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A Survey on a Semantic-based Friend Recommendation Systems for Social Networks

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ABSTRACT: Already in social networking services recommend friends to users based on their social graphs, which may not be themost appropriate to reflect a user's preferences on friendselection in real life. In this paper, we present Friendbook, a novel semantic-based friend recommendation system for social networks, which recommends friends to usersbased on their life styles instead of social graphs. By takingadvantage of sensor-rich smartphones, Friendbook discovers life styles of users from user-centric sensor data, measures the similarity of life styles between users, and recommends friends to users if their life styles have high similarity. Inspired by text mining, we model a user's daily life as life documents, from which his/her life styles are extracted by using the Latent Dirichlet Allocation algorithm.We further propose a similarity metric to measure thesimilarity of life styles between users, and calculate users' impact in terms of life styles with a friend-matching graph. Upon receiving a request, Friendbook returns a list of people with highest recommendation scores to the query user. Finally, Friendbook integrates a feedback mechanism to further improve the recommendation accuracy. We have implemented Friendbook on the Android-based smartphones, and evaluated its performance on both small-scale experiments and large-scale simulations.

KEYWORDS:Friend recommendation, mobile sensing, social networks, life style

I. INTRODUCTION

One challenge with existing social networking services is how to recommend a good friend to a user. Most of them rely on pre-existing user relationships to pick friend candidates. For example, Facebook relies on a social link analysis among those who already share common friends and recommends symmetrical users as potential friends.Unfortunately; this approach may not be the most appropriate based on recent sociology findings. According to these studies the rules to group people together include: 1) habits or life style 2) attitudes 3) tastes 4) moral standards 5) economic level and 6) people they already know. Apparently, rule 3 and rule 6 are the mainstream factors considered by existing recommendation systems. Rule 1, although probably the most intuitive, is not widely used because user's life styles are difficult, if not impossible, to capture through web actions. Rather, life styles are usually closely correlated with daily routines and activities. Therefore, if we could gather information on user's daily routines and activities, we can exploit rule 1 and recommend friends to people based on their similar life styles. This recommendation mechanism can be deployed as a standalone app on smartphones or as an add-on to existing social network frameworks. In both cases, Friendbook can help mobile phone users find friends either among strangers or within a certain group as long as they share similar life styles.In our everyday lives, we may have hundreds of activities, which form meaningful sequences that shape our lives. Here, we use the word activity to specifically refer to the actions taken in the order of seconds, such as "sitting", "walking", or "typing", while we use the phrase life style to refer to higher-level abstractions of daily lives, such as "office work" or "shopping". Online Social Networks are today one of the most popular interactive medium to share, communicate, and distribute a significant amount of human life information. In OSNs, information filtering can also be used for a different, more responsive, function. This is owing to the fact that in OSNs there is the possibility of posting or commenting other posts on particular public/private region s, called in general walls.

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Information filtering can therefore be used to give users the ability to automatically control the messages written on their own walls, by filtering out unwanted messages.
Social networks can be considered as a milestone in the web history with the advance in online social life. A social network is "a set of people (or organizations or other social entities) connected by a set of social relationships, such as friendship, co-working or information exchange." Social Networking sites like Facebook (FB) focus on building and reflecting the social networking and relationships among the community sharing similar interests. Facebook showed tremendous changes in the way how people communicated and connected to one another. And mainly the friends are recommended based on the previous existing relationships and pick among them as friends for example, Facebook makes use of social link analysis among those who already share common friends and recommends symmetrical users as common friends and connect people across the country. Which might be not that suitable to recommend as it doesn't reflect any user preferences on friend selection in real life. Social networking sites have enormous data set of users, according to the current survey. Every individual social networking site makes record of the activities of users such as his/her likes; what user likes? , what user is doing? , what is user's hobby? Etc. and it has gained main area of focus in understanding the user behaviour, One of the best example we might consider is Facebook.

II. RELATED WORK

Recommendation systems that try to suggest items (e.g.,music, movie, and books) to users have become moreand more popular in recent years. For instance, Amazon[1] recommends items to a user based on items the user previously visited, and items that other users are lookingat. Netflix [3] and Rotten Tomatoes [4] recommendmovies to a user based on the user's previous ratings andwatching habits. Recently, with the advance of social networking systems, friend recommendation has received alot of attention. Generally speaking, existing friend recommendationin social networking systems, e.g., Facebook,LinkedIn and Twitter, recommend friends to usersif, according to their social relations, they share commonfriends. Meanwhile, other recommendation mechanismshave also been proposed by researchers. Forexample, Bian and Holtzman presented MatchMaker, a collaborative filtering friend recommendation system basedon personality matching.Kwon and Kim, proposed afriend recommendation method using physical and socialcontext. However, the authors did not explain what thephysical and social context is and how to obtain the information.Yu et al.Recommended geographically related friends in social network by combining GPS information and social network structure. Hsu et al. studied the problem of link recommendation in weblogs and similar social networks, and proposed an approach based on collaborative recommendation using the link structure of a social network and content-based recommendation using mutual declared interests. Gou et al. proposed a visual system, SFViz, to support users to explore and find friends interactively under the context of interest, and reported a case study using the system to explore the recommendation of friends based on people's tagging behaviors in a music community. These existing friend recommendation systems, however, are significantly different from our work, as we exploit recent sociology findings to recommend friends based on their similar life styles instead of social relations.
In this section, we give a high-level overview of the Friendbook system. Figure 2 shows the system architecture of Friendbook which adopts a client-server mode where each client is a smartphone carried by a user and the servers are data centers or clouds. On the client side, each smartphone can record data of its user, perform realtime activity recognition and report the generated life documents to the servers. It is worth noting that an offline data collection and training phase is needed to build an appropriate activity classifier for real-time activity recognition on smartphones. We spent three months on collecting raw data of 8 volunteers for building a large training data set. As each user typically generates around 50MB of raw data each day, we choose MySQL as our low level data storage platform and Hadoop MapReduce as our computation infrastructure. After the activity classifier is built, it will be distributed to each user's smartphone and then activity recognition can be performed in real-time manner. As a user continually uses Friendbook, he/she will accumulate more and more activities in his/her life documents, based on which, we can discover his/her life styles using probabilistic topic model. On the server side, seven modules are designed to fulfill the task of friend recommendation. The data collection module collects life documents from users' smartphones. The life styles of users are extracted by the life style analysis module with the probabilistic topic model. Then the life style indexing module puts the life styles of users into the database in the format of (life-style, user) instead of (user, life-style). A friend-matching graph can be constructed accordingly by the friend-matching graph construction module to represent the similarity relationship between users' life styles. The impacts of users are then calculated based on the friend-matching graph by the user impact ranking module. The user query module takes a user's query and sends a ranked list of

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potential friends to the user as response. The system also allows users to give feedback of the recommendation results which can be processed by the feedback control module. With this module, the accuracy of friend recommendation can be improved.

III. PROPOSED SYSTEM

A. *PROBLEM STATEMENT:*

To develop a system of the presence of Friendbook, a novel semantic-based friend recommendation system for social networks, this recommends friends to users based on their life styles instead of social graphs.

B. *GOALS AND OBJECTIVES:*

- To design system which will use to suggest the friends on life style of both parties instead of mutual friend basis?
- To use of Friend-book, GPS location information to help users find friends within some region.
- To automatically and accurately discover life styles from noisy and heterogeneous sensor data.

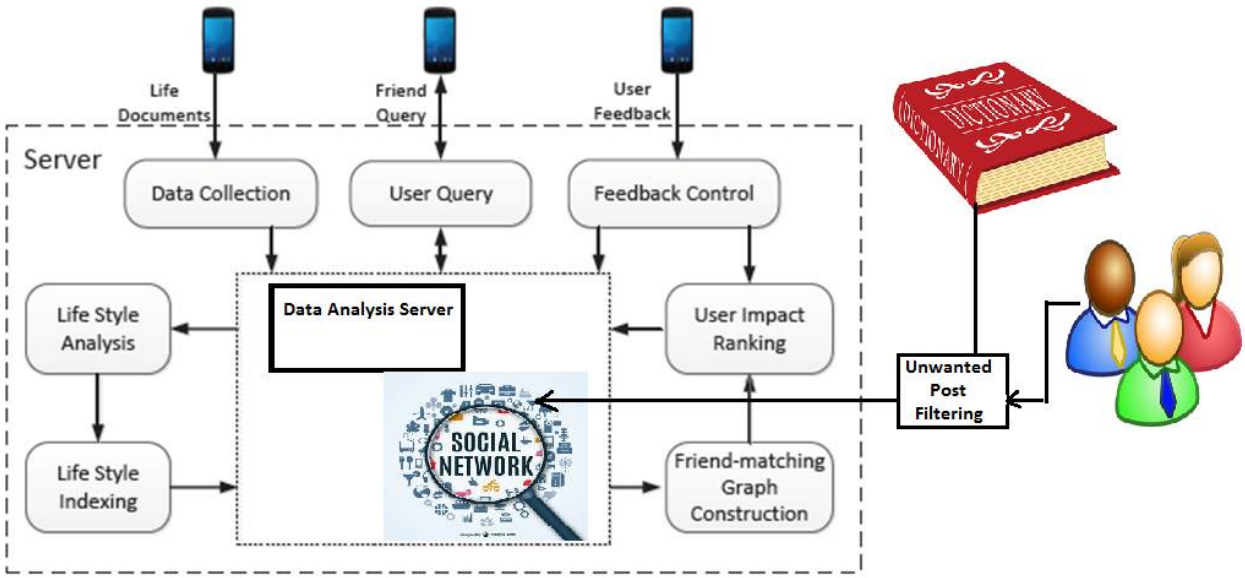

Fig 1: System Architecture

We propose a unique similarity metric to characterize the similarity of users in terms of life styles to recommend friends to users based on their life styles.

To the best of our knowledge, Friendbook is the first friend recommendation system which makes an effective use a user's life style information as the basic requirement for friend suggestions. The proposed system improves the efficiency of friend making by use K-means algorithm and Weightage algorithm. This system also includes the unwanted message filtering before posting on social medial.

IV. PROPOSED ALGORITHM

1 Friend Recommendation:

Input: The Friend Matching Graph G.

Output: Impact ranking vector r for all users.

1. For i= i to n do

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2. r (0)n = 1/n
3. End for
4δ= ∞
5 €= e-9
6. Whileδ> € do
7. For i= 1 to n do
8. rk+1 =∑j1/'n rk(j) + ∑j w(i;j):rk(j)/∑j w(i;j)
9. end for
10. =∑ni=1 |rk+1 – rk|
11. end while
12. Return r.

2 K-means:

Let X = fx1, x2,x3,..,xn g be the set of data points and
V = fv1, v2,., vcg be the set of centers.
1) Randomly select 'c' cluster centers.
2) Calculate the distance between each data point and cluster centers.
3) Assign the data point to the cluster canter whose distance from the cluster centre isminimum of all the cluster centres.
4) Recalculate the new cluster canter using:
Vi = (1/Ci)∑cj=1 Xi
Where, Ci represents the number of data points in ith cluster.
5) Recalculate the distance between each data point and new obtained cluster centres.
6) If no data point was reassigned then stop, otherwise repeat from step 3).

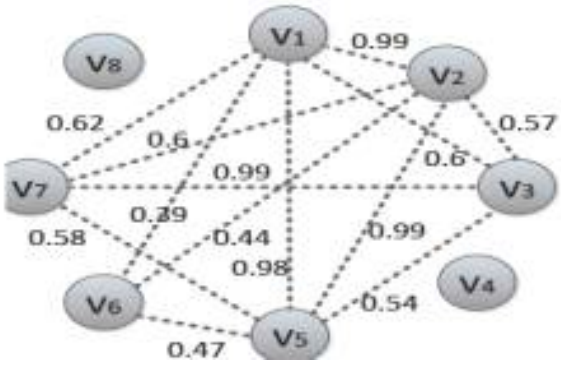

Figure 2. Friend of matching graph

3 Advantages of K-Means Algorithm:

Fast, robust and easier to understand.
Relatively efficient: O(tknd), where n is objects, k is clusters, d is dimension ofeach object, and t is iterations. Normally, k, t, d << n.
Gives best result when data set are distinct or well separated from each other.

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V. CONCLUSION

In this paper, we presented the design and implementation of Friendbook, a semantic-based friend recommendationsystem for social networks. Different from the friend recommendation mechanisms relying on social graphs inexisting social networking services, Friendbook extractedlifestyles from user-centric data collected from sensorson the Smartphone and recommended potential friendsto users if they share similar life styles. We will implementFriendbook as a website and will evaluate its performance on both smallscale experiments andlarge-scale simulations. Beyond the current prototype, the futurework can be four-fold. First, we would like to evaluateour system on large-scale field experiments. Second, we intend to implement the life style extraction using LDAand the iterative matrix-vector multiplication method inuser impact ranking incrementally, so that Friendbookwould be scalable to large-scale systems.Third, the similarity threshold used for the friend-matchinggraph is fixed in our current prototype of Friendbook. Itwould be interesting to explore the adaption of the thresholdfor each edge and see whether it can better representthe similarity relationship on the friend-matching graph.

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