Interface and Interaction Design for Group and Social Recommender Systems

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ABSTRACT
Group and social recommender systems aim to recommend items of interest to a group or a community of people. The user issues in such systems cannot be addressed by examining the satisfaction of their members as individuals. Rather, group satisfaction should be studied as a result of the interaction and interface methods that support group dynamics and interaction. In this paper, we survey the state-of-the-art in user experience design of group and social recommender systems. We further apply the techniques used in the current recommender systems to *GroupFun*, a music social group recommender system. After presenting the interface and interaction characteristics of *GroupFun*, we further analyze the design space and propose areas for future research in pursuit of an affective recommender.

Categories and Subject Descriptors
H.5.2 [**Information Interfaces and Presentation**]: User Interfaces *–Graphical user interfaces (GUI), User-centered design.* H.5.3 [**Information Interfaces and Presentation**]: Group and Organization Interfaces - *Web-based interaction*

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Keywords
Group and Social Recommender Systems, Interface Design, Interaction Design, Affective Interface, Emotional Contagion

1. INTRODUCTION
Nowadays, sharing, coordination, cooperation and communication among group members are becoming indispensible in online environment. Such groups can be constituted by families selecting a recipe together, colleagues working on same projects, and social club members planning a culture event. These are examples of small groups, normally less than hundreds of people. With the proliferation of social networks, social groups allow users to congregate around issues of mutual interest. The largest Facebook group, for instance, have more than a million users. Moreover, in recent years, organizations accelerate business performance with strategic uses of social and collaborative technologies. For example, *Socialtext*, as enterprise software, aims at increasing enterprise productivity by providing services such as social networking, group activities, and wiki workspaces.

In group environment, group decision making therefore becomes a problem due to information overload. Group recommender systems (GRSs) aim to alleviate information overload by suggesting items to a group of people, and social recommender systems (SRSs) filter information by taking advantage of social media. Google has extended its traditional search to social search by integrating recommendations from users' social network.

However, group and social recommendation problem is not only "the sum of members" [1]. As the audiences move from individuals to groups of people, challenges arise such as aggregating preferences and arriving at equilibrium point of expectations. Jameson et al. have proposed two methods for enhancing mutual awareness in a group recommender system. McCarty et al. [2] has studied group needs in GRSs. To the best of our knowledge, research that comprehensively studies interface and interaction design in two types of recommender systems is lacking. Therefore, we provide a survey in the two types of recommender systems.

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2. RELATED WORK
2.1 Recommendation Interface
"Group interfaces differ from single-user interfaces in that they depict group activity and are controlled by multiple users rather than single user" [3]. Therefore, interface adequacy has more requirements in group recommenders compared with individual recommenders.

Flytrap [4] visualizes recommended items by using colors and locations. Songs personalized for different users are displayed with different colors, and the closer the songs are to the center, the more likely they will be played. *PolyLens* [5] supports three models of visualizing recommendation UI. Group-only interface only displays movies from group recommendation. Composite interface displays a list of recommended movies with both group and individual member predictions. Individual-focused interface shows the items for other individual users' preferences. *CATS* [6] offers users personal space and group space. In group space, each user has a snowflake with a different color and the size of snowflake indicates preferences of individual users. This allows users to check the interest of other users for a particular resort. Additionally, each icon presents a resort, and its size grows or shrinks in accordance with the preference of the whole group. *Travel Decision Forum* [7] introduces an animated character for each group member currently not available for communication. By responding with speech, facial expressions, and gesture to proposed solutions, a representative conveys to the current online users some key aspects of its corresponding offline user's responses to a proposed solution. *INTRIGUE* [8] offers two types of recommendation lists: separate and unique. The separate list shows recommendations for each sub-group (e.g., children, adults

or the elderly), while the unique list displays sorted items representing the recommendations for the whole group.

SRSs used abundant social information which suggests familiarity and similarity among users. Due to the diverse resources in social media, it is essential to explain the results and rationale, which enhances users' interest and trust in recommended items [9]. The size limit of UI restricts the amount of information that can be displayed. Existing systems tackle this problem by several techniques. ***Textual explanation*** is the easiest and most straightforward method for explanation ("You and Amy have the following 10 keywords in common") [10]. ***Tabular explanation*** summarizes categories of recommendation reasons in one column and further details in another [11]. For example, the tag "news" corresponds to the category "you both used the tag". ***Cascaded explanation*** displays only the category of information sources (e.g., "you both contribute to 2 wikis") and allows users to click for details (e.g., "SONAR project wiki and Fringe project wiki") [12]. ***Graph explanation*** is an effective way to illustrate social path between two users. From the categorization above, we could conclude that the more information is displayed on the interface, the more complex the interface will become. This indicates a trade-off between information sufficiency and simplicity of interface design.

2.2 Group Interaction

Jameson studied some of the key user issues for group recommender systems [1] and investigated several measures for promoting collaborating and coordination. These measures mainly aim at designing user interfaces to enhance mutual awareness. Mutual awareness in group recommender systems includes membership awareness, preference awareness and decision awareness.

Membership awareness allows users to check which users are in the group. Being aware of members in a group facilitates users to decide how to behave and thus enhances trust in a group recommender [13].

Preference awareness enables users to be aware of the preferences of other members. A user study on *PolyLens* reveals that users would like to see each other's preference information, even at the expense of some degree of privacy loss. Preference awareness in group recommender systems are categorized into three levels: zero awareness, partial awareness and full awareness. Zero preference awareness means that users only know their own preferences, as shown in *MusicFX* [14]. Zero preference awareness systems are simple but do not inspire user trust. Partial awareness in group recommenders allows users to apply preference information from other group members [17]. However, it is prone to social loafing, a phenomenon when people contribute less in a social environment than when they work individually. In full preference awareness, users are aware of other members' preferences. One typical technique for is Collaborative Preference Specification (CPS) [1], as presented in CATS, *PocketRestaurantFinder* [15] and *Travel Decision Forum*. CPS in group recommender systems enables persuasion, supports preference explanation and justification and reduces conflict.

Decision awareness is important in helping users arrive at a final decision. Decision awareness is a status in which users are aware of the decision making process of other members. Existing group recommender systems include the following decision making styles: (1) zero awareness - simply translating the most highly rated solution into action without the consent of any user (e.g. in *MusicFX*), (2) partial awareness - one or a selected set of representatives of the group are responsible for making the final decisions (e.g. *INTRIGUE* and *PolyLens*), and (3) full awareness - arriving at final decision through face-to-face discussions (e.g., *CATS*) or mediated discussions (e.g., *MIAU* [16] and *Travel Decision Forum*).

3. WORK UP-TO-DATE

3.1 *GroupFun*

We have developed a music group recommender system named *GroupFun*, which is a Facebook application that allows groups of users to share music for events, such as a graduation party. The functions of *GroupFun* mainly include: 1) group management, 2) music recommendation. Users are able to create a group, invite their friends to group, and join other groups. The user task model is shown in Figure 1.

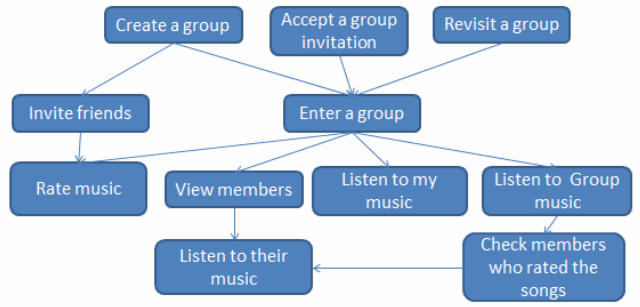

Figure 1. Task model of *GroupFun*

3.2 Need Assessment Survey

We performed need assessment interviews with 11 users who use social network services on a daily basis. These users are from 6 countries, 7 of them are university students. When asked how they discovered music, 8 of them mentioned that they would like their friends to recommend music. 9 of them are willing to sharing music playlist with their friends, 10 are interested in knowing friends' music taste and 10 would like to mutually share music with their friends. When asked about how they would like to share music, all of them expect some applications to help them automatically fulfill this task. In the meantime, 4 of them also pointed out the benefit of face-to-face discussions and 3 also preferred online chatting tools to assist music sharing. This indicates users' need for communication in *GroupFun*. When we asked them what would be the most attractive features for such applications, the following factors were emphasized: 1) attractive interface, 2) application enjoyability 3) ease to learn and ease to use 4) save effort and 5) help to discover new music.

3.3 Interface and Interaction Design

Based on the interview results, we designed the first version of *GroupFun* interface. In order to design good group interface, we followed two principles: 1) enhance mutual awareness and 2) enhance transparency. A screenshot of the interface is shown in Figure 2. This interface supports membership awareness by listing all members in the group. Preference awareness is implemented by enabling users to check which songs their friends have contributed. Common playlist supports explanation by enabling users to check who have liked certain music. Users express their attitude towards music by ratings, e.g. number of hearts.

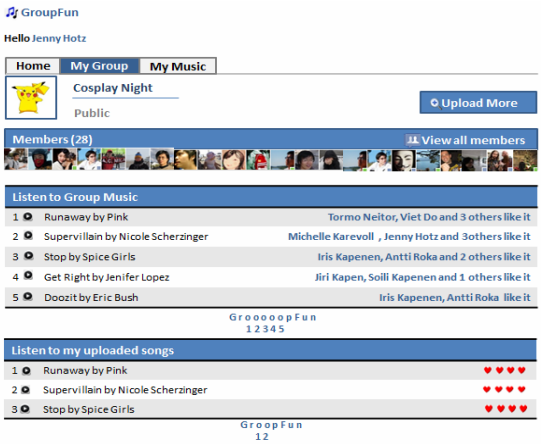

Figure 2. Screenshot of group music interface

4. RESEARCH PLAN

4.1 Innovative Interface

Interface techniques in this area remain very traditional. Based on user feedbacks, we will design and develop innovative interface features for *GroupFun*. These tools will meet the criteria of being **exploratory and collaborative**, allowing users to discover the preferences of other participants and construct suitable preferences together; **flexible**, accommodating users' individual preference structures; and **incremental**, allowing reasonable changes in decisions to be made and incorporated in the current problem solving process. The new interfaces will improve the state-of-the-art on explanation, group awareness, negotiation, and adaptive decision making.

4.2 User-user Interaction

We observed that existing systems are limited in modeling group properties in user-user interaction. For example, we will consider group dynamics such as dominance, leadership, friendship, status, trust, affiliation, and how these factors influence user-user interaction mechanisms. We believe that by identifying the group and its properties, we can better understand the needs of a group as a whole and those of an individual. It will provide us with opportunities to find innovative techniques for user-user interaction design.

One focus of interaction is negotiation in online group environments. It allows for expressing complex and qualitative preference models. Thus negotiation and interactive decision making will have a great impact on group recommender technology and social recommender systems. We will study how they integrate with the group properties.

4.3 Motivation for Contribution to Groups

Several studies have applied social psychology to motivate user contribution to online communities. For example, Ludford et al. [17] have investigated the effectiveness of motivating participation using uniqueness and group dissimilarity. Because members assume that others will do the same work, by emphasizing the uniqueness and their special role in a group, users more actively contribute to groups. Members of a community attempt to defend or climb social status. They compete for group status not by intimidating others, as some theorists have proposed, but by behaving in ways that suggest high levels of competence, generosity, and commitment to the group [18]. Thus we will investigate how to motivate user contributions by promoting their dominance and giving them certain rights in negotiation and decision making. We will also investigate how economic advantages, such as getting a group discount, and other incentives motivate user contribution. By setting up these hypotheses in controlled experiments, we can develop a model to formally explain user motivation to contribute in social recommenders.

5. PROPOSED WORK

5.1 Affective Interface Design

When evaluating the first version of interface design, users reported several concerns. "A song useful for a birthday party may not suitable for a graduation party." "It is not very meaningful for me to see who liked what, since I have my own music taste." "I don't see any reason why I should like a song from the ratings received by others."

Based on feedback from users, we propose Affective Color Tagging Interface (ACTI) for *GroupFun*. The main idea for ACTI is to express users' emotional attitude towards each song instead of giving text comments or ratings. We designed an emotional wheel (i.e., the Geneva emotion wheel), where users are able to tag their emotional feeling after listening to each song. The wheel contains dimensions of emotions evoked by music, visualized by different colors. In each dimension, the intensity of emotion is divided into five scales, visualized by different sizes. ACTI meets the criteria we proposed: exploratory and collaborative, flexible and incremental. First, ACTI allows collaborative tagging and supports group emotion visualization. Second, as music contains high degree of emotional elements [18], it is more convenient to comment a song by emotional tagging. Third, one song might suit for a limited number of themes, but the suitability is difficult to characterize by ratings; instead, the emotion contained in a song is constant, which could be used to evaluate contextual suitability. The combination of emotion and color tagging leads to an interface with inspiring visualization and ludic feedback. We will evaluate ACTI by comparative user studies.

5.2 Emotional Contagion in Group Interaction Design

We also plan to adopt Ripple Effect to analyze emotional contagion and its influence on group behavior. Socio- and Psycho- studies have proved the existence of emotional contagion among group members [19]. They further proved the influence of emotional contagion on group performance including cooperativeness, conflict and task strategy. Moreover, the affective status within a group also influences group dynamics, e.g. leadership and dominance. Therefore, we will apply the Ripple Effect and design affective interaction to enhance task performance and cooperativeness on group level. We will then evaluate the effectiveness of affective interaction in *GroupFun* by large scale user studies and comparing group efficiency with and without affective interaction.

We will further design a user study to identify factors that characterize user interaction and the criteria for measuring group performance such as increased awareness, increased interaction, acceptance and satisfaction of the decision outcome, and decreased cognitive effort in achieving decision outcomes. Measuring group diversity and alignment of personal utility to group utility is another focus.

6. CONCLUSIONS AND FUTURE WORK

This work is still in preliminary stage. We have summarized the state-of-the-art of interface and interaction design in current group and social recommender systems. We also apply those design principles to a music group recommender system *GroupFun*. After two rounds of interviews with potential users, we discovered space for research for interaction and interface design. Based on related work, we proposed research direction in the future, including designing innovative group and social interface, user-user interaction and new mechanisms for motivating group contribution. Based on our existing work, we proposed ACTI, a novel explaining and feedback interface for recommended songs. We aim to provide an affective, entertaining interface to allow users to express their emotional opinions towards songs. Furthermore, by learning from the Ripple Effect, we aim to design interaction that aims at generating and passing positive emotion across a group and thus enhance group performance and reduce conflict. The proposed methods have borrowed theories from socio- and psycho- theories, especially from emotional and affective studies, and apply them in group behavior studies. Future work includes evaluating the effectiveness and impact of the affective interface and interaction by comparative user studies and designing motivation methods for group contribution.

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