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Retraction

Retracted: Design and Implementation of Sports Industry Information Service Management System Based on Data Mining

Advances in Multimedia

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] H. Zhang, "Design and Implementation of Sports Industry Information Service Management System Based on Data Mining," *Advances in Multimedia*, vol. 2022, Article ID 1470953, 6 pages, 2022.

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Research Article

Design and Implementation of Sports Industry Information Service Management System Based on Data Mining

Hang Zhang

College of Physical Education, Anhui Polytechnic University, Wuhu 241000, Anhui, China

Correspondence should be addressed to Hang Zhang; 201904217311@stu.zjsru.edu.cn

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With the continuous development of sports in China, the tentacles of the sports industry have extended to all walks of life in China. At the same time, with the development of information and network, the information exchange between enterprises and between enterprises and between enterprises and customers is also increasing. How to use the existing information technology to provide enterprises and customers with special information about the sports industry has become a focus of the author's thinking. Combining the development of our city's sports industry, based on B/S mode, with ASP.NET for the development of technology, designed specifically for sports enterprises and users to provide an information exchange platform, this paper studies the user-based collaborative filtering recommendation algorithm and its application in sports industry information service management system, to design and develop the corresponding sports industry information service management system.

1. Introduction

With the continuous upgrading of the sports industry and the wave of changes brought by informatization to sports enterprises, sports enterprises must strengthen the construction of modern informatization in this era, so as to expand their own sales channels and gain the channel competitive advantage in the fierce market competition. At the same time, a variety of different sports facilities and venues are also in hot development with people's health concepts. Under the condition of informatization, how to effectively integrate the relevant sports resources of our city so as to improve the communication and cooperation among sports production enterprises, users, and sports intermediaries has become the key topic of current resources integration. In this paper, with the help of the current network, the use of ASP.NET technology, and UML modeling technology, to build an information service platform, in order to strengthen the cooperation and communication between enterprises [1, 2].

To provide users with relevant information services related to sports enterprises, so as to strengthen the cooperation between enterprises and between enterprises and between enterprises and users; users can view all sports venues, including gyms, gyms, and other relevant information, and can achieve online booking of the sports venues. The system can provide a large number of enterprise training, sports enterprises to exchange information, and to provide specialized related conference cooperation [3] and can download or watch a large number of online fitness videos, in order to guide the public more scientific scientific experiments. The related information announcement may understand the government in the sports industry-related dynamics, the sports enterprise activity, and so on [4].

2. System Requirements Use Case Analysis

According to UML use case analysis, the system is divided into three different roles: member, visitor, and system administrator. The overall use case analysis of the system is shown in Figure 1. Through the use case analysis above, we can divide the functional modules of the system into the following types: system management: this module is mainly aimed at system administrators, and system parameters can be set; the second is the management of registered users and the allocation of permissions so that different

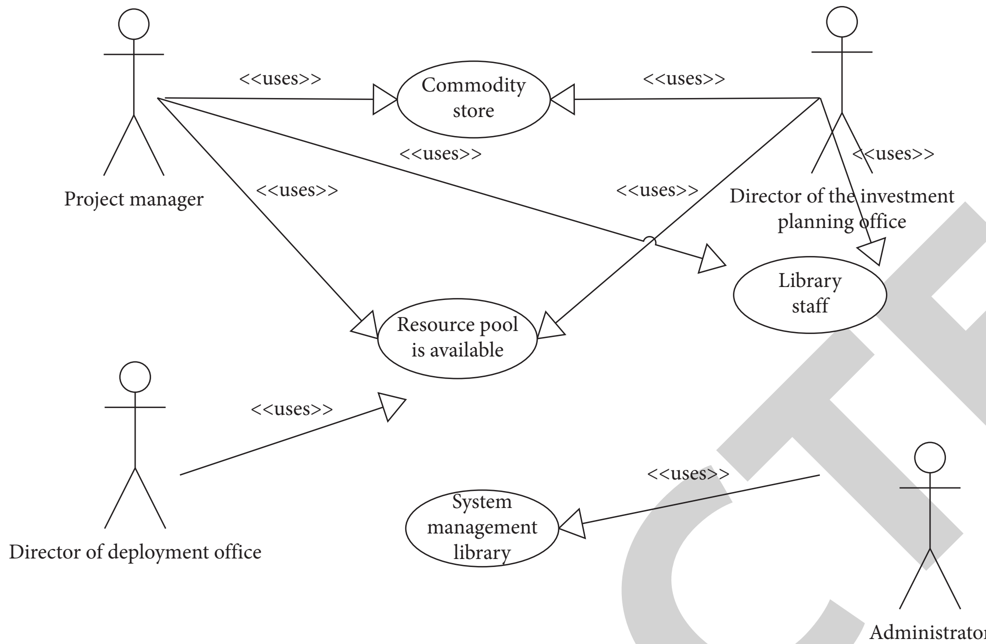

Figure 1: Overall system use case diagram.

permissions can be used for different functions. News release belongs to the administrator category. The news release is divided into news announcements and government dynamics. Among them, news bulletins release relevant industry news and activities of different sports enterprises; The government dynamic is mainly related to the government's support for the sports industry and other related policies issued. Online booking is mainly for the online booking registration of city's sports venues and facilities, and it can achieve sports venues, fitness center online registration, and other functions so as to improve the efficiency of sports venues.

Enterprise information release is mainly aimed at member enterprises of the system. After paying a certain amount of membership fee, member enterprises can release relevant product information in the system and realize online reservation service. Fitness video is mainly divided into video upload and watch. Video uploads are for enterprise and system administrators. Through the release of enterprise information, users can watch relevant fitness videos and corporate culture propaganda. Online communication is mainly in the form of BBS, in the community system, to provide the majority of users to communicate with each other plate. Under BBS, it is divided into enterprise perspective, health tips, supplier community, sports technology exchange, and so on.

3. Overall System Architecture Design

The system adopts the current popular B/S mode. The main reason is that the model belongs to a three-tier structure. Compared with the traditional C/s, the model in the web server has strong advantages in different levels of data processing, data processing, and logic processing.

The user only installs a web browser and does not need to install a client interface to achieve access to relevant data.

The presentation layer mainly USES the web browser and USES ASP.NET technology to realize dynamic pages. The browser makes an Action request and sends it to the web server, which then passes the request for data to the corresponding logical function according to the rules of logical processing. Logical layer: this layer is mainly composed of the web server and logical business. At the same time, the logical layer plays the role of connecting the preceding and the following in the three-layer structure, so as to realize the normal transmission of user request data. Therefore, the coupling and extensibility of this layer are very important for the system design. In this system, we add the class library lyzj. userlimitmv.ibll to realize the encapsulation of business logic interface data, so as to prevent data tampering when accessing. At the same time, we have another three different interfaces: IUserInfoService, IRoleService, and IBaseService. And we edit the corresponding reference code realization of the data access layer. Data access layer: this layer has mainly a variety of data query and other functions and adds a data interface. The ADO.NET interface is used to access the data. Meanwhile, the database system of this website adopts SQL Server2008 data management system. This is because the system has certain advantages in security and stability. Its specific architecture is shown in Figure 2.

4. Personalized Recommendation Technology of the Sports Industry Information Service Management System

The sports industry information service management system has revolutionized the traditional business transactions, which requires the transformation from

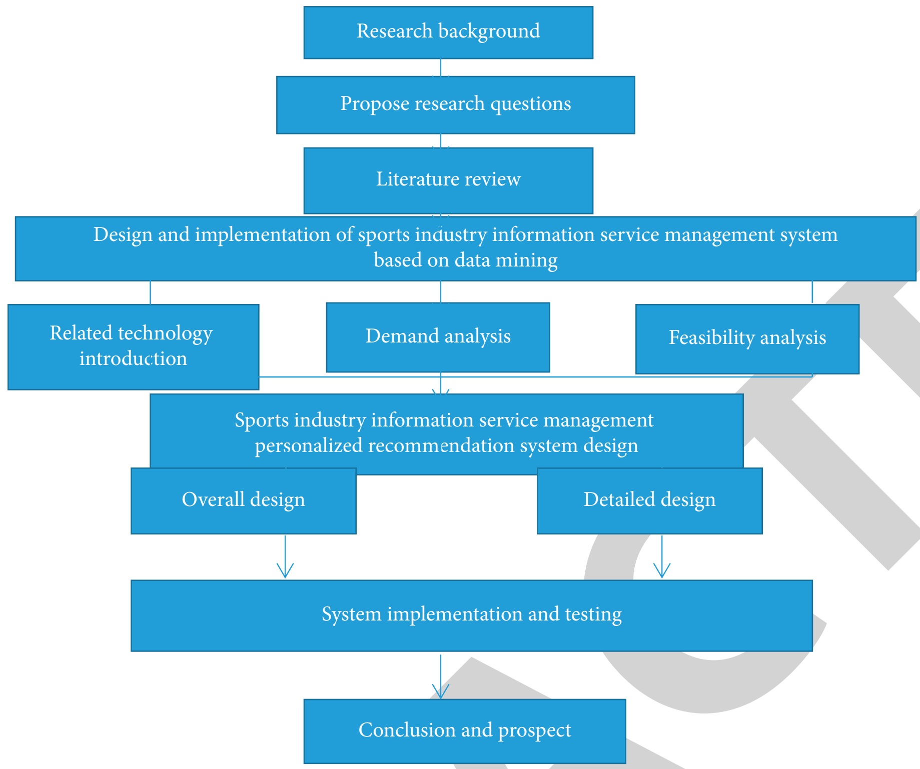

Figure 2: The framework of the paper.

"product centered" to "customer-centered" and "customer-centered" new business models [5]. It is necessary to differentiate products from target customers, provide what they need around customer service, and provide personalized services for each customer. In this context, the recommendation system came into being [6]; it is based on the user's personal preferences, habits to recommend information, and commodity procedures. The website of the sports industry information service management system can use the recommendation system to analyze customers' consumption preferences, recommend products to each customer specifically, help users select the commodities that suit their needs from the huge commodity catalog, and provide personalized services for each customer as far as possible [7–11].

Personalized recommendation technology, by studying the interests of different users, can take the initiative to recommend the most needed resources for users, so as to better solve the contradiction between the increasingly large Internet information and user needs. At present, recommendation technology is widely used in the sports industry information service management system, digital libraries, news websites, and other systems. Various technologies suitable for recommendation systems emerge at the right moment, such as collaborative filtering technology (CF), Bayesian network technology, cluster analysis technology, association rule technology, neural network technology, and graph model technology, among which collaborative filtering is the most widely used personalized recommendation technology. Collaborative filtering recommendation is divided into model-based collaborative filtering and user-based collaborative filtering. Later, professor Sarwr proposed a project-based collaborative filtering algorithm in 2001.

The classification standard of recommendation technology: literature [11] gives the two-dimensional attributes to distinguish the recommendation technology: (1) the degree of automation, whether the customer needs explicit input information to get the recommendation of the recommendation system; (2) the degree of persistence, the recommendation system produces recommendations based on the customer's current single session or multiple sessions based on the customer. Some scholars also believe that in addition to the above two characteristics, the degree of personalization is also an important indicator for the evaluation of recommendation technology, which can be used to reflect the degree of the recommendation results in line with users' interests and hobbies.

Collaborative filtering is mainly based on user experience and Suggestions with similar attributes or interests as the basis of providing personalized recommendations. Through collaborative filtering, users with similar preferences or attributes can be collected and their opinions can be provided to users in the same cluster for reference, so as to satisfy people's mentality that they usually refer to others' opinions before making decisions.

Collaborative filtering recommendation is the most studied personalized recommendation technology at present. It can get the recommendation of target users based on the data of neighbor users, and the recommendation is highly personalized. Famous systems include GroupLens/Net Percep2tions, Ringo/Firefly, Tapestry, etc. The biggest advantage of collaborative filtering is that it has no special requirements for recommended objects and can handle unstructured complex objects, such as music and movies.

Collaborative filtering recommendations are mainly divided into two categories: first, collaborative filtering is based on memory. Firstly, neighbor users with similar interests and hobbies can be obtained by using the similarity statistics method. Therefore, this method is also called user-based collaborative filtering or neighbor-based collaborative filtering. The second is model-based collaborative filtering, which first USES historical data to get a model, and then USES this model to make predictions. Model-based recommendation widely used techniques include learning techniques such as neural networks, latent semantic retrieval, and Bayesian networks, training a sample to get a model.

This paper mainly studies the implementation of a collaborative filtering recommendation algorithm based on users.

With the increase in the number of users, the collaborative recommendation algorithm based on users increases linearly, and its performance becomes worse and worse, and it cannot provide a good explanation for the recommendation results. Therefore, in 2001, professor Sarwr proposed the third collaborative filtering recommendation algorithm, namely, the project-based collaborative recommendation algorithm. Through calculation, the algorithm first evaluates the project and predicts the similarity. The similarity is used as the weight to weight the project and get the predicted value of the project. The item based recommendation algorithm is more important than the user based recommendation algorithm and can solve the user based collaborative recommendation. However, the author comprehensively reviews various recommendation algorithms and finds that project-based collaborative recommendation is not necessarily good. The accuracy of the algorithm is related to the experimental scale data adopted. In most cases, it is better to use user based collaborative recommendation [12].

The starting point of collaborative filtering is that users with similar interests may be interested in the same things. Therefore, as long as the data about user preferences are maintained, users with similar tastes can be obtained from the analysis, and then, recommendations can be made based on the opinions of similar customers. Another possible starting point is that users may prefer items that are similar to what they have purchased. The similarity between products can be judged based on the user's evaluation of various things, and then, the products that are closest to the user's interest can be recommended. The former focuses on the relationship between customers, while the latter focuses on the relationship between projects. Collaborative filtering recommendation is highly personalized, and many websites, such as Amazon.com, CDNow.com, MovieRinder.com, and so on, have adopted recommendation systems based on this technology. Based on the starting point of "users with similar interests may be interested in the same thing," this paper mainly studies the collaborative filtering recommendation algorithm based on users.

5. User-Based Collaborative Filtering Recommendation Algorithm

5.1. Algorithm Introduction. User-based collaborative filtering [13–23] is the most widely used method in personalized recommendation, which is to predict the interest preference of target users based on the interest and hobbies of neighbor users. The algorithm first USES statistical techniques to find neighbors with the same preferences as the target user and then generates recommendations to the target user based on the preferences of the target user's neighbors.

Its basic principle is to recommend the resources that the user may be interested in to the current user using the similarity of the user's access behavior. The access system calculates its access behavior (purchase product set, visit web page set, etc.) through its history and specific similarity function, takes the most similar n users as a group of nearest neighbors, counts neighbor access targets, uses user access resources to generate recommendation candidates, then calculates the degree of each resource in the candidate set recommended by the user, and selects K recommended top-level resources as the user set.

5.2. Algorithm Steps

5.2.1. Establishment of the User Model. The input data of the collaborative filtering algorithm are usually expressed as an $m * n$ user-evaluation matrix R, where m is the number of users, n is the number of projects, and Rij is the score value of the i-th user for the JTH project. The score matrix is

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \cdots & \dots & \cdots & \cdots \\ r_{i1} & r_{i2} & \cdots & r_{in} \\ \cdots & \cdots & \cdots & \cdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix}. \quad (1)$$

The scoring value here can be the user's browsing times, purchase times, and another implicit scoring, and it can also be used to display the score, such as the user's direct scoring of the goods; the implementation of this algorithm is to use the user's direct scoring of the purchased goods as the scoring value in the scoring matrix.

5.2.2. Finding the Nearest Neighbor. In this stage, the main task is to find the nearest neighbor of the target user. By calculating the similarity between the target user and other users, the "nearest neighbor" set that is most similar to the target user is calculated. That is, generate a "neighbor" set with sim (I, j) descending order for target user I. The process is completed in two steps: firstly, the similarity of the user's question is calculated, which can be measured by Pearson correlation coefficient, cosine similarity, and modified cosine similarity. Secondly, select "nearest neighbor" according to the following methods: (1) select users whose similarity is greater than the set threshold; (2) select the top k users with the largest similarity; (3) select k users whose similarity is greater than the preset threshold.

Each user's score can be viewed as a vector in the dimensional project space. If the user does not score the project, the user's score for the project will be set to 0. The similarity between users is measured by the cosine angle between vectors. Let the score of user i and user j in dimension project space be expressed as vector DDD and vector FFF, respectively; then, the similarity $\mathrm{sim}(i, j)$ between user i and user j is

$$\mathrm{sim}(i, j) = \frac{\vec{i} \cdot \vec{j}}{\|\vec{i}\| \cdot \|\vec{j}\|}. \tag{2}$$

Here, the numerator is the inner product of two user rating vectors and the denominator is the product of two user vector moduli.

Let the set of items graded jointly by user i and user j be represented by I_{ij} and $I_{ij} = I_i \cap I_j$; then, the similarity $\mathrm{sim}(i, j)$ between user i and user j is measured by Pearson correlation coefficient:

$$\mathrm{sim}(i, j) = \frac{\sum_{d\in I_{ij}} \left(R_i, d - \overline{R_i}\right)\left(R_j, d - \overline{R_j}\right)}{\sqrt{\sum_{d\in I_{ij}} \left(R_i, d - \overline{R_i}\right)2}\ \sqrt{\sum_{d\in I_{ij}} \left(R_j, d - \overline{R_j}\right)2}}. \tag{3}$$

Here, R_i, d represents the user i 'score of the project d; $\overline{R_i}$ and $\overline{R_j}$, respectively, represent the average score of the user i and user j on the project.

In the cosine similarity measurement method, the scoring scale of different users is not taken into account, and the corrected cosine similarity measurement method improves the defect by subtracting the average score of users on projects. Suppose the set of items graded by user i and user j is represented by I_{ij}, $I_{ij} = I_i \cap I_j$; I_i and $I_j I_j$, respectively, represent the set of items graded by user i and user j; then, the $\mathrm{sim}(i, j)$ of similarity between user i and user j is

$$\mathrm{sim}(i, j) = \frac{\sum_{d\in I_{ij}} \left(R_i, d - \overline{R_i}\right)\left(R_j, d - \overline{R_j}\right)}{\sum_{d\in I_{ij}} \left(R_i, d - \overline{R_i}\right)2\ \sqrt{\sum_{d\in I_j} \left(R_j, d - \overline{R_j}\right)2}}. \tag{4}$$

Here, R_i, d represents the user's i score of project d; $\overline{R_i}$ and $\overline{R_j}$ represent the user i and j average score of the project, respectively.

The system selects the ten users with the highest similarity as the nearest neighbors.

In this paper, cosine similarity is used to calculate user similarity in the prototype system, and ten nearest neighbors are selected.

5.2.3. Generating Recommended Items. The calculation method is as follows:

$$P_i, d = \overline{R_i} + \frac{\sum_{j\in NBSi} \mathrm{sim}(i, j) * \left(R_j, d - \overline{R_j}\right)}{\sum_{j\in NBSi} \left(|\mathrm{sim}(i, j)|\right)}. \tag{5}$$

Here, $\mathrm{sim}(i, j)$ represents the similarity between user i and user j, R_j, d represents the score of the item d by the nearest neighbor user j, and $\overline{R_i}$ and $\overline{R_j}$ represent the average score of user i and user j, respectively. The essence of formula (4) is to find the user in the user's nearest neighbor set NESi, take the similarity value between the target user and the found user as the weight value, and then conduct a weighted average for the difference between the neighbor user's score of the project and all the scores of the neighbor user.

The above method is used to predict the target users' rating of the unevaluated items, and then, the top-n items with the highest predicted rating are recommended to the target users.

6. Conclusion

With the continuous development of sports in China, the tentacles of the sports industry have extended to all walks of life in China. At the same time, with the development of information and network, there are more and more information exchanges between enterprises and between enterprises and between enterprises and customers. How to use the existing information technology to provide special information about the sports industry for enterprises and customers has become the focus of the author's thinking. Combined with the development of the sports industry in our city, based on B/S mode, using ASP. NET for the development of technology, specifically for sports enterprises and users to provide an information exchange platform, this paper studies the user-based collaborative filtering recommendation algorithm and its application in the sports industry information service management system to design and develop the corresponding information service management system of the sports industry. The prototype quality and algorithm of personalized recommendation system are studied, and the experiment is deeply analyzed.. We will strengthen the use of local sports resources.

Data Availability

The dataset can be accessed upon request.

Conflicts of Interest

The author declares no conflicts of interest.

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