Application and Optimization of Algorithm Recommendation in Mobile Audio APP

Jieyi Zhang¹, Dehua Kong²,*

¹ School of humanities and law, Wuhan Donghu University, Wuhan, HuBei, 430000, China
²,*School of Computer Science, Wuhan Donghu University, Wuhan, HuBei, 430000, China
*Corresponding author’s e-mail: kdh@wdu.edu.cn

Abstract. A major feature of mobile audio applications compared with traditional radio stations is that they can enhance the direct connection between users and programs through capturing and analyzing all kinds of data, and make personalized recommendation and accurate transmission to users. Algorithmic recommendation system has different classification, different mobile audio applications based on user positioning and product characteristics, flexible use of a variety of algorithm recommendation methods in the platform. At the same time, the negative effects of algorithm recommendation can not be ignored.

1. Algorithmic recommendation and classification
Algorithm recommendation refers to tracking users' network behavior, using some mathematical algorithms to calculate personal characteristics, environmental characteristics and other relevant information, and infer the content that users may like. The application of algorithm recommendation in mobile audio platform mainly involves three levels. First, the content level of audio platform includes subject category, program source and channel, service function, interactive topic discussion and so on. The second is the user level, including the user's region, interest, occupation, age, gender and the use of terminal type. The third is the scene level, involving the time, place and scene of listening, such as work, commute and journey.

At present, there are five types of algorithm Recommendation: demographically-based Recommendation, content-based Recommendation, collaborative filtering based Recommendation, rule-based Recommendation, and hybrid algorithm Recommendation. These five types of algorithm recommendation methods have different application occasions and values in different mobile audio applications.

2. The application of algorithm recommendation in mobile audio APP

2.1. Demographic-based Recommendation
This is the simplest recommendation algorithm, which uses the user's basic information, such as age, gender, location. Analyze the similarity of users and recommend the items preferred by similar users to this user.
When opening the mobile audio application, the system often prompts the user whether to allow access to photos and media files, call information and network information in the device. Archimedes FM will recommend the radio station in the user's city according to the geographical location of the user's mobile phone. In the recommendation column of Himalayan FM, through the entrance of "guess what you like", you can enter the interface of asking users about gender, age and topics of interest.

The advantage of the algorithm recommendation based on demographic statistics is that for new users, there is no need to collect and analyze their listening habits and behaviors to recommend programs. However, the defect is that the program recommendation is relatively rough and cannot be accurately recommended according to users' preferences for content.

2.2. Content-based Recommendation

This recommendation algorithm uses the similarity of the item itself rather than the similarity of the user as the basis. In the mobile audio application, the system firstly models the attributes of multiple audio programs. The program type is used as the attribute in the figure. The system finds that the program types that user A often listen to are children's and history's. Through similarity calculation, it is found that program A and C have higher similarity because they belong to children's and history's categories. The system believes that user A is likely to be interested in program C, so it recommends program C to user A.

In the mobile audio application, the system will track and record which audio programs the user has listened to. When the user opens the application next time, the first interface will recommend the same type of program to the user. Mobile audio applications, such as netease Cloud Music and Kugou Music, make recommendations based on the user's past listening history and characteristics such as the type, style and singer of music festivals. This recommendation algorithm is to understand users' listening interest by analyzing their listening habits and preferences. For example, through the comprehensive analysis of the user's click rate, listening duration and frequency, collection number and forwarding number of certain songs recorded in the system, it is found that the user prefers to listen to European
and American pop music programs. Music programs with popular features in Europe and America are recommended content for this user.

2.3. Collaborative Filtering-based Recommendation

2.3.1. User-based Collaborative Filtering Recommendation
Both user-based collaborative filtering recommendation and demographics-based recommendation calculate user similarity, but the difference lies in the different methods to calculate user similarity. The demographics-based mechanism only considers the characteristics of the user, while the user-based collaborative filtering mechanism calculates the similarity of the user on the data of the user's historical preferences. The basic assumption is that users who like similar items may have the same or similar tastes and preferences.

In mobile audio applications, user-based collaborative filtering algorithm discovers users' attitudes towards a certain program, such as collection, content comment, sharing, forwarding, through the data of users' historical listening behavior, and measures and scores users' listening behavior. Then analyze the attitudes of different users towards the same audio program to calculate the similarity between users, and finally select the users with high similarity for program recommendation. For example, User A and User B both listen to the same financial and economic program continuously, comment and thumb up below the program, and both subscribe to this program for free. Then, user A and B are counted as the same type of user and can recommend other audio programs that user A has listened to to user B.

2.3.2. Item-based Collaborative Filtering Recommendation
The difference between item-based collaborative filtering recommendation and content-based recommendation is also the difference in similarity calculation methods. The former is inferred from the user's historical preference, while the latter is based on the attribute characteristic information of the item itself.

This algorithm recommendation is to calculate the relationship between different audio programs through the ratings of different users, and its core is to pay attention to the characteristic attributes of audio programs. For example, if listener A subscribed to program A and B, the system will analyze the previous correlation between program A and B, and calculate the similarity between the two programs from multiple factors such as program type, broadcast content, duration, program host, broadcast region, and program style. When listener B also listens to or subscribes to program A, the system assumes that he is also interested in listening to program B.

2.3.3. Model-based Collaborative Filtering Recommendation
Model-based collaborative filtering recommendation is to construct a recommendation model based on sample user preference information, and then predict recommendations based on real-time user preference information. This collaborative filtering recommendation method adopts the machine learning method and uses offline historical data to conduct model training and evaluation. When capturing the user and program data, there are still a large number of users and program scoring data is blank. At this time, the system can build a model based on the acquired small part of data, predict the correlation between the missing users and program data, and refer to this model to find the program with the highest scoring and recommend it to the user. Because the model-based collaborative filtering method needs to depend on the size of the data set actually acquired, it needs to take a long time to complete.

2.3.4. Association Rule Based Recommendation
Recommendation based on association rules is more commonly used in e-commerce systems. Such recommendations are reflected in shopping behavior as well. Seemingly unrelated items are actually more closely related, and users who buy one item are more likely to buy another. The core of the algorithm recommendation based on association rules is to mine out the association rules among
products. Some product sets are often purchased by many users at the same time, and the products in these sets can be recommended to each other.

In mobile audio applications, program recommendation based on user clicks, thumb up number and subscription are all recommendation based on association rules. In addition, the platform can predict users' preferences for other similar types of audio programs based on the correlation between their historical listening data and program characteristics. This recommendation method is also applicable to the audio advertisement recommendation of the type music radio station, and appropriate advertising products are arranged according to the program positioning and style characteristics, which is in line with the user's advertising reception psychology and demand positioning.

2.3.5. Hybrid Recommendation
The above four Recommendation algorithms have their own advantages and disadvantages. Hybrid Recommendation is often adopted in practice in order to promote its advantages and avoid disadvantages. Multiple recommendation algorithms are combined to avoid or compensate for the weaknesses of each recommendation technique. Amazon, for example, mixes various recommendation algorithms and takes advantage of each.

In addition to dozens of music editors engaged in manual recommendation, Litchi FM adopts hybrid recommendation algorithm. In-city recommendation adopts the recommendation algorithm based on demographic statistics. Through LBS (Location Based Service), listeners can find anchors in the same city. The program content and language style with dialect characteristics have strong regional proximity, so as to realize the effective distribution of program content. The multi-type list is subdivided into hot list, new list, musician list and so on. These lists are obtained by the recommendation algorithm based on association rules. Intelligent recommendation adopts content-based recommendation and recommendation algorithm based on collaborative filtering. By analyzing users' playing, subscribing, commenting and other operation behaviors, the algorithm generates data and gives priority to more content in line with users' interests and hobbies for recommendation.

3. Defects of algorithm recommendation in mobile audio APP

3.1. The Algorithm Recommendation Is Not Accurate Enough
Algorithm recommendation is based on users' browsing, listening and clicking behaviors and other data to analyze and calculate, and then realize effective recommendation of relevant programs. However, mobile audio users seldom make comments and thumb up on the feedback behavior of listening to programs. Especially, most of the audio programs are free to listen to, and paid programs only account for a small part. Compared with the huge program library, the data mastered by the system on users' purchasing behavior of programs is negligible.

On the other hand, when users click on the audio program recommended by the system, they need to wait for dozens of seconds of advertising time and program buffer time after opening the program. It is not as good as the text recommendation information, which only takes a short time for users to decide whether to read deeply. Users tend to be more inclined to keep listening to what they've already heard and less patient to try out new programs recommended by the system.

3.2. The Lack of Gatekeeping Links
A major difference between mobile audio platforms and traditional radio stations is the lack of a specific host to choose and organize the content of the program. In the operation of traditional radio stations, it is necessary to comprehensively consider the economic benefits and social effects of the programs, and at the same time undertake the social responsibility of guiding public opinion and carrying forward the mainstream social values. Therefore, the program editors have more rigorous requirements on the program theme, content, language style and other elements during the check process. The mobile audio platform is a commercial organization that provides many information services such as voice listening, and traffic and profit are its primary concerns. When recommending programs to users, algorithm
recommendation is to satisfy users' listening interests and preferences, rather than to recommend the programs worth listening to or should listen to.

3.3. Information Cocoons Lead to Narrowing of Interest
The algorithm recommendation of mobile audio applications is based on the analysis of users' listening behavior data in the past, so as to accurately recommend relevant programs that they may be interested in. In the long run, this will result in the invisible "narrowness" of the user's listening to the program, and the user will only listen to the program he chooses and the program that pleases him. When users are in excessive independent choice for a long time and immerse themselves in the satisfaction of personalized choice, they will gradually lose interest and contact opportunities to understand other different types of programs. You've unconsciously created an information cocoon for yourself. As a result, users do not enrich their knowledge structure and broaden their horizons because of the application of the recommendation system, but are limited to their original cognition and thinking without knowing it.

4. Application of optimization algorithm recommended in mobile audio APP

4.1. Strengthen the Research of Optimization Algorithm
In the research of algorithmic recommendation system, the artificial neural network method represented by deep learning has made great achievements in the fields of image recognition and voice recognition, and can also be applied to the recommendation system of mobile audio. In the application of collaborative filtering algorithm, a setting interface can be added to allow users to set specific topics that they do not want to be recommended, thus increasing the predictability and controllability of the algorithm.

In the design of recommendation module, a column can be set to ask users to directly express their favorite programs and content. Many mobile audio apps use this direct approach to get new users' preferences when they first open it. At the same time, the module design as simple as possible, adhere to do subtraction.

4.2. Increase Manual Recommendation and Check
In terms of human recommendations, some mobile audio apps assign editorial teams of several dozen people to review programs. They are very sensitive to content, to sound. Editors listen to dozens of programs each day to find the best content on the platform and recommend it to the front page and various channels. At the same time, content review should be strengthened. Mobile audio platforms should develop a set of machine learning system to identify vulgar content according to text keyword characteristics, and with the assistance of manual review, keep the bottom line of content safe broadcast and program quality.

4.3. Multiple Ways to Overcome the Deficiency of information Cocoon room
In terms of content, mobile audio platform should expand the breadth of recommended content, increase users' interest points, and focus on improving users' sense of long-term experience. At the same time, the platform can try to expand the interests of users. Through the interaction and interest circle between users and other users on the platform, the potential interests of users can be explored and their personal potential can be activated.

Technically, the application of hybrid algorithm recommendation is increased. The popular recommendation algorithm in the recommendation system will rank the popular programs according to the audience rate of the current programs. Many of these contents have nothing to do with the current interest of users, but they can also help users find new interest points. In addition, by optimizing the information grasping ability of the recommendation system, more input information can be obtained to enhance the understanding of users, so as to improve the efficiency of accurate recommendation.
5. Conclusion
At present, five common algorithm recommendation methods are flexibly applied to different product categories of mobile audio application platform. However, algorithm recommendation in mobile audio APP also has some defects. It is urgent to explore a more scientific and reasonable algorithm recommendation way to optimize the personalized communication of mobile audio applications to users.

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