Research on the Application of Artificial Intelligence Technology in Island Tourism

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**Abstract.** In this paper, the specific application of artificial intelligence technology in the field of island tourism is launched, and an intelligent recommendation system for island tourism is designed. The system considers the data characteristics of island tourism activities and the influence of geospatial factors. First, the relationship between the data is clarified by constructing the island tourism information ontology, and then geographic information data system (GIS) is added to the system architecture design. In terms of algorithm, artificial intelligence algorithm is used in combination with different recommendation methods. Finally, the feasibility of the scheme is proved through experiments.

**Keywords:** Artificial Intelligence, Island Tourism, Intelligent Recommendation, System Construction

1. **Introduction**

With the development and popularization of computer technology and information technology, many industries are constantly developing in the direction of intelligence. With its outstanding advantages, artificial intelligence technology has gradually become a powerful boost for the further development of the tourism industry. At present, the network resources in the tourism field are becoming more abundant. Using artificial intelligence technology to help tourists find their favorite content in a variety of tourism-related information will undoubtedly bring great convenience. This article takes the island tourism field as an object, discusses an artificial intelligence recommendation system applied to this object, in order to help tourists make travel decisions and meet their individual needs.

2. **Ontology construction of island tourism information**

Island tourism information is the basis for realizing the artificial intelligence recommendation function, but various data related to the island tourism field such as transportation, culture, scenic spots, sports and entertainment items are not only large in quantity, but also scattered. Therefore, it is necessary to realize the effective collection and management of information data by constructing the island tourism information body, so as to clarify the relationship between data and information, so that the information and data can be further processed.

This paper draws on relevant research experience and combines the characteristics of island tourism itself, and determines the construction of island tourism information ontology based on
sightseeing spots, transportation routes, characteristic culture, leisure projects, sports, event celebrations, etc., as shown in Figure 1.

![Figure 1. Ontology level of island tourism information](image)

The island tourism information ontology shown in Figure 1 is developed and constructed using Protege, and six types of information ontology are described using OWL. On this basis, this article uses Java to develop the island tourism intelligent recommendation system.

3. Design of an intelligent recommendation system for island tourism information

3.1. Architecture of Intelligent Recommendation System for Island Tourism Information

The spatial distribution between the ontologies such as sightseeing spots is relatively objective and fixed, while the time distribution between the ontologies such as event celebrations and characteristic culture is relatively flexible. Therefore, this paper organically combines the geographic information data system (GIS) with the island tourism information ontology to construct the island tourism information intelligent recommendation system as shown in Figure 2.
As shown in Figure 2, this system uses geographic information data system (GIS) to provide spatial information semantic integration, and at the same time provides a geospatial system of island tourism information ontology, so as to provide spatial data support for island tourism-related resources for the realization of the recommendation function. System users access and interact with the system through a Web application. When the user conducts tourism activities on the island, the island tourism information intelligent recommendation system will synchronously generate corresponding files and update and manage the files in the user database.

3.2. System user profile
In the island tourism information intelligent recommendation system designed in this article, the user database is responsible for storing system user configuration files, including demographic data, tourism activity-related information, etc. The system divides these data information into two parts: explicit information and implicit information.

Clear information is mainly collected in the form of questionnaires, including user information such as the number of tourists, travel time, and planned budget. The implicit information is mainly to mine the interactive behavior between the system user and the island tourism information intelligent recommendation system, and infer the content of interest to the system user through data analysis, and then combine the system user profile to calculate the tourist’s various island travel interest level of the project, and the calculation result is stored in the system user profile.

4. System recommended method
In order to be able to more accurately calculate the tourists’ interest in various island tourism projects, this article uses a combination of content-based methods and collaborative filtering methods based on relevant research results to break through the limitations of a single method.

4.1. Content-based approach
The content-based method is to compare the system user profile stored in the user database match with the island tourism information ontology based on the feature differences of different island tourism information ontology such as sightseeing spots, traffic routes, characteristic culture, leisure projects, sports, event celebrations, etc., the matching result is the interest degree value of the system user in each island tourism information body, the value is between -1 and 1, and the confidence level is also between -1 and 1.

By analyzing the initial user configuration file of the system based on the content, a list of the degree of interest of the system users to each island tourism information body can be obtained. After the user interacts with the system, by analyzing the specific interaction behavior of the user, the interest and confidence of the system user in the island tourism information body can be updated, as shown in Table 1.

| Action type               | Interest value | Confidence level |
|---------------------------|----------------|------------------|
| Add activities to the plan| 1.0            | 0.5              |
| Delete activities from the plan | -1.0         | 0.5              |
| Request details           | 1.0            | 0.2              |
| Evaluation activity       | [-1.0-1.0]     | 1.0              |
| No action                 | 0.0            | 0.0              |

As can be seen from Table 1, the interaction behavior between users and the system is divided into
5 types, including adding activities to the plan, deleting activities from the plan, requesting activity details, evaluating the activity, and no action. Different user behaviors correspond to different interest values and confidence levels. When the interest value is greater than 0, it means that the system user is interested in the current island tourism information ontology; if the interest value is lower than 0, it means that the system user is not interested in the current island tourism information ontology.

Referring to the island tourism information ontology level shown in Figure 1, each specific tourism activity can be mapped to a higher-level island tourism information ontology. Assuming a certain island tourism information ontology is \( c \), the information marked by the system user \( u \) is included in \( c \): the set of tourism activities is \( K_{u,c} \), then the mean value \( S^u(c) \) of system user's interest in tourism activities is:

\[
S^u(c) = \frac{\sum_{i \in K_{u,c}} S(i) \cdot CL(i)}{\sum_{i \in K_{u,c}} CL(i)}
\]

(1)

The average confidence level \( CL^u(c) \) is:

\[
CL^u(c) = \frac{1}{|K_{u,c}|} \sum_{i \in K_{u,c}} CL(i)
\]

(2)

The average value of interest and confidence level of system users in tourism activities are associated with the specific recommended content of the island tourism information intelligent recommendation system, and the system user profile is also updated as these two values change.

4.2. Method based on collaborative filtering

Collaborative filtering is a method based on feature items or user group opinions. After a new system user appears, it will measure similarity with other system users, find the most similar system user through comparison, and give recommendations. Specifically, to adopt a method based on collaborative filtering for recommendation, firstly, the clear information mentioned above is required, that is, the number of users, time, budget and other user information collected through questionnaires to obtain the value of the correlation between each factor and recommendation, and then use the clustering method to calculate the similarity between the two system users.

For system user \( u \) and system user \( v \), the similarity vector \( x = (x_1, x_2, \cdots, x_n) \), if they are the same in a certain user information attribute \( x_i = 1 \), otherwise \( x_i = 0 \). Combine the results of each attribute to get a new vector value. The similarities between system user \( u \) and system user \( v \) are:

\[
\omega_{u,v} = FPC(u, v) = \frac{1}{\sum_{i=1}^{n} x_i} \exp \left( \frac{\lambda(r_{u,j} - \bar{r}_u)(r_{v,j} - \bar{r}_v)}{\lambda} \right)
\]

(3)

In the formula, \( \lambda \) is the weight of the activity, and the recommendation is increased by adding \( \lambda \). If the confidence level of all system users on all island tourism activities is \( U \), the calculation confidence level of system users \( u \) on all island tourism activities is \( R_u \). Then the weight of the activity \( \lambda \) is:

\[
\lambda_{i1} = \log \left( \frac{|U|}{|U_i|} \right), \lambda_{i2} = \exp \left( \frac{|U_{ui}}{|U_u|} \right), \lambda_{i3} = \frac{|R_u|}{|R_i|}
\]

(4)

4.3. Hybrid approach based on content and collaborative filtering

The two methods mentioned above can analyze the interest of system users in various island tourism activities, and they also have a certain level of confidence. This article uses a combination of the two methods, the final degree of interest is averaged, and the confidence level is a weighted average:
\[ CL^u(c) = \frac{\sum_{i=1}^{6} CL^u_i(c)}{6} \] \hspace{1cm} (5)

\[ S^u(c) = \frac{\sum_{i=1}^{6} S^u_i(c)CL^u_i(c)}{\sum_{i=1}^{6} CL^u_i(c)} \] \hspace{1cm} (6)

According to the obtained final value, the intelligent recommendation system for island tourism information eliminates island tourism activities that are lower than the confidence level threshold, and then retrieves island tourism activities, sets the corresponding interest value and confidence level for each activity, and performs activities accordingly recommended sorting. The specific sorting rules are as follows:

1. If the confidence level of island tourism activity a is higher than that of island tourism activity b, then a has priority over b;
2. If the interest value of island tourism activity a is higher than that of island tourism activity b, then a has priority over b;
3. If the geographic space location of island tourism activity a outside the recommended list is less than 2km from the user’s current location, island tourism activity a will be added to the recommendation list;
4. If the above rules do not appear, they are sorted randomly.

4.4. Verification

According to the method described in this article, an intelligent recommendation system platform for island tourism information is constructed, and 100 tourists are selected for example verification in an island scenic spot. The results of statistical user feedback found that more than 85% of users believe that the island tourism activities recommended by the system match their own interests, and the island tourism information artificial intelligence recommendation system is feasible.

5. Conclusions

Based on artificial intelligence technology, this paper proposes a design scheme for an intelligent recommendation system for island tourism information, combining two intelligent recommendation methods. Experiments have proved the feasibility of the system, and the accuracy of its intelligent recommendation has reached a high level. With the development of artificial intelligence technology, the application prospects of artificial intelligence technology in the field of island tourism will be even broader.

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