PERSONALISED RECOMMENDATIONS FOR GROUP OF USERS

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Abstract. It has been shown that social information as group structure or personality characteristics improve the group recommendations. Sometimes no such information is available, especially when ad-hoc groups are constructed. Moreover, often the items' content is not available (or users' preferences are unknown). In this paper we summarize proposed and state-of-the-art approaches for group recommendations considering users' social characteristics and the usage of voting based group recommendation and the user's preference for such a method settings - we analyze aggregation strategies preferences, sharing preferences and users rerating consistency.

1. Introduction

Thanks to the Web popularity increase the group recommendations are used more and more. Not only "standard" domains as movie or music are typical, but group recommenders for restaurants, tours, holidays etc. have been proposed in the literature [3].

Based on analysis of state-of-the-art group recommenders we proposed a set of disjoint attributes, which can be used for the group recommender classification (Figure 1). One of the basic principles of the group recommendation is the usage of aggregation strategy in order to solve deviating preferences of the group members.

When designing the aggregation strategy the activeness of the group have to be considered [4]. On the one hand members of the active groups desire to be actively involved into the recommendation process. On the other hand passive groups prefer to consume generated recommendations. In respect to this aspect appropriate recommendation approach have to be used, in order to obtain optimal recommendation.

Despite the social aspect of group presence no social characteristics are considered in todays' aggregation strategies. It is clear that group members are interacting and influencing

each other and their real preferences within the group differs from single user preferences (in case of real groups).

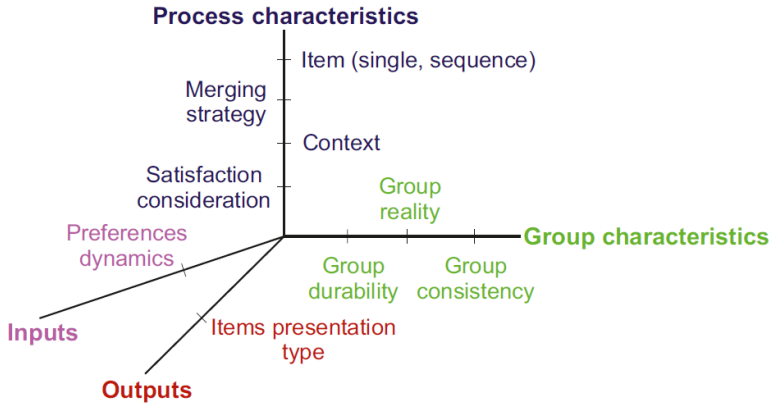

Figure 1. Group recommenders' characteristics.

2. Voting-based recommendation for active groups

Often the group members act actively and thus the recommendation approach can benefit from such environment. Users actively involved into the recommendation process, especially into the aggregation of preferences help to maximise members' satisfaction. Moreover, various social aspect are considered by members implicitly and thus there is no need to model these characteristics.

To investigate the influence of sharing preferences and various aggregation strategies on the result of voting-based group recommendation, we proposed web based application in the domain of movies [1]. The user rating matrix is constructed for every user (Item x Votes) based on user votes on items already voted by other members, or the new item can be suggested. Next, the Min-Max normalisation is performed and in the final phase aggregation strategy is used (additive, multiplicative, additive with least misery) to in order to generate recommendations for the group (Figure 2).

The total of 73 real user votes for 902 movies during 93 voting events. The task presented to the user was to create or to join some event and try to reach the consensus over the group. We observed user behaviour from the sharing preferences, aggregation strategy and reratings point of view.

When there is no additional information about the group available, the voting seems to be a promising approach to generate group recommendations. The additive with least misery and multiplicative strategy is more preferred by small groups, while large groups prefer pure additive strategy.

Interesting fact was discovered from the sharing preferences point of view – users do not reflect the sharing preferences or their preferences was consistent and thus no reratings were needed. On the other side users were consistent over 85% of ratings given, which again supports the minimal effect of sharing preferences during our experiment.

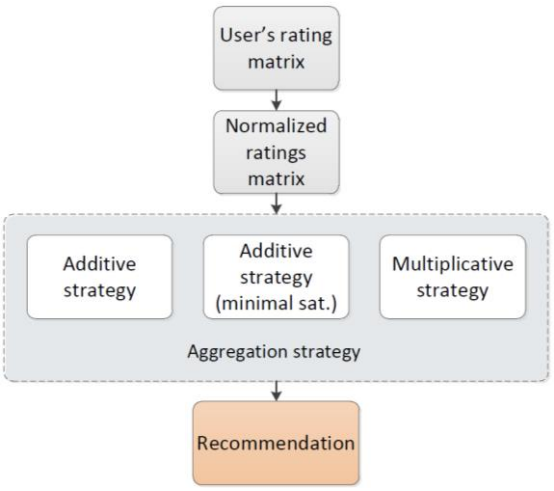

Figure 2. Proposed voting-based group recommender.

3. Social characteristics enhanced group recommendation

The social aspects of individuals play important role in the Web based applications nowadays. The group members often includes various personalities and types, while not only horizontal but vertical social structure can be observed and should be considered in group recommenders. The group satisfaction is formed based on various inter-group processes, which spread single member's satisfactions over the group. Often the predicted individual satisfaction, based on which the group recommendations are mostly generated differs to real satisfaction of user in the group (he/she is influenced and liable to change attitudes). The social structure (including emotional contagion) is in nowadays group recommenders considered only between two users if at all [2].

In order to model various inter-group processes based on information spread over the group, we proposed group based influence graph (Figure 3), which is a ordered pair *G=(V,E)* where V is set of vertexes – group members and E represents set of edges – connections between group members. The edges weights are computed based on various social and personality characteristics of group members.

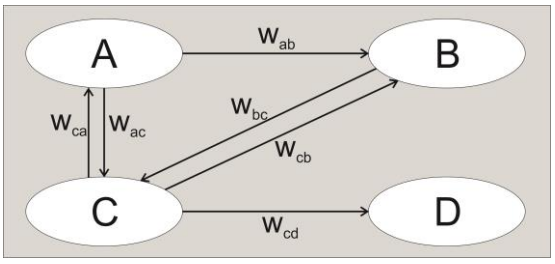

Figure 3. Proposed group based influence graph.

Adjusted satisfaction for every users (adjusted based on the actual group structure and members social characteristics) is then computed as the activation spreading over influence graph as:

$$r_{u\in Users,i\in Items} = \kappa\,\eta\left(\frac{\sum_{j=1}^{|\mathrm{RI}_u|-1}\left(\left(\log_{|\mathrm{RI}_u|-1}\sqrt{j+1}\right)\,\mathrm{sp}\,(\mathrm{RI}_{u_j},\mathrm{u})\right)}{|\mathrm{RI}_u|-1}\right) + (1-\eta)\,\mathrm{sp(i,u)} \qquad (1)$$

where i represents the item actually experienced, and u is the user, whose satisfaction is computed. The user emotional contagion is expressed as $(i,)$ - the spreading activation in user's u influence graph for predicted item i. RI_u refers to the recent items - items rated by user u previously (within one recommendation sequence). By using symmetric rating scales e.g., <5;5> we are able to model positive and the negative emotional contagion respectively (κ= 2.631 - compensation of logarithm for the used rating scale). The previous experienced items (sequence) is combined with the ι weight. The time emotion decrease is considered from the beginning of the sequence (log). Proposed approach improves the precision of group recommendation for various group sizes [2].

4. Conclusions

Group recommendation plays important role in today's Web based applications. The nature of the groups result in the need to include social characteristics into the recommendation process. As we have shown by introducing the group based influence graph and the satisfaction modelling based on such a graph, such socially enhanced recommendations outperforms standard approaches. On the other side sometimes there is no such an information available about group members. For this purpose we proposed voting based group recommender, which is suitable for highly active groups, desiring to be actively involved into the recommendation process.

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