Design and Realization of Campus ID Card Management System

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Abstract

Campus ID Card Management System is widely used in colleges and universities in China, which is used in students' daily life on campus and greatly improves the management efficiency of schools. The campus card system stores data of students' consumption level, water consumption time, book borrowing habits and punching in class. Therefore, the campus card data analysis system uses data mining technology to deeply analyze these data, thus discovering potential laws and valuable conclusions, providing important digital basis for improving school service level, perfecting campus management and school leadership decision-making, and laying a solid foundation for the future construction of smart campus. According to the demand of data mining, the campus Campus ID Card data analysis system preprocesses all the data stored in Campus ID Card and then constructs a new Campus ID Card data set. Finally, the data in Campus ID Card data set is analyzed by K-Means++ clustering algorithm, and the data rules are obtained.

Keywords

Campus ID Card Management System; Data Mining Technology; Campus Management; K-Means++.

1. Analysis of current situation

At present, the campus Campus ID Card system in many colleges and universities has been perfected. The system takes the campus IC card as the carrier and is used by students in all aspects of campus life. Students use the IC card to start hot water bathing, consume in canteens and supermarkets, borrow books in libraries and so on, which will generate a large amount of data every day. According to statistics, on average, a Campus ID Card system in a university will produce more than 60,000 records in one day, but these records are not used.

The campus Campus ID Card data analysis system described in this paper is mainly to deeply mine a large amount of data generated by the campus Campus ID Card system, and then process the seemingly ordinary data containing students' behaviors and living habits, and finally draw the required conclusions, providing important decision-making suggestions for school education and management services.

2. Data mining technology

Data mining refers to the process of searching hidden information from a large amount of data through algorithms. Data mining is usually related to computer science, and achieves the above goals through statistics, on-line analytical processing, information retrieval, machine learning, expert system (relying on past empirical rules) and pattern recognition.

Main steps of data mining process:

1. Define the problem. The first and most important requirement before starting knowledge discovery is to understand data and business problems. In this paper, we need to use the data to know whether the students are poor students, the students' bathing time, the types of books borrowed by the students, and the students' clock-in situation.

2. Establish data mining database. Establishing data mining database includes the following steps: data collection, data description, selection, data quality evaluation and data cleaning, merger and

integration, metadata construction, data mining database loading and data mining database maintenance.

3. Analysis of data. Select or extract useful data, remove redundant fields, merge the same field and delete some redundant data.

4. Prepare data. This is the last step of data preparation before establishing the model. This step can be divided into four parts: selecting variables, selecting records, creating new variables and converting variables.

5. Build the model. Modeling is an iterative process. Different models need to be examined carefully to determine which model is most useful for the business problem faced. First, a part of the data is used to build the model, and then the rest of the data is used to test and verify the model. Sometimes there is a third data set, called validation set, because the test set may be affected by the characteristics of the model, so an independent data set is needed to verify the accuracy of the model. Training and testing data mining models need to divide the data into at least two parts, one for model training and the other for model testing.

6. Evaluation model.

7. Implementation.

3. Function design of all in Campus ID Card

Management center subsystem: the main function of the system is to realize the pre setting function of the system, including setting the card issuing machine function, configuring the user terminal, protecting the user privacy, and at the same time, it can timely detect and handle the abnormal situation of the user terminal.

User center subsystem: this system has the function of managing user's basic data, including the management of user's department information, user's identity information, user's cancellation information and so on. In order to facilitate other sub modules to call the data of the module.

Business card printing center subsystem: the main function of this system is to store user card data information, and provide users with card handling, loss reporting and card replacement services. It also has the functions of bank card automatic recharge, user cash deposit and withdrawal.

Statistical center subsystem: the main function of the system is to count the consumption of supermarkets, water and canteens, the dining details of users, and the cash deposit and withdrawal of users.

4. Data mining algorithm design

According to the statistics, a university's data volume reaches 60000 or more a day, so the amount of data in Campus ID Card is large. In order to improve the extraction efficiency, the Campus ID Card system adopts the combination of total extraction and incremental extraction (M26) in data extraction, and controls the incremental extraction and full extraction mode by controlling the time stamp of extraction.

5. Data preprocessing

Campus ID Card data preprocessing operations include data cleaning, integration, transformation and loading (m29), etc.

Data cleaning: after a large amount of data is generated, there will be unnecessary data. Data cleaning routines "clean up" data by filling in missing values, smoothing noisy data, identifying or removing outliers, and resolving inconsistencies. The main goal is to achieve the following goals: format standardization, abnormal data elimination, error correction, duplicate data elimination. In this paper, the data cleaning is mainly from the consumption data in Campus ID Card, for example, some consumption records are less and the consumption cost is higher can be ignored. The purpose of consumption data is to evaluate poor students, so some consumption data with small proportion of

consumption cost and consumption frequency is the key point, and the higher consumption data can be "cleaned up".

Data integration: according to the integration routine, the data in multiple data sources are combined and stored uniformly. The process of establishing data warehouse is actually data integration. In the integration of Campus ID Card data, on the one hand, different types of similar consumption records are fused and integrated, and redundant fields are removed, and the same field is merged to improve the efficiency of data mining.

Data transformation: through smooth aggregation, data generalization, normalization and other ways to transform data into a form suitable for data mining. In this system, we can get the data from the business system such as Campus ID Card consumption, book borrowing and water drawing, eliminate the useless fields such as students' name and major, and convert the data into usable fields; after integrating the data of different businesses in the system, the data in different formats will be transformed into the data with uniform format; when analyzing the consumption amount of students, we can calculate the attribute, It is necessary to calculate the total consumption of students in a month or a certain period of time; the system normalizes the total consumption amount and the balance value of students; when evaluating poor students, the average consumption amount of students in each stage is processed, and the average consumption value of students can be calculated by calculating the total consumption amount of a certain stage divided by the number of consumption records.

6. Data storage

After preprocessing the extracted data, the system uses mongodb database to store all-in-one data. The biggest feature of Mongo is that the query language supported by Mongo is very powerful. Its syntax is a little similar to the object-oriented query language. It can realize almost all the functions of single table query in relational database, and it also supports data indexing.

7. Data mining

In this paper, a well-defined K-means++ algorithm is used for clustering analysis of Campus ID Card data.

7.1 Cluster analysis of poor students

In order to improve the accuracy of cluster analysis, according to the situation of Campus ID Card data, the highest, middle and lowest consumption values are obtained, which are defined as the initial values of the three clustering centers. After the cluster analysis of students' consumption data, the consumption level of students can be obtained, which provides data support for the evaluation of poor students in schools.

7.2 Cluster analysis of water card consumption

The K-means ++ algorithm is used to cluster the data, and the data are clustered according to the "date" and "region" fields in the data. It is found that the distribution of water cards is closely related to the time attribute, and the water use time and water use area of students are obtained, so that the school can reasonably arrange the water burning time and the expansion of the area.

7.3 Cluster analysis of books borrowing and reading in Library

From the data in the "time" and "book category" fields of the library lending information data, we can find out which kind of books are borrowed more frequently and which books have never been lent out, so as to provide help for library book purchasing. The conclusion can also be drawn from the borrowing time, so that the library can reasonably adjust the opening and closing time.

8. Conclusion

The timeliness and convenience of campus card application system, as well as the storage of data, determine that the campus card system has become an important and indispensable carrier for the construction of smart campus. Through the relevant data resources accumulated by campus smart

card, as well as the educational administration, books, network and other related application systems for the media of Campus ID Card, its data almost covers all the daily behaviors and records of students in school, and it will play an important role in information mining and utilization.

This paper focuses on the construction of campus smart card system, carries out the research on smart campus and smart management, and carries out data mining on students' Campus consumption, water card consumption, book borrowing and other information. These information can reflect the law of students' life and consumption in school. In this paper, K-means++ clustering algorithm data mining algorithm is used to analyze the internal laws of student consumption data, water consumption data and book borrowing information in Campus ID Card data, complete the data mining of Campus ID Card data, form a visual chart, present the description results of data analysis, and give relevant suggestions and conclusions or early warning opinions, It provides data support for the assessment of poor students, water supply time, book purchasing direction and the formulation of various policies and systems, so as to provide decision support and intelligent service for school education, management and service.

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