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Design of Travel Itinerary Planning System Based on Artificial Intelligence

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Design of Travel Itinerary Planning System Based on Artificial Intelligence

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Abstract. The existing travel information on the Internet is cluttered, repetitive, and singular. It cannot provide tourists with accurate travel information and help tourists plan their trips rationally. To this end, this article establishes a travel planning system based on artificial intelligence. This article conducted a multi-threaded performance test for the route search submodule, and tested the tendency of the vertical search crawler to crawl the webpage as the number of multi-threads increased. In addition, this article conducted a stress test to test the system's increase in the number of concurrent users. System performance changes. The test results show that the system function basically meets the needs of users, and has good stability and efficiency.

Keywords: Artificial Intelligence, Travel Itinerary Planning, System Design, Route Search

1. Introduction

The functions provided by the existing travel itinerary planning system still have major defects. First, the development of the tourism industry has promoted the development of self-driving tourism and self-service tourism. The self-service tourism market has become a new tourism hot spot; and the planning results provided by the existing system are provided by tourism companies and agencies such as travel agencies [1, 2].

The details of these travel products are planned by travel agencies, and users generally cannot participate in the planning and design of these contents. Even in the Internet environment, the self-help planning of travel itineraries is basically completed manually by netizens. This status of self-help travel planning runs counter to the trend of digitalization and informatization of the tourism industry, and new research is urgently needed to fill the gap. Therefore, designing a travel planning system based on artificial intelligence is of great significance [3, 4].

This article first analyzes the main relevant status of the intelligent travel (IT) itinerary planning system, and then analyzes the existing itinerary planning system and market development trends, and proposes the system requirements of the IT itinerary planning system, and completes the overall design and detailed design of the system. Finally, the system prototype was realized, and the feasibility of the system proposed in this paper was verified by tests.

2. Proposed Method

2.1 Association Rule Mining

Association rule technology is also known as shopping basket analysis. Its proposed purpose is to find a certain internal connection between database items from a large amount of data, so as to improve the decision support ability of the application system [5, 6].

The association rules are defined as follows:

If the itemsets are $X \subseteq I, Y \subseteq I$ and $X \cap Y \equiv \varnothing$, the implications of the form $X \Rightarrow Y$ are called association rules, which means that a transaction T containing x itemsets is also likely to contain Y itemsets [7, 8]. Among them, X is called the former item set of association rules, and Y is the latter item set of association rules. If c% of the transactions that contain X also contain Y, then the confidence of the association rule $X \Rightarrow Y$ is called c%; if s% of the transactions in D contain $X \cup Y$, then the support of the association rule $X \Rightarrow Y$ is called s%, The calculation expressions are:

$$Support(X \Rightarrow Y)P(X \cup Y) \tag{1}$$

$$Confidence(X \Rightarrow Y) = P(Y|X) \tag{2}$$

2.2 Database Layer Design

The scenic spot information database mainly stores scenic spot information, including scenic spot name, place, profile, type, ticket budget, tour time, video storage path and other information. This database mainly provides data support for constructing the interactive platform processing process in the self-service route planning sub-module.

The province information database and city information database store province and city information divided by administration, that is, province name and city name information. These two tables mainly provide data support for the province-city linkage menu in the planning form.

The hotel information database stores hotel information including hotel name, hotel location, hotel star rating, hotel discount, hotel reservation, hotel service type, hotel address, hotel profile, hotel room type and price, etc.

The route information library stores finished planned route information; including route name, departure and destination, departure and return time, attractions along the route, schedule and other information. The route information database mainly provides data support for the finished route planning sub-module.

2.3 Module Design of Travel Planning System Based on Artificial Intelligence

(1) Detailed design of user information management module

The user fills in and submits the login form to enter the system through the login page, or fills in and submits the registration form to enter the system from the registration page. After successful login, the system encapsulates the user information into a user class and stores it in the session for invocation; at the same time, it jumps to different pages according to different user requests.For example, when the user proposes to view or modify the user's personal information, the user is provided with the user Information management services; or when users request travel itinerary planning, provide users with personalized information data for other modules. When the user logs out and logs out of the system, the user information management module updates the user personalized information in the user information database according to the information feedback from other modules.

(2) Detailed design of the trip planning module

Itinerary planning is the main function that this system needs to achieve, it provides users with a series of itinerary planning including travel arrangements, attractions, accommodation arrangements, transportation arrangements, etc.

1) Product planning sub-module

The finished product route refers to the tourism products in which all the route details are planned from the travel destination and travel time to the sightseeing spots, accommodation and transportation along the way. The finished product planning sub-module provides users with itinerary planning for such tourist routes: according to the planning requirements form submitted by the user, and calling the intelligent processing function of the intelligent processing module, it provides users with intelligent and personalized finished product planning routes. In addition to the basic functions of trip planning, this module also needs to provide users with functions such as favorite routes, route reviews, and route information query.

2) Route search submodule

The finished product planning sub-module has high operating efficiency and can provide intelligent and personalized trip planning services; however, the route provided by the module to users is read from the server-side database. The capacity of the database limits the amount of data for the finished product route; at the same time, the database update period is longer, which reduces the real-time nature of the finished product route. The route search sub-module combines vertical search technology to format and extract finished route data from major travel websites on the Internet according to the user's basic planning form, and outputs it to the user. More real-time advantages.

3) Self-help planning sub-module

The finished product planning sub-module and route search sub-module provide users with planned routes. The route details such as round-trip transportation, sightseeing spots along the way, and accommodation cannot be customized or modified by tourists. The self-service planning sub-module provides users with self-service planning services, enabling users to self-customize every detail of the travel route, and draw personalized travel planning routes.

4) Route information query submodule

After the planned route is obtained through the basic function module of travel itinerary planning, the route information query sub-module provides users with route related information query services, including traffic information query, accommodation information query, video playback of attractions, etc.

5) Plan route collection submodule

After the user completes the itinerary planning, the system provides the user with the function of collecting routes to facilitate the user to view the planned routes when logging in to the system at different locations.

6)Planning Route Comment Submodule

After returning from the trip according to the planned route, the user can comment on the planned route based on personal experience, including scoring and evaluation. The user's comment on the route can not only provide a direct reference for other users when planning, but also provide data for the system to mine the association rules between the user and the route.

(2) Detailed design of intelligent processing module

The development of tourism digitalization can not only provide tourists with convenient and fast tourist information services, but also make the realization of intelligent personalized services possible [9, 10].

The intelligent processing module mainly includes two parts of functions. One is to mine the intelligent relationships in the system based on the data of the user's system, and the other is to intelligently process the planning results of the trip planning module. When the user completes the travel itinerary planning, the system automatically records the user's route planning information, such as the route information that the user has viewed, the route information that the user has favorited, the route information that the user has rated, etc .; and according to the requirements of association rules mining, these The information is sorted and stored in the relevant database. When the system calls the intelligent processing module, the module reads the data to be mined from the relevant database, uses data mining algorithms to perform data mining on these data, and derives the association rules between user information and route information and stores them in association rules. database.

When the user is planning the travel itinerary, the itinerary planning module passes the preliminary planning results to the intelligent processing module; this module scores the preliminary planning results based on the fuzzy weight algorithm and the association rules between the user and the route; the preliminary planning is based on the route score The results are sorted by recommendation level, and the sorted intelligent planning results are sent back to the trip planning module [11, 12].

3. Experiments

3.1System Test

The system test environment is the local area network in the laboratory, and the test content is system performance test and stress test.

(1) System performance test

According to the nature of the system and actual needs, the performance of the travel planning system based on artificial intelligence mainly includes client response performance, network transmission performance and server performance. This paper uses the route search submodule as the main test object to test the system performance.

(2) Stress test

This paper takes the page response latency in the client response performance as the main indicator, and performs a load test on the system performance to measure the performance of the system running under a certain load. This test uses two test schemes, using virtual users to simulate the system load and operating pressure generated by actual users, and test the performance and stability of the system under different virtual pressures and long-term repeated running.

4. Discussion

4.1 Analysis of System Performance Test Results

With the route search submodule as the main test object, the system performance is tested. The results are shown in Figure 1.

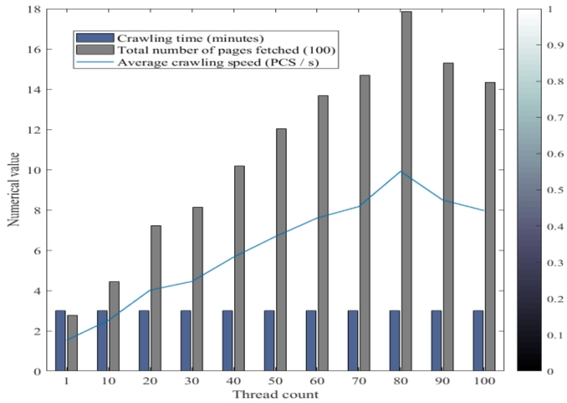

Figure 1. Analysis of system performance test results

It can be seen from Figure 1 that when multi-threaded crawling is used for vertical search of travel itinerary planning routes, the system performance will gradually increase to a peak as the number of threads increases; after reaching this peak, continuing to increase the number of parallel threads will instead make the system Decline. That is, as the number of threads increases, the speed of crawling web pages by the route search submodule can be significantly improved. However, when the number of threads reaches a certain value, the crawling performance will decrease. The reason is that the thread management will cause additional system resource overhead. When this part of the overhead is too large, the performance improvement brought by the multi-threading technology will be offset.

4.2 Stress Test Results Analysis

This test determines a regular database data volume, and gradually increases the number of virtual users under the condition that the data volume is unchanged. The system performance and its changes under different pressures of the number of virtual users are tested. The results are shown in Table 1.

Table 1. Analysis of pressure test results

Number of virtual users	Database order of magnitude	Recording page	Number of concurrent users	Execution time (s)
50	50000	Finished product route planning results page	12	0.5
80	50000	Finished product route planning results page	15	0.8
100	50000	Finished product route planning results page	20	1
120	50000	Finished product route planning results page	19	1.5
150	50000	Finished product route planning results page	26	2

It can be known from Table 1 that the system response speed is good under the condition that the number of virtual users is increasing and a large number of concurrent operations are performed. During the test, the system runs stably without adverse reactions, and the system runs well under extreme pressure conditions. The test results show that the system has good stability and efficiency, and has realized an open and shared, unified standard, and rich content artificial intelligence travel itinerary planning system.

5. Conclusions

Based on the analysis of the existing system and the development trend of the tourism market, this paper designs an artificial intelligence-based travel itinerary planning system and three main functional requirements for the IT itinerary planning system: finished product route planning function, self-service route planning function, and route search function . This paper tests the feasibility of the system through experiments.

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