Student Personal Sustainability Assistant

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1 Introduction

Recommendation is a basic technology to provide personalized media experience, which is widely used in various personalized products to solve some common contemporary problems and optimize user experience.

Due to the well-developed network facilities in modern society, all kinds of complicated choices are swarming, which will also be mixed with a lot of poor-quality information that does not meet the user's preferences, especially in the selection of travel destinations, routes, travel methods, etc.(Abdul et al., 2013), allowing students to and other groups that have not yet contacted society have serious choice difficulties.

At the same time, unreasonable forms of tourism and travel will also produce a large amount of carbon emissions, which has an immeasurable impact on the environment and does not conform to the principle of sustainable development.

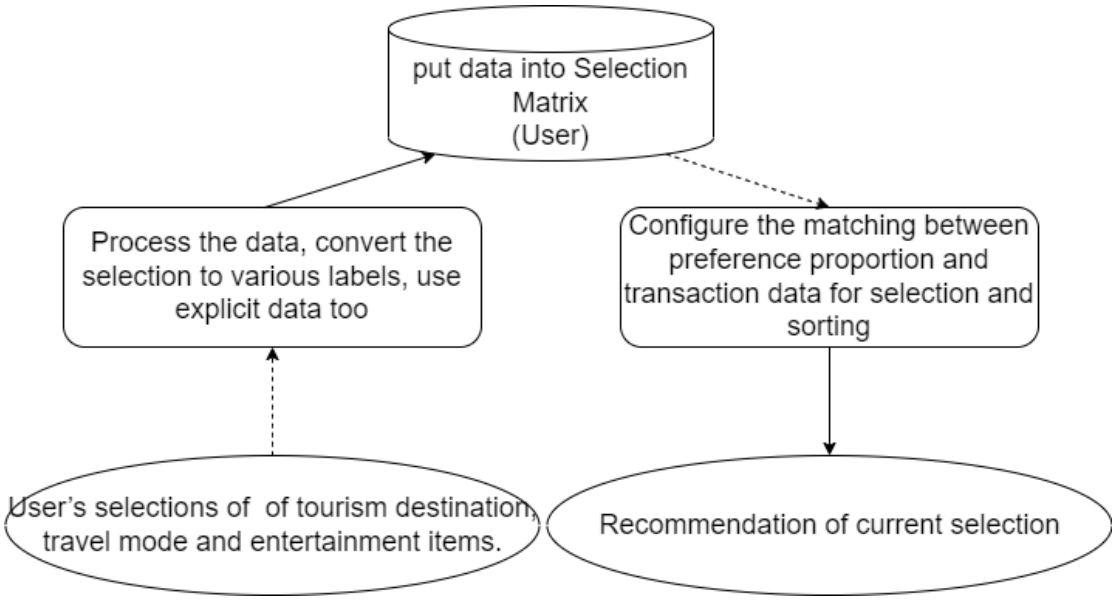
In response to these phenomena, the experiment designed an online questionnaire about tourism and low-carbon environmental protection and distributed it in universities, because these students are more representative and common in tourism. For specific questions, see the appendix.

The collected results are saved in mysql database and processed by java language. The results show that most people are confused by the above problems and need an application that can alleviate the problem. In addition, research shows that travel destinations, travel methods, and entertainment items are also the highest choices Three needs, along with a large number of people expressing concern for privacy.

Based on the above situation, this paper will discuss a system for assisting students to travel, Student Personal Sustainable Tourism Assistance system. Recommendations are made after comprehensive consideration, one is user preference, the other is sustainable development, and the above needs are covered, including travel destinations, travel methods, and entertainment items. In addition, the protection of user privacy will also be one of the needs.

2 Architecture

2.1 Schema of user-adaptive systems



2.2 Data Collection

In terms of collecting user information, the system adopts explicit and implicit methods. The data is sent to the back-end for processing through java, and finally stored in mysql database.

2.2.1 Explicit Data

At the display data level, it is actively input by the user. The user will make a series of input, user account information, travel plan information, and various branch selection information. These information will be encrypted by the front end, and then transmitted to the back end through ajax in json format. Decrypt with the key, then parse and store.

2.2.2 Implicit Data

On the implicit data level, the system will obtain the device information used by users, such as mobile phone and PC information, through sessions and cookies.(Tai et al., 2022) And if the user gets the user's location information through the device's IP, LAN, or third-party services when traveling, etc.(Logesh et al., 2018)

2.3 Modelling Method

In this paper, the user model is constructed by sample weighting and feature extraction. Multi objective optimization is carried out through Sample Weight to ensure that while a main objective is guaranteed, the data distribution is changed by transforming other characteristic values into sample weights, so as to achieve the effect of optimizing other objectives.(Debnath et al., 2008) Convert different targets into the same target, and determine the sample weight according to online AB test.(Renjith et al., 2014)

2.4 Application Operation Process

When the user initially uses it, the system will ask the user to go through several question and answer steps to complete the user's personal preference initialization Of course, the user can also skip initialization, and the preferences can be adjusted in the system settings later. At the same time, the program will also be selected and optimized by the system in subsequent trips.

Each choice of users in each trip will affect the proportion of parameters in various recommendations of the system for different types of tourism, so as to make recommendations closer to users' preferences.

When users start to use the system, the system will recommend similar tourist destinations and routes to users.

If the user specifies a destination, the system will provide different routes and travel modes, as well as scenic spots and entertainment places similar to those set in the destination.

For a instance, if the user chooses to go to London in the UK during a trip, the system will label the ancient buildings, Britain, Europe, islands and other places that belong to the destination, and the parameters used to recommend tourist locations will be improved. After selecting cruise ship travel and city driving, the system will adjust. When there are waterways in the future, the system will more recommend shipping, and when in the city, the system will more recommend driving.

On this basis, in addition to the best options recommended by the system, a mixed user preference option will be proposed from another perspective of sustainable development, carbon emissions, to meet user needs and preferences as much as possible while achieving the goal of environmental protection.(Renjith et al., 2014) One scenario is that the system will recommend users to drive based on user preferences, and it will also give another recommendation, to drive electric cars or bicycles, Balance user preferences and sustainable ideas in a certain proportion. The proportion used for weighting will also change with user preference.

3 Methods

3.1 Recommender Method

This paper uses a content - based recommendation algorithm. The core of this algorithm is that the content-based algorithm will take into account the attributes of the item itself, according to the user's previous historical behavior on the selection, such as the destination, travel mode, entertainment items, etc., and then calculate options

similar to these attributes, and recommend them to users.(Debnath et al., 2008) For example, if a user has previously selected an amusement park in Hangzhou as an entertainment project, then the user can be recommended some facilities related to the amusement park around the destination.

The implementation of content-based recommendation algorithm is as follows:

 Select some representative features to represent each option.

 Use the user's historical behavior data to analyze these features of the options, so as to learn the user's preferences or interests, that is, to build a user model.

 By comparing the user model obtained in the previous step with the model to be recommended (composed of the features of the options to be recommended), recommend the first K options with the greatest relevance to the target user.

Two core formulas for calculation:

$$sim(u,s) = \sum_{s_i \in U} score(s_i) * sim(s_i, s) \quad Rec(u) = \sum_{s_i \in U} \{s_j | s_j \in kNN(s_i)\}$$

3.2 Data acquisition

3.2.1 Background Data

Part of the data comes from the user's initial use. The system will require the user to go through several question and answer steps to complete the user's personal preference initialization.

Second, if the user skips the initial stage, the application will use a third-party service, kaggle, to select the current popular tourism csv file, process it through java, take the results as background data, and embed the model into the user as the initial attribute.

Third, the application will directly use the third-party service, kaggle, to obtain tourism plans and labels related to carbon emissions and environmental protection. Through processing such csv files, it will extract various characteristic values and build a sustainable tourism model.

3.2.2 Input Data

Each choice of users in each trip will affect the proportion of parameters in various recommendations of the system for different types of tourism, so as to make recommendations closer to users' preferences.(Logesh et al., 2018)

When the user starts to use the system, the system will recommend the tourist destinations and routes with similar preferences to the user, and record the user's choice this time.

When the user specifies a destination, the system will provide different routes and

travel modes, as well as scenic spots and entertainment venues similar to those set in the destination, and record this selection.

If the trip is over, the application will extract features from each selection recorded, model the trip, compare it with the models formed in the past, find the corresponding models, and increase the proportion of this feature value.

4 Critical Review

4.1 Strength

4.1.1 pros of recommender method

Content based recommendation algorithm is the most intuitive algorithm, which takes solving the needs as the primary goal, and can well realize the user's preference needs.(Debnath et al., 2008)

Second, this algorithm often relies on text similarity calculation, and these data can be easily obtained through the interaction between applications and users.

Third, this algorithm can be implemented in Java. Spring boot can be used to modularize it, which can solve the cold start problem well, and will not be limited by the heat.

Fourth, the data transmission of this algorithm is relatively convenient, most of which are text information, which are sent to the back end for data processing and model building.

4.1.2 pros of user privacy protection

Another consideration of the system is the user's privacy. When the user uses the system, there will be many inputs such as destination, route, entertainment mode, etc. If these are recorded and disclosed, the user's privacy will be greatly violated Based on this problem, the system adopts session based data storage and transmission, and encrypts the user's input in sha-2, md5 and other ways.(Tai et al., 2022) The user's current travel plan is only saved locally. When accessing, it is transmitted to the server in the form of a session and encrypted. At the same time, the server uses Redis storage and sets the session expiration time. After that, it is destroyed. At the same time, the system will not force users to record their historical travel. Instead, after each trip, each selected record will be labeled, and different parameter proportions will be changed to ensure that the recommendation is still valid. After processing, the system will send information to users about whether to keep this record. If not, it will be deleted.

4.2 Limitatin

4.2.1 cons of recommender method

First of all, content-based recommendation algorithms are easily limited by the detailed description of text, image, audio and video content. Inappropriate option settings will reduce the accuracy of the system's processing of user preferences.

Second, due to the over specialization of this algorithm, items that have been recommended to users with closely related content lose the diversity of recommended content.(Debnath et al., 2008) As a result, the recommended topics are too concentrated, which weakens the user's surprise.

Third, this recommended algorithm consumes a lot of performance. It requires a high-performance Linux server as the back-end, or uses distributed servers to distribute the computing power consumption.

4.2.2 cons of inferior selection

This is an influencing factor that fluctuates with users. When users use this application carefully, good positive feedback can be generated. However, when users choose options in tourism at will, the model built will add too many undesirable features. This information is redundant for a good model, and will greatly increase the burden on back-end servers.

In addition, such action will also reduce the accuracy of feedback, making users unable to get a better experience, a vicious circle.

5 Link to prototype

https://www.bilibili.com/video/BV1bv4y1m7Aw/?spm_id_from=333.999.0.0&vd_source=1dfd6f91b58588a5c83517782e7443d7

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7 Questionnaire Attachment

List of core questions:

1. Do you travel frequently?
2. Is it difficult to choose a tourist destination?
3. Is it difficult to choose a travel route?
4. Is it difficult to choose a travel mode?
5. Is it difficult to choose entertainment items in tourist destinations?
6. Whether to support environmental protection and emission reduction
7. Are you very sensitive to personal privacy?
8. Would you like an app to provide these support