International Journal of Engineering & Technology, 7 (2.7) (2018) 883-886

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research Paper



Acquiring the user's opinion by using a generalized Context-aware Recommender System for real-world applications.

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Abstract

Acquiring the user's opinion on specific things undoubtedly changes according to the given context. A context-aware or Multidimensional Recommender System can adapt its behaviour according to the user's personal or environmental context. The same user may express or use completely different decision-making ways for various contexts to express the opinion .So, correct anticipation of user need depends upon the amount to which the relevant discourse data is in incorporated within the user's opinion type. Here, we propose a generalized Context-aware recommender system that is suitable for all applications where a contextual segment plays a major role to find user's opinion in real-world applications.

Keywords: *- Collaborative; Content; knowledge; Hybrid Recommender Systems;*

1. Introduction

Recommender Systems (RS) are proven to be very much beneficial in e-commerce websites by providing useful information in the recommendation process. RS were originally defined as a system which takes suggestions as inputs, which then combined and directs to acknowledge beneficiaries. They have become fundamental applications in e-commerce and information filtering, providing suggestions at effectively prune large information spaces so that users are directed towards those products that meet their preferences. By bringing ideas together from user profile, information refining and machine learning, Recommender Systems have proven to be effective at delivering the user proactively information. These RS are basically categorized into collaborative, content based and knowledge based systems based upon their approach to rating estimation [8]. These Traditional Recommender Systems (RS) have performed reasonably well in several applications, but it may not be sufficient to consider only two dimensional rating paradigms. Prior to Context-aware/Multi-Dimensional Recommender Systems, Prior Recommender Systems uses very simplistic user model to generate guidance to the users. For example user based collaborative filtering approaches generally model the user as vector of item ratings and content based methods tend to use methods like feature vectors [7]. This approach of modelling simply omits the available contextual information in different situations that the way users interact with systems.

1.1 Context-aware recommender systems:

Context–aware RS are extension to traditional collaborative systems to capture the contextual features. This Context is not passive but it is active or dynamic. Context is nothing but any information that can be used to delineate the position of an entity. An entity is something sort of a place, an individual or associate object that's thought-about relevant to the interaction between the user and also the application. Many applications like recommending movies and vacation packages, it may not be sufficient to consider only two dimensional paradigms i.e. user and entity. It is important to include the contextual information of the user's opinion [5][4].

1.2 Importance of Context in Context-aware recommender systems:

Context is a multidimensional concept devising in many areas like Linguistics, philosophy, psychology, organisational sciences and in computer science primarily in artificial intelligence other major areas. Based on the usage the term context is having many forms. In data processing, context is defined as the situations which describe the life stages of a user which will govern a modification in his/her preferences, standing and price for the organization samples of context include a replacement job, marriage, divorce, and retirement. There are several concerns that come to mind when one can talks about context-aware RS / multi-dimensional RS. The first one is why should we consider context? What happens if someone doesn't include any context into the recommendation process? Does it have any impact on the overall performance of the system or not? The way that users interact with systems with a particular ratings scale for one item in one context may be completely different from the rating for the item in another context [6] [9]. If this contextual information can be changed into a valuable element in recommender system, then it can improve the technique. The extension of RS with context awareness increases the amount of input and thereby enables the system not only to rank the information items based on the user's static profile, but also on his/her dynamically changing situation. This should result in giving different recommendations to the same user at two different points in time [1].

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1.3 Inclusion of Contextual Information in Recommender Systems:

Recommender systems emerging as a most prominent research area from past two decades. User preferences changes dynamically according to the situations. For example if we consider a Tourism industry user satisfaction is the critical element. Same Tourist travelling across various places throughout the world and he/she is visiting the same place more than once in a particular period of time. So many factors are influence the tourist like the climatic conditions, hospitality provided by the hotel, guides who are helping to explain the things and so on. Travellers more and more discover new sources of knowledge once they share experiences and appraisals with different users. The users are always key followers of opinions given by other tourists but are not limited to hotel service management. Most of the countries mainly depend on the income generated by Tourism industry. In this tourism industry acquiring the User's opinion from time to time is a challenging task. In these scenario Context-aware/Multi dimensional recommender systems plays a crucial role. Since, traditional recommender systems can't have any provision to express User's opinion in an elaborate manner since they were using two dimensional methods.

2. Related Work

2.1 Attaining contextual information

Contextual information can be attained in different ways [4].

Explicitly

According to the given application, we choose appropriate contexts relevant to the task. Here we can gather the information from the stake holders by asking directly or sometimes gathering the information from the created web sites with the help of user's feedback.

Implicitly

Users move around the world for different reasons. So, gathering the information directly is a quiet difficult task. Here based on the location we acquire the feedback like mobile companies identify based on the change of location.

Inferring

One of the methods, to obtain user's opinion on the particular program in a TV channel by using TRP rating.

The following table is the example for Context aware recommender system

Table 1: Sample data for context aware recommender systems

				Traditional
Person ContextualSegments	Movie1	Movie2	Movie3	Rating
Alice Story;Hero;Director;Action	**5 4;5;3;3**	**4 4;3;2;2**	**4 4;4;2;2**	3
Bob Story;Hero;Director;Action	**4 4;3;4;4**	**3 2;2;1;2**	**5 5;5;2;2**	4
John Story;Hero;Director;Action	**5 2;2;4;4**	**4 2;2;3;3**	**3 5;4;3;3**	3
Smith Story;Hero;Director;Action	**5 3;3;5;5**	**5 3;3;5;5**	**4 4;3;4;4**	5

From the above table, the overall rating that users offer to an item provides the data relating to what proportion they just like the item, and multidimensional ratings give some insights relating to why they liked it [3]. Thus, the multidimensional ratings enable a lot of correct estimates of the similarity between 2 users.

2.2 Multi Dimensional Recommendation Structure:

Multi Dimensional or Context-aware is design to exploit available contextual information to better serve the user and adopt the changes in the context [1]. Here we use Multi-Dimensional Recommendation Structure. It supports multiple dimensions, profiling information and hierarchical aggregation of opinions.

2.2.1 Multiple Dimensions:

Multiple dimensions mean that there are other dimensions that can become basis for multi criteria applications. These dimensions can be anything like Time, Location and Companion. Let D1, D2, … Dn be the different dimensions or contexts for given application and 'S' is a recommendation space can be defined as

$$S=D1 \times D2 \times \ldots \times Dn.$$

Let ratings be a rating domain representing the set of all possible rating values then the rating function is R is defined as

$$R: D1 \times D2 \times \ldots \times Dn \rightarrow Ratings.$$

For instance, let S = U x I x C, be the recommendation space, which means the dimension 'Time' is the contextual segment that is involved along with the traditional User and Item paradigm[4].
Where U=User,
I=Item,
C=Context.

Profiling capabilities

The profile information base stores the profile of consumers and the discourse dimensions like time, place, location, and companion etc. In general, a user profile provides an intensive definition of the preferences that a user has in a given domain of interest during a multidimensional recommendation state of affairs, there are changes within the establishing capabilities and patterns of the profiles.

Aggregation

Multidimensional databases are used to store data in multiple dimensional cubes, which support aggregation hierarchies. When the spatial property of the information will increase it'd have an effect on the question time. Multidimensional recommendation model supports a similar aggregation capability because the multidimensional model [4] [10].

The following figure is a sample Context-aware recommender system which includes contextual information

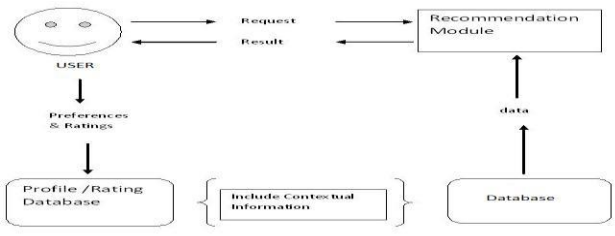


Figure 1: Context based recommendation structure

3. Proposed System

From the past one decade e-commerce industry and the usage of Recommender Systems techniques has grown to a large extent to attract the users to buy the product on e-commerce sites. Earlier, Traditional Recommender Systems are used to find user's opinion on specific things as the time progress the opinion of the user's changes dynamically because of the healthy competitors. So, there is a need for a new technique that is used to hold the contextual information. Even though Context-aware/multi criteria recommender system provides some solution but still most of the e-commerce industry sites are based on two dimensional rating methods along with the text reviews but it is very difficult to extract the user's opinion with above two ways. Since, it is not covering the entire appropriate context where user's opinion changes dynamically. Even though most of the e-commerce industries use Context-aware Recommender System, according to Adomavicious [5] an additional correct prediction of user preference depends on the degrees of incorporation of discourse information into the Recommender Systems

3.1 The motivations behind to propose a generalized Context-aware system:

- when we bought any product from e-commerce sites, majority of them are asking only about overall rating of the product in the Traditional two dimensional paradigm along with text based reviews but majority of the users unaware of how to write the review.
- Let us consider a scenario, when we bought a new cell phone from famous e-commerce sites like Amazon, flip- kart…etc they ask for the rating/text review only. For example, cell phone working functionality can be depends on the contexts like Display, battery backup, heating issues, camera performance…etc there is no possibility of expressing the opinions of user for the above contexts.

Therefore, Traditional Recommender Systems like Collaborative, Content-based, Knowledge based systems are not suitable to find user opinion or feedback. So Context-aware or Multidimensional criteria Recommender Systems plays a key role to find the user's opinion for the given application.

When we include a contextual segment in recommender system it is important to find the impact on overall rating.

Scenario 2:-

- Throughout the world various welfare schemes are organized by various governments in different countries and organizations like UNO, UNESCO spends trillions of Dollars to improve the socio-economical status of the poor people.

Scenario 3:-

- Various organizations have their employees and they are working according to their task which is assigned to them. Sometimes tasks can't completed within the deadline because of various reasons. So now-A-days it becomes essential that every organization/company find the satisfaction level of their employees to hold the retention ratio.

From the above motivations we say that Context-aware Recommender System is the suitable one for finding the user's opinion. Here, in this system we include various potential contextual segments that are useful to find the opinions and also we consider overall satisfaction level. So, we take user opinions for different contexts in the form of numerical ratings rather than text descriptions. Because, most of the users can't express their opinions in proper manner what they feel.

Here we propose a generalized context aware recommender system to fulfil any type of applications where contextual segments play a major role. User's opinion changes in a dynamical fashion according to the context.

From the above motivations we say that Context-aware Recommender System is the suitable one for finding the user's opinion. Here, in this system we include various potential contextual segments that are useful to find the opinions and also we consider overall satisfaction level. So, we take user opinions for different contexts in the form of numerical ratings rather than text descriptions. Because, most of the users can't express their opinions in proper manner what they feel.

Now the generalized Context-aware Recommender System looks like in the below format.

Table 2: A sample Context - aware Recommender System to find user's opinion for any given application.

	Context1	Context2	Context3	Context4	Context5	Overall rating
user 1	4	5	1	5	3	5
user2	5	2	3	4	1	5
user 3	3	3	2	1	5	4
user4	2	4	4	2	2	4

In the above model, we acquire the opinions of different users for different contexts in the form of a numerical rating scale between (1 to 5) along with the overall rating.

3.2 Technical Analysis

- First we determine which contextual dimensions have significant impact on overall rating given by users this can be done by using chi-square test.
- We find out the interactions among contextual segments within themselves as well as with the overall rating by applying data mining and machine learning techniques.

4. Conclusion

Recommender Systems plays a major role in the e-commerce industry to find user's opinion. Among various Recommender system techniques Context-aware Recommender System plays a major role in finding the user's opinion using multiple dimensions for current real world scenarios.
In this paper, we propose a generalized Context aware model that is suitable for all applications where contextual segments make a huge impact on overall rating to find user's opinion.

5. Future work

Contextual segments make a huge impact to acquire user's opinion for given scenarios. Sometimes user may not aware of understanding the given context for expressing opinion may leads to impact on overall rating. So, we analyze different similarity techniques makes impact on this model.

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