://doi.org/10.5815/ijisa.2015.06.03

[6] Tehseen zia.; Muhammad Pervez Akhter.; Qaiser Abbas.: Comparative Study of Feature Selection Approaches for Urdu Text Categorization, Malaysian Journal of Computer Science, 28(2), 2015, 93-109.

[7] De Li.; Xue Zhe Jin.; LiHua Cui.: Text Recognition Algorithm Based on Text Features, International Journal of Multimedia & Ubiquitous Engineering, 11(5), 2016, 209-220. https://doi.org/10.14257/ijmue.2016.11.5.19

[8] Yan, K.; Li, Z.; Zhang, C.: A New Multi-Instance Multi-Label Learning Approach for Image and text classification, Multimedia Tools & Applications, 75(13), 2016, 7875-7890. https://doi.org/10.1007/s11042-015-2702-6

[9] Kumar.; Ganesh.; Vivekanandan, K.: Intelligent Model View Controller Based Semantic Webservice Call Through Mishmash Text Featuring Technique, Journal of Computational & Theoretical Nanoscience, 14(4), 2017, 2021-2029. https://doi.org/10.1166/jctn.2017.6537

[10] Brown, G.T.L.; Hanna, E.: Swedish Student Perceptions of Achievement Practices: The role of Intelligence, Intelligence, 69(3), 2018, 94-103. https://doi.org/10.1016/j.intell.2018.05.006

[11] Beigi, A. M.; Maroosi, A.: Parameter Identification for Solar Cells and Module Using a Hybrid Firefly and Pattern Search Algorithms, Solar Energy, 171(4), 2018, 435-446. https://doi.org/10.1016/j.solener.2018.06.092

[12] Gotmare, A.; Patidar, R.; George, N. V.: Nonlinear System Identification Using a Cuckoo Search Optimized Adaptive Hammerstein Model, Expert Systems With Applications, 42(5), 2015, 2538-2546. https://doi.org/10.1016/j.eswa.2014.10.040

[13] Chen, Z.; Yuan, X.; Tian, H.: et al. Improved Gravitational Search Algorithm for Parameter Identification of Water Turbine Regulation System, Energy Conversion and Management, 78(5), 2014, 306-315. https://doi.org/10.1016/j.enconman.2013.10.060

[14] Kelly, B. S.; Rainford, L. A.; Darcy, S. P.: et al. The Development of Expertise in Radiology: in Chest Radiograph Interpretation,"Expert" Search Pattern May Predate "Expert" Levels of Diagnostic Accuracy for Pneumothorax Identification, Radiology, 280(1), 2016, 252-260. https://doi.org/10.1148/radiol.2016150409

[15] Patwardhan, A. P.; Patidar, R.; George, N. V.: On a Cuckoo Search Optimization Approach

Towards Feedback System Identification, Digital Signal Processing, 32(2), 2014, 156-163. https://doi.org/10.1016/j.dsp.2014.05.008

[16] Dzeng, R.J.; Lin, C. T.; Fang, Y. C.: Using Eye-Tracker to Compare Search Patterns Between Experienced and Novice Workers for Site Hazard Identification, Safety Science, 82(2), 2016, 56-67. https://doi.org/10.1016/j.ssci.2015.08.008

[17] Zhu, X.; Wu, B.; Huang, D.: et al. Fast open-World Person Re-Identification, IEEE Transactions on Image Processing, 27(5), 2017, 2286-2300. https://doi.org/10.1109/TIP.2017.2740564

[18] Koulayev, S.: Search for Differentiated Products: Identification and Estimation, The Rand Journal Of Economics, 45(3), 2014, 553-575. https://doi.org/10.1111/1756-2171.12062

[19] Kertesz-Farkas, A.; Keich, U.; Noble, W. S.: Tandem Mass Spectrum Identification Via Cascaded Search, Journal of proteome research, 14(8), 2015, 3027-3038. https://doi.org/10.1021/pr501173s

[20] Varley, J. B.; Miglio, A.; Ha, V. A.: et al. High-Throughput Design of Non-Oxide P-Type Transparent Conducting Materials: Data Mining, Search Strategy, and Identification of Boron Phosphide, Chemistry of Materials, 29(6), 2017, 2568-2573. https://doi.org/10.1021/acs.chemmater.6b04663

[21] Chen, Z. L.; Meng, J. M.: Cao, Y.: et al. A High-Speed Search Engine Plink 2 with Systematic Evaluation for Proteome-Scale Identification of Cross-Linked Peptides, Nature communications, 10(1), 2019, 1-12. https://doi.org/10.1038/s41467-019-11337-z

[22] Ayala, H. V. H.; dos Santos Coelho L.; Mariani, V. C.: et al. An Improved Free Search Differential Evolution Algorithm: A Case Study on Parameters Identification of One Diode Equivalent Circuit of a Solar Cell Module, Energy, 93(3), 2015, 1515-1522. https://doi.org/10.1016/j.energy.2015.08.019

[23] Brehm, M.; Imberman, S. A.: Lovenheim, M. F.: Achievement Effects of Individual Performance Incentives in a Teacher Merit Pay Tournament, Labour Economics, 44(5), 2017, 133-150. https://doi.org/10.1016/j.labeco.2016.12.008