Research and Exploration of a new Model of Physical Dance Teaching Based on the Background of Big Data

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Abstract. With the rise of Internet technology and the advent of the Big Data era, the number of Internet sites and users is increasing dramatically. The amount of information, knowledge and data being generated is also enormous. It is becoming increasingly difficult for users to access the data they want, and in the era of big data, the two main means of obtaining accurate information are search and recommendations. With the continuous progress of society, the reform of basic education and the overall development of quality education, traditional dance teaching methods have gradually failed to meet the needs of modern teaching. This study combines PBL (problem-based learning) with secondary school dance teaching to explore the feasibility of this teaching method in dance teaching practice and to illustrate the effectiveness of the implementation of this teaching method. This paper combines and does some research on intelligent learning methods and teaching and training models on top of incorporating big data algorithms, making a breakthrough and progress in the field of i-virtual teaching, which is the research and analysis of a new teaching model enriched by new teaching methods.

Keywords Big data; Physical dance; Teaching dance; PBL Teaching Method

1 Introduction

With the development of society, the concept of student-centred teaching is gaining more and more attention. The 18th Party Congress emphasised the importance of providing education that satisfies the people, deepening comprehensive reform in the field of education, and vigorously promoting equity in education so that every child can become a useful person [1]. With the advent of emerging Internet technologies and the mobile Internet era, not only are the number of Internet users increasing in this time when people are initially entering the era of big data, but the number of mobile Internet users far exceeds that of the traditional Internet, both in terms of the number of web pages on traditional sites and those on emerging mobile Internet sites, which are increasing exponentially [2]. It is also because the traditional e-commerce shopping, book reading and music media are complex and numerous. Nowadays, people want to find the information, knowledge and data they want in such a huge data set is like looking

S. Yacob et al. (eds.), *Proceedings of the 2023 7th International Seminar on Education, Management and Social Sciences (ISEMSS 2023)*, Advances in Social Science, Education and Humanities Research 779,
https://doi.org/10.2991/978-2-38476-126-5_74

for a needle in a haystack, and as the Internet has a trend of gradual platformization, and each Internet platform has banned search engine indexing and has the traffic entrance in its own hands, it has become increasingly difficult to obtain the data they want by means of search engines. Therefore for platform users the advantages of each platform's respective in-platform search system, in-platform big data analysis system, and platform information recommendation system become important [4]. Therefore, search and recommendation are the two main means by which people can effectively access information at present [3]. Among them, search requires users to be manually inspired to belong to passive search, while recommendations can be actively pushed by the platform based on the results of the user's big data analysis, making the platform users in the process of obtaining useful information to add some intelligence, but also make the user search and platform operation more efficient.

2 Research and presentation of basic technologies

2.1 Current status of big data research

The current state of research in big data analytics, which is closely related to the research and design of this platform, includes both an introduction to big data analytics and the main technical tools [5][6].

2.2 Hadoop Framework

Hadoop is an open source framework written in Java to store massive amounts of data and run distributed analytics applications on distributed server clusters, with HDFS and MapReduce as its core components [7]. MapReduce, one of the core components of Hadoop, is a computing framework: the core idea of MapReduce computing is to distribute large computing tasks to be executed in a cluster of servers within a computing cluster. By splitting the computational task (Map computation-Reduce computation) and then computing the task according to a task scheduler (JobTracker), this is known as distributed computing [8].

The main components of the Hadoop framework are shown in Figure 1.

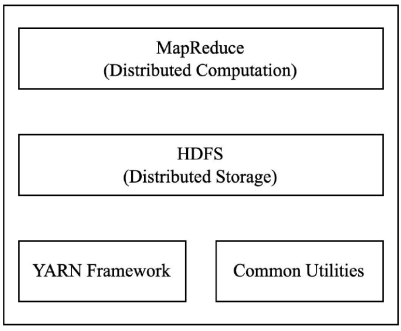

Fig. 1. Hadoop main components hierarchy diagram

The applications that Hadoop can implement are big data storage, with its distributed storage; log processing, which is good at log analysis; ETL (Extract-Transform-Load): extracting data to Oracle, MySql, DB2, Mongdb and mainstream databases; and also data mining, which is currently popular for advertising recommendations, personalised advertising recommendations, etc [10]. Beyond this is machine learning, such as the Apache Mahout project implementing machine learning algorithms described below [9].

2.3 C/S architecture

The traditional C/S architecture is also not flexible enough to meet the cross-platform support and the development workload is huge. As the system needs to display different content according to different users and also make personalised recommendations, traditional static web pages are also not possible. This is why the B/S (browser/server) model development architecture, with the development of dynamic web technologies, has become the first development solution for modern software systems. The popular server-side dynamic web interaction technology is now one of the main technologies for developing B/S-based online platforms, and JSP is one of the more mature dynamic web technologies currently in use. JSP pages are ultimately translated into HTML format by the JSP container, which can be used with mainstream web technologies such as HTML5, JavaScript and CSS3. A diagram of the B/S structure model developed based on JSP dynamic development web technology is shown in Figure 2.

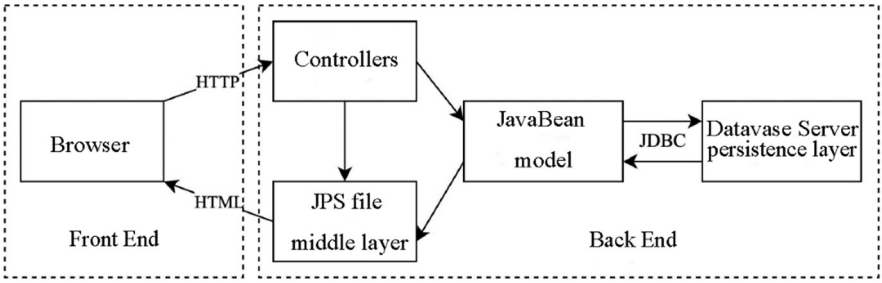

Fig. 2. Development model for B/S architecture

2.4 SpringMVC development framework

Now the mature MVC development pattern that is Model-View-Controller design pattern, which mainly reduces the coupling of objects in the Service layer and Dao layer objects to reduce the development difficulty, in the design and development of this platform uses the SpringMVC framework developed in accordance with this pattern, its working principle is shown in Figure 3 above: domain model layer (Model): the data model is mainly used to store the data of the properties of the objects in the system business, such as user information, song information, etc. The View presentation layer

(View): displays specific business data to the user. Application control layer (Controller): responsible for the execution of functional logic code and business data interaction between the Model and View layers.

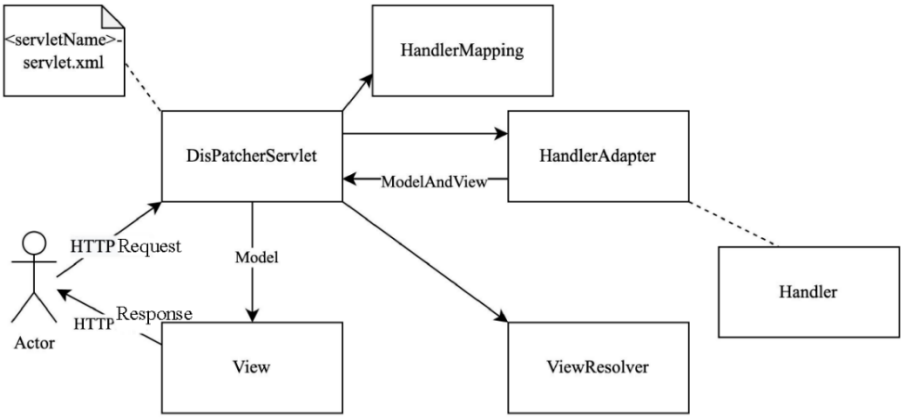

Fig. 3. Schematic diagram of the SpringMVC framework MVC pattern

2.5 MyBatis framework

MyBatis framework is a relatively low resource consumption of J2EE data persistence layer ORM framework. ORM, Object Relational Mapping, maps Model objects to relational database tables, and the DAO layer can perform CRUD operations on their corresponding data tables by manipulating Java Model objects through MyBatis. Its JDBC-based implementation is used for the DAO layer data manipulation methods.

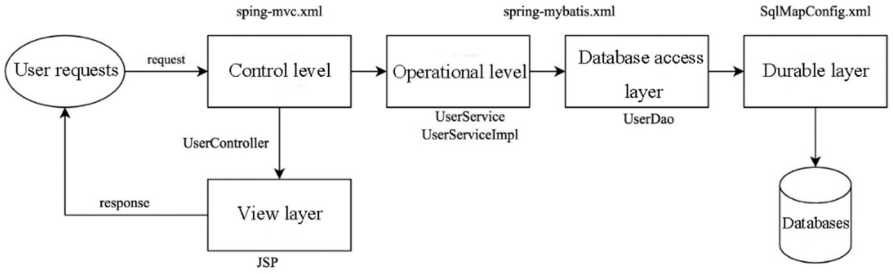

Fig. 4. Diagram of the role of the MyBatis framework in the MVC development model

The position of the MyBatis framework in the system architecture is shown in Figure 4. MyBatis framework is a persistence layer framework, the data persistence layer does not need to write business-specific implementation of SQL statements and Java code, it is focused on connecting to operate the database. Using MyBatis framework will focus development attention on the business level, you can improve the efficiency of

the application DAO layer development, improve code readability, improve system maintainability.

3 Fuzzy KNN algorithm

3.1 Dissimilarity metric

Similarity between multidimensional data objects is usually expressed using distance as a criterion for proximity between data samples.

(1) Minkowski Distance.

Min's distance is a very common measure of the distance between data points and is a definition of a set of distances. The definition of Min's distance is shown in equation (1):

$$d_q(x_i, x_j) = ||x_i - x_j||_q = (\sum_{d-1}^{D} |x_{id} - x_{jd}|)^{\frac{1}{q}} \tag{1}$$

where, $q \in [1, \infty)$, Min's distance can be seen as a general format for distance quantification. The Manhattan Distance when $q = 1$, the Euclidean Distance when $q = 2$, and the Chebyshev Distance when $q \to \infty$.

The variance is the square of the standard deviation, which refers to the average of the distances from each point in the data sample set to the mean point and reflects the dispersion of the data set. The formula for calculating the standardised Euclidean distance is shown in equation (2):

$$d(x_i, x_j) = (\sum_{d-1}^{D} \left| {(x_{id} - x_{jd})}/{S_d} \right|)^{\frac{1}{2}} \tag{2}$$

(2) Camberra Distance.

The Lancet distance is a dimensionless quantity that is less affected by singular values and is suitable for data with a high degree of bias. It is a self-standardised quantity, but it does not take into account the intercorrelation between the data components.

For everything $X > 0$, the formula for the Lang distance is shown in equation (3):

$$d(x_i, x_j) = \frac{1}{D} \sum_{d-1}^{D} \frac{|(x_{id} - x_{jd})|}{x_{id} + x_{jd}} \tag{3}$$

(3) Mahalanobis Distance.

The Marxist distance is an effective method for calculating the similarity between sets of data samples, expressing the covariance distance of data that obey the same distribution. Covariance is a measure of the correlation statistic between variables in a multidimensional data set. If its covariance matrix is a unit matrix, it becomes a Euclidean distance; if the covariance matrix is a diagonal matrix, i.e. the variables are independent of each other, then the Marcian distance degenerates to a weighted Euclidean distance with the inverse of the standard deviation as the weighting. Let the covariance be $\sum > 0$ then the formula for calculating the Marxist distance is shown in equation (4):

$$d(x_i, x_j) = (x_i - x_j)` \sum^{-1} (x_i - x_j) \quad (4)$$

The advantages of the Marginal distance are that it is not disturbed by the scale, is not associated with the units of measurement of the original data sample and can be calculated successfully in the vast majority of cases.

4 Conclusion

This paper studies collaborative filtering recommendation algorithms based on music big data, and analyses the problems of collaborative filtering recommendation algorithms. In response to these problems, a user-based collaborative filtering song recommendation algorithm implemented under the Hadoop platform is proposed, and the algorithm is combined with other algorithms and applied in the fully personalised recommendation module of the music big data analysis system designed in this paper. The system designed in this paper mainly contains modules such as basic user functions, home page music display, recommended music display, user behaviour functions, administrator management of music information, etc. The analysis of the algorithm and the design of the system are combined with the Hadoop distributed platform and the Mahout algorithm framework. The music recommendation algorithm based on big data is the core algorithm of the key functions of this system. The music recommendation algorithm applied in this system not only improves the intelligence of the music platform, but also has a good recommendation accuracy rate, which shows that the music platform proposed in this paper also has certain feasibility and realizability.

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