



INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact factor: 4.295

(Volume 5, Issue 3)

Available online at: www.ijariit.com

Virtual assistant based recommendation system

Darshan B. S.

darshanhosahalli@gmail.com

Don Bosco Institute of Technology,
Bengaluru, Karnataka

Ajay S.

ajaysrinivas530@gmail.com

Don Bosco Institute of Technology,
Bengaluru, Karnataka

Akshatha C.

akshathac98@gmail.com

Don Bosco Institute of Technology,
Bengaluru, Karnataka

Aishwarya V.

aishwaryanammu@gmail.com

Don Bosco Institute of Technology,
Bengaluru, Karnataka

Shilpa S. G.

shilpasg.06@gmail.com

Don Bosco Institute of Technology,
Bengaluru, Karnataka

ABSTRACT

In the current commercial application, the e-commerce applications give the only recommendation of the particular tastes only when one is interested in a particular item. The recommendation is also very much related to the item the user is interested in. Though this system works well it lacks the personalized experience that the user can get when purchasing an item through an offline vendor. This can be achieved by aggregating the recommendation engine within a virtual assistant. In our proposed system the user will be getting the online e-commerce experience with a personalized buying assistance that one gets while buying through an offline retail vendor.

Keywords— Recommendation, Virtual assistant, Book recommendation, E-commerce, Collaborative filtering, Content based filtering, Cosine similarity, Linear regression

1. INTRODUCTION

In today's world there are millions of choices for every object we need to buy online and books are no exception, hence customers need certain tools for selecting books that are worth their time. Major e-commerce, book publishing and book magazine's use recommendation as their tool. This recommendation can also be provided by a vendor at a local store who has quite some amount of expertise in that field along with providing personal service. This can be achieved in the online commerce also by using a virtual assistant within which a recommendation system is also integrated. Today the number of choices is massive and people need some instruments to find and choose the best that suits them. For that one of such tools is called recommendation system. Another one such tool that filters out the best choice for them is a virtual assistant that tells as to why one should choose. Recommender systems support users in a personalised way for the identification of products based on the history of the user that can be useful or interesting in the large space of possible product. Recommender engine helps to access relevant information quickly without searching

the web manually. A recommender system is an information filtering technology, commonly used on e-commerce Web sites to present information on items and products that are likely to be of interest to the reader. So far, several approaches have been developed in both the research and business fields. But none has yet implemented the combination of both the recommendation engine and the virtual assistant. Content-based make method recommendations by analysing the description of the items that have been rated by the user and the description of items to be recommended. Collaborative filtering systems, which suggest items to a particular user based on a database of all user ratings. When asked for a recommendation for the current user, it identifies users similar to her (her neighbours) and it is suggested her the items the neighbours have liked in the past. But the problem with this is it gives a cold start and not much useful when the level of an object is very granular and niche such as a book recommendation. Thus the required level of accuracy can be reached with content-based filtering without the problem of cold starts. The virtual assistant system also has the feature of interacting with the user, which facilitates user and show its artificial intelligence. Also, it has functionalities like defining words, auto correction the search hands-free voice control. The virtual assistant provides a personal like service that gives and explains the reason to pick a choice.

2. LITERATURE SURVEY

In 2009 Mr Zheng proposed a web service recommender system, constructed on a CF-based approach, for selecting and recommending web services to users. This paper used content-based filtering to create a recommendation system. A service recommendation system is meant to provide users with recommendations of services, including those on the web, in the cloud, or such services as people might require on a daily basis.

In 2011 a Survey conducted by Sandholm & Ung on Social Media, Recommendation System showed that recommendation

system actually worked as a good marketing strategy that indeed proves to be profitable and also improved customer service. A social media recommendation system recommends media in social networks or internet like online news, Twitter pages, online videos, etc. To users, which was extensively used in online content advertisement could also be used for recommended buying. A social media recommendation system for online web content is built on a CF-based method which considers geographical influences on ratings and the features of the book itself and compares with the similar parameters of another book on the recommendation.

In 2016 Punam Bedi and Ravish Sharma published a paper called Trust based Ant Recommender System (TARS) which produces valuable recommendations by incorporating a notion of dynamic trust between users and selecting a small and best neighbourhood based on a biological metaphor of ant colonies. New users can highly benefit from pheromone updating strategy known from ant algorithms as positive feedback in the form of aggregated dynamic trust pheromone defines “popularity” of a user as recommended over a period of time.

The current e-commerce websites have a large range of products, this makes it difficult for creating the virtual assistant models that can learn from the virtual assistant that can suggest the users with the items or filter down the possibilities that the user might be interested. This is possible when the range of products that the virtual assistant has to consider is very niche. Thus the book recommendation platform is the best to start with creating preference suggesting bot’s that can narrow down the possibilities for the user, so they can have a fast and easy choice making process while buying the articles.

Nowadays, the changing trends in technology and rapid development on the internet has affected almost every aspect of life. People depend on the internet for various things, online shopping is one of them. Purchasing books on the internet from the huge collection of the book is very difficult to work for various academician and students. From the huge number of books, it is really difficult to choose a particular textbook. So, the recommendation system technique plays a very important role and helps the user to get books according to their need and interest.

3. EXISTING SYSTEM

There are several recommendation websites already in existence for various domains. The methodology adopted for giving recommendations from these sites may vary but have still had a lot in common. Item-based collaborative filtering and User-based collaborative filtering are the two commonly adopted techniques. In Item-based recommendations, the similarity between items is taken into account and then predictions are made. Whereas in the latter, users with similar taste are found and on the basis of their ratings, predictions are made.

Different algorithms like Cosine Similarity Measure, Pearson Correlation Similarity Measure are used for the same. Book recommendation websites have flourished over the web over the past decade. Huddersfield Book Recommender system, Book Psychic, WhatshouldIreadnext.com, Library Thing, Goodsreads.com and Bookexplorer.com are some of the popular ones.

Content-based recommendations are also provided by some of the mentioned systems. But none of them combines the regular content-based recommendation system with a virtual assistant

that progressively provides a system that can be an online system providing the personal service equivalent to that of an offline retail vendor’s personal service.

The reason why the big league companies such as Amazon, eBay etc. are not yet able to accomplish the task of training a virtual assistant that acts as a personal recommender of the products is the sheer range and variety of products. This can be accomplished in a very nice environment such as a book rental platform since the range of products within which the bot has to learn is less and comparatively easy.

4. PROPOSED SYSTEM

In the proposed system the recommendation engine is built within a virtual assistant. The virtual assistant is built within an android application. The virtual assistant is built using the NLP models for the recommendation. The primary focus is to provide real-time responsiveness of the book recommendation system that assists the user in the searching process. This system also provides a platform for an online library with a recommender engine that enhances the users'ability to obtain personalised recommendations of books of his taste.

4.1 Android application

The design of the android application is such that it creates the feel of a virtual library. The users can browse through books manually can use the help of a virtual assistant. The Virtual Assistant helps the users in finding books related to the users' tastes and also generates recommendations similar to a given book. The in-app intelligent AI assistant can be used to completely surf the platform at ease and also place purchase orders by interacting with the bot.

The Virtual Assistant based Book Recommender System is built upon the Android platform using Native Android Framework for Java, Dialogflow for Natural Language Processing, Node. Is at the server side back-end and Google Firebase NoSQL database.

4.2 Virtual assistant

The core of the whole system is a virtual assistant that can, to a certain degree, understand the questions typed by the users in the natural language form, the language form can include manually typed, chats or user voice that is recognised and then translated into text that the virtual assistant can understand.

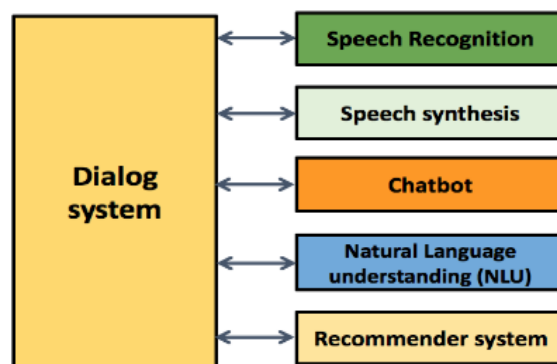


Fig. 1: Flow chart of virtual Assistant

The Virtual Assistant generates personalised recommendations for a given user based on the users past purchase history, which is, of course, a result of the recommendation engine. The Virtual Assistant is capable enough to notify the users about new releases in the market that might lead to potential sales. The Virtual Assistant intelligently recommends books to the

users that he/she might potentially be interested in which might lead to more sales as a result of targeted advertising based on Machine Learning backed inferences from the user's data

Dialog flow is an API that is used to power assistants in any platforms. Dialog Flow is extensively used by Apple's Siri, Google assistant, Microsoft Cortona, etc. It uses NLP techniques to create a virtual assistant. It is powered by Google's machine learning techniques such as speech – to – text, etc. The flow chart of the dialog flow is given in figure 1.

4.3 Recommendation System

Recommendation System is a subclass of information filtering system. It is primarily used to understand the user's preferences and taste and they use this information to generate recommendations so that it can be used commercially to improve customer satisfaction and user-friendliness. In this context, the book recommendation can be given through two concepts, content-based filtering and collaborative filtering.

In content-based filtering and collaborative filtering both the techniques can be implemented using the cosine – similarity algorithm and linear regression algorithms can be used to predict the books that a person might like.

Cosine similarity is a metric used to measure how similar the documents are irrespective of their size. Mathematically, it measures the cosine of the angle between two vectors projected in a multi-dimensional space. The cosine similarity is advantageous because even if the two similar documents are far apart by the Euclidean distance (due to the size of the document), chances are they may still be oriented closer together. The smaller the angle, the higher the cosine similarity.

In this approach, similarities between pair of items are computed using the cosine similarity metric. The rating for target item *i* for the active user *a* can be predicted by using a simple weighted average as:

$$p_{a,i} = \frac{\sum_{j \in K} r_{a,j} w_{i,j}}{\sum_{j \in K} |w_{i,j}|}$$

Where K is the neighborhood of most similar items rated by the active user *a*, and *w* (*i,j*) is the similarity between items *i* and *j*. For predicting what books a person might like we can use linear regression that predicts the similarity between two or more books based

$$\hat{r}_{ui} - \bar{r}_u = a + b(r_{vi} - \bar{r}_v)$$

on the parameters obtained from cosine similarity. The traditional prediction formula, we can find that

$$\hat{r}_{ui} - \bar{r}_u = \frac{\sum_{v \in U} sim(u,v)(r_{vi} - \bar{r}_v)}{\sum_{v \in U} |sim(u,v)|}$$

Behind this aggregation, there is a valid assumption that the relationship between them a special linear correlation,

$$f(x) = x$$

Where *x* denotes Person correlation coefficient represents the degree of linear correlation between two book records, it reflects as to how similar those two books are. Thus we use a general weighted linear regression formula here.

$$r_{vi} - \bar{r}_v \text{ and } f(x) \text{ represents } \hat{r}_{ui} - \bar{r}_u.$$

Linear regression is most basically used to adjust the book records of missing book record values like rating, rank within the genre etc. This can also be used to adjust the values so as to recommend books with the highest accuracy as possible.

5. RESULT

As Shani and Gunawardana say [11], experiments on recommendation systems are divided into the three categories: a) offline experiments: when user behaviour is simulated i.e. the process of system making predictions and recommendations and the user corrects them or uses these re recommendation is simulated, b) user studies: analyze the quantitative and qualitative measurements and observe the behaviour of a group of subjects that will interact with the systems c) online evaluation: the system is used by real users son real tasks and then analyzed. But the user base for this project is less compared to that of industry giants thus we opted for an online survey. Through this survey, we selected a group of people and asked them to find a book that they had already read and they had also liked the book, the genre and various other parameters of the book. They they were asked to rate based on how fast and easily all the books that were recommended to them. The same people were also asked to do the sameon different websites. The results were as shown below,

Note: the following graphs are based on a survey conducted with a few random groups of people with varying age group.

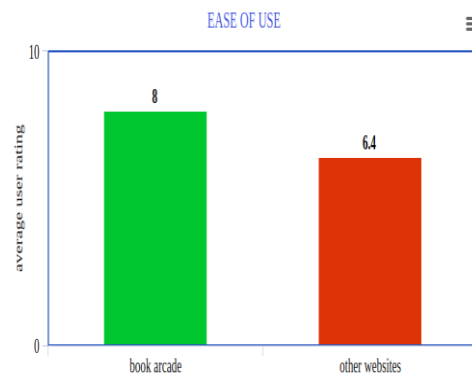


Fig. 2: Ease of use

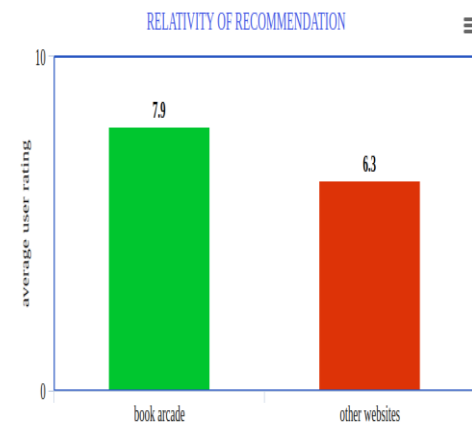


Fig. 3: Speed of searching n recommendation

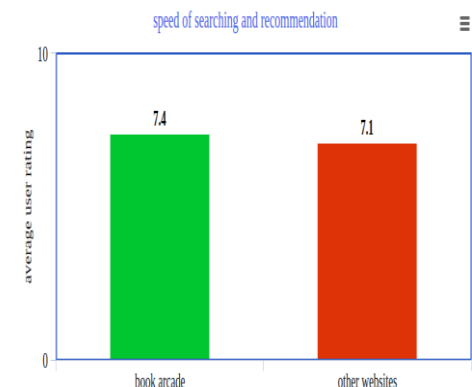


Fig. 4: Relativity of recommendation

The important point to note here is that the user-friendliness of the application is significantly better than that of other websites due to the use of virtual assistants in every aspect of the application.

6. CONCLUSION

The innovative idea of combining virtual assistant and recommendation system. This integration of a Recommendation Engine within a virtual assistant improves the recommendation due to the fact that the virtual assistant can recognise the conversation and the conversation can be fed to the recommendation engine to recognise the tastes and preferences of the user.

7. REFERENCES

- [1] Jb Schafer, J. Konstan, J. Riedi, Recommender systems in e-commerce, in Proceedings of the first ACM Conference on Electronic Commerce, 1999, pp. 158-166.
- [2] K. Lang, Newsweeder: Learning to filter news, In Proceedings of the 12th International Conference on Machine Learning, 1995, pp. 331-339.
- [3] M. Balabanovic and Y. Shoham Fab: content-based collaborative recommendation, Communications of the ACM, Vol. 40, No. 3, 1997, pp. 66-72
- [4] S. Maneeroj, H. Kanai, K. Hakozi, An Improved Recommendation. Method for better Filtering Information Out of Database, IPSJ Transactions on Database Abstract, Vol. 43, no SIG05-007, 2002, pp. 254-261.
- [5] X. Su and T. M. Khoshgoftaar, "A Survey of Collaborative Filtering Techniques," Adv. Artif. Intell. 2009.
- [6] G. Adomavicius and A. Tuzhilin, "Towards the Next Generation of Recommender Systems: A Survey of the State-of-the-Art and Possible Extensions," IEEE Trans. Knowl. Data Eng., vol. 17, no. 6, pp. 734-749, 2005.
- [7] Magnus Mortensen, "Design and Evaluation of a Recommender System", INF-3981 Master's Thesis in Computer Science, February 5, 2007.
- [8] Cataldo Musto, Apache Mahout – Tutorial (2014), 08/01/2014.
- [9] Paul-Alexandru Chirita, Wolfgang Nejdl, Cristian Zamfir, "Preventing Shilling Attacks in Online Recommender Systems", WIDM'05, November 5, 2005, Bremen, Germany.
- [10] Bamshad Mobasher, Robin Burke, Runa Bharam, Chad Williams, "Towards Trustworthy Recommender Systems: An Analysis of Attack Models and Algorithm Robustness", ACM Transactions on Internet Technology (TOIT), Volume 7, Issue 4, October 2007, Article No. 23
- [11] G. Shani and A. Gunawardana, "Evaluating Recommendation Systems," Springer, 2011.