

Game Recommender System

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Abstract: This paper presents a recommender system based on a game theory in which the recommendations are made from user-item ratings. This system filters out or evaluate games through the opinions of other similar gamers using collaborative filtering technique and suggest those to the intended user. The system uses individual ratings given by the members of community, along-side rating of the games that a particular gamer likes, in order to predict and recommend new games to that gamer. The aim is to recommend games that match the user preferences and then user-item based collaborative filtering is applied on the individual ratings of the games for a particular gamer to find similarity between those gamers. A working web based system will be presented that will provide high user satisfaction in terms of usability and recommendation quality.

Keywords: Game recommendation system, Collaborative filtering, User item based filtering.

1. Introduction

Recommender systems: Recommender systems are software that automatically predicts how much a user will like a particular item. Many top companies enhance customer satisfaction by investing in recommender across the world as they bring real value to both, users and companies. Recommender systems are tools that interact with complex and large information spaces. They prioritize items likely to be of interest to the user and provide a personalized view of such

spaces. Personalized recommendations are part of many e-commerce applications such as Netflix, Amazon and Pandora. These recommendations based system have been missing in the video game industry. Video and computer games have become more than a fad; it is a part of life. In the past, computer games have been considered as a distraction from more 'worthy' activities, such as homework or playing outside. Today, however, teachers and designers of learning resources and specially researchers are beginning to ask how this new medium might be powerful to support children's learning. So, games are not only the source of entertainment but also help people learn and develop their mind to think better and also increases their problem solving ability. Video gameplay can improve certain aspects of cognitive ability. These recommender systems have become a key component of the modern E-Commerce applications. Collaborating Filtering approach has been proposed to build a recommender system. Like many machine learning techniques, a recommender system makes prediction based on user's historical behaviors. Specifically, it's to predict

user preference for a set of items based on past experience. To build a recommender system, the most two popular approaches are Content-based and Collaborative Filtering. Content-based approach requires a good amount of information of items own features, rather than using user's interactions and feedbacks.

Table 1
Literature survey

S. No.	Author	Title	Conclusion
1.	Syed Muhammad Anwar, Talha Shahzad, Zunaira sattar, Muhammad Majid	A Game Recommender System Using Collaborative Filtering (GAMBIT). [1]	The game recommender system was implemented for user-user and item-item approach using collaborative filtering. The underlying algorithm was Pearson-correlation. The system was unable to provide a better accuracy in case of cold start scenario.
2.	Michael Meidl, Steven Lytinen	Using Game Reviews to recommend games. [2]	The RS was focused to use an informative theoretic co-clustering approach which uses adjacent context word pair to provide better efficiency and accuracy. It was using reviews for recommendation instead of ratings.
3.	Yivei Cao, Matthias Jarke, Ralf Kiamma, Manh Cuong Pham	A Clustering approach for collaborative filtering recommendation using social network analysis. [3]	It was implemented using hybrid rank algorithm which is a combination of user and feature correlation matrices and was more focused to provide better recommendations in cold start scenario.
4.	Anthony Chow, Min-Hui Nicole, Giuseppe Mana	Hybrid Rank: A Hybrid Content based approach to mobile based recommendations. [4]	The RS was build using Hybrid rank algorithm (combines user and Feature correlation matrices) and Personalized page rank algorithm (references). It was developed using cosine similarity, correlation based similarity and adjusted cosine similarity. Sparsity and scalability were the major drawbacks of the system.
5.	Badrul Sarwar, George Karypis, Joseph Konstan, John Riedl	Item based collaborative filtering recommendation algorithm.[5]	The RS used the methodology of Cosine based similarity, Correlation based similarity and adjusted cosine similarity. This paper displayed an implementation using network clustering of the items so as to reduce the sparsity.

For example, it can be movie attributes such as genre, year, director, actor etc. or textual content of articles that can be extracted by applying Natural Language Processing. Collaborative Filtering, on the other hand, doesn't need anything else except user's historical preference on a set of items. Because it's based on historical data, the core assumption here is that the users who have agreed in the past tend to also agree in the future.

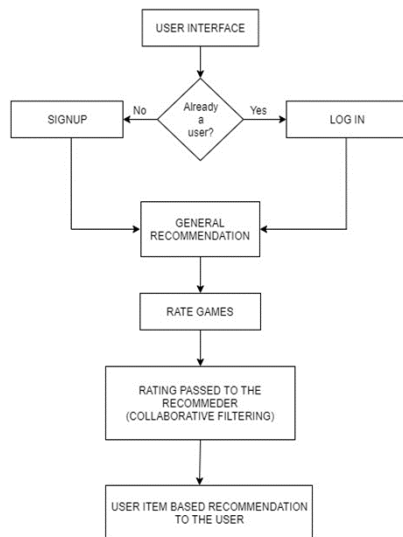
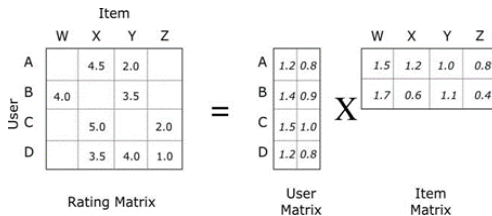
2. Problem statement

To create a recommendation system which provide related content out of relevant and irrelevant collection of items to users of that platform with high accuracy.

3. Proposed system

The proposed system is distinctive in such a way that not only a recommendation system is developed but also translated into an actual web-based system that maintains the accuracy and high predictive value. Game ratings gives us a better idea of the likeness or unlikeness of a game for a particular user. Hence, these are used to find the predictions. Matrix factorization helps a model to learn and factorize rating matrix into user and game representations, which allows model to predict better personalized game ratings for users. With matrix factorization, less-known game can have rich latent representations as much as popular games have which improves recommenders ability to recommend less-known games.

4. Working



The project works in three phase:

- Creating website and retrieving the rating
- Pre-processing
- Obtain the rating and analyze data

Creating website and retrieving the Rating: Building a website and taking the user rating as per the played games. Recommender system is used to verify or analyze the ratings given by the user to recommend from it. The front end is developed using languages like HTML and the design to the site is given by using CSS. Javascript is used to give the validation in the forms and perform several tasks. Python is used in the server side scripting to perform the connection to database and get message from users and feed to algorithm.

Pre-processing: Before we can use the rating as inputs for the recommender system it is required to do some pre-processing on the data. The main purpose here is to analyze the given rating from the particular user and then recommend the games according to the given ratings.

5. Matrix factorization

In collaborative filtering, matrix factorization is the state-of-the-art solution for sparse data problem, although it has become widely known since Netflix Prize Challenge.

Matrix factorization is simply a family of mathematical operations for matrices in linear algebra. To be specific, a matrix factorization is a factorization of a matrix into a product of matrices. In the case of collaborative filtering, matrix factorization algorithms work by decomposing the user- item interaction matrix into the product of two lower dimensionality rectangular matrices. One matrix can be seen as the user matrix where rows represent users and columns are latent factors. The other matrix is the item matrix where rows are latent factors and columns represent items. In the sparse user-item interaction matrix, the predicted rating user u will give item i is computed as:

$$\tilde{r}_{ui} = \sum_{f=0}^{n\text{factors}} H_{u,f} W_{f,i}$$

where H is user matrix, W is item matrix

Rating of item is given by user u can be expressed as a dot product of the user latent vector and the item latent vector.

6. Module explanation

A. User interface

The user interface (UI) is the point of human-computer interaction and communication in a device. This can include display screens, keyboards, a mouse and the appearance of a desktop. It is also the way through which a user interacts with an application or a website.

B. General recommendation

In 'general recommendations', all the games that belong to

user's interested genre and having accumulative rating above an average value are suggested to the user. General recommender will consist of some basic recommendations. In this section, the user is presented with some basic regular games on the user interface

C. Rate games

Rating system is a system used for the classification of games into suitability-related groups.

D. Rating passed to the recommender (collaborative filtering)

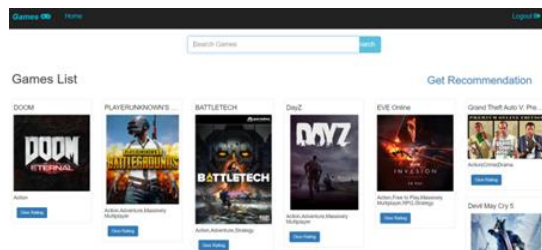
The user can rate games after logging into the system. A rating scale ranging from (1-5) is given to the user where 1 represents the worst and 5 representing extremely good. The ratings are then stored in the database and then passed to the algorithm for calculating similarity between games and users.

E. User item based recommendation to the user

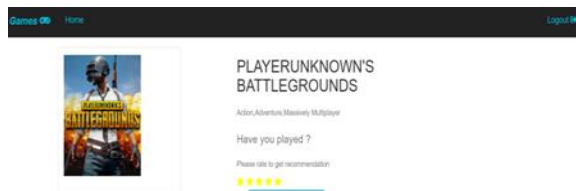
The algorithm uses the low rank matrix factorization for finding similarity and then recommend games to the user who shares the same interest based on their rating.

7. Result

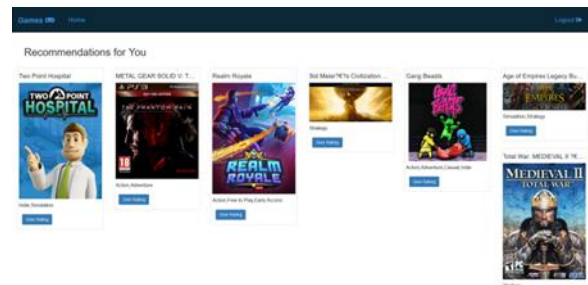
A. User interface



B. Rate games



C. Recommendation



8. Conclusion

The purpose is to recommend games to gamers based on their likes, dislikes. A game recommender system is proposed that generates high quality recommendations to the users. The recommendation systems used by various websites have different efficiency levels depending on the context of the solution. The proposed recommendation system works efficiently according to games data. The growing video game industry can certainly benefit from this recommender system that would help in introducing the right games to the right audience and would be economically beneficial to the industry. In future work, the approach can be extended in terms of game features used in order to find the similarity between users more efficiently.

References

- [1] Manh Cuong Pham, Yiwei Cao, Ralf Klamma, Matthias Jarke, "A Clustering Approach for Collaborative Filtering Recommendation Using Social Network Analysis."
- [2] Syed Muhammad Anwar, Talha Shahzad, Zunaira Sattar, Rahma Khan, Muhammad Majid, A Game Recommender System Using Collaborative Filtering (GAMBIT)."
- [3] Anthony Chow, Min-Hui Nicole, Foo, Giuseppe Manai, Hybrid Rank: A Hybrid Content-Based Approach to Mobile Game Recommendations.
- [4] Sarwar, George Karypis, Joseph Konstan, and John Riedl, Item -Based Collaborative Filtering Recommendation Algorithms Badrul.
- [5] Michael Meidland Steven Lytinen, Kevin Raison, Using Game Reviews to Recommend Games.
- [6] Burke, Robin, Alexander Felfernig, and Mehmet H. GÖker. "Recommender systems: An overview." AI Magazine 32.3 (2011).
- [7] Schafer, J. Ben, et. al. "Collaborative filtering recommender systems." The adaptive web. Springer Berlin Heidelberg, 2007.