Using Proximity and Homophily to Connect Conference Attendees in a Mobile Social Network

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***Abstract*—In an academic conference, it is difficult to find people that share similar research interests with you, and it is also a chore to add them into your personal online social network for later communication. Aiming at helping the conference attendees better organize their schedule and expand their social network, we designed and developed Find & Connect where we used location and encounters, together with the conference basic services, all through a web user interface, in order to get the homophily and physical interactions between users, and then to base these information for recommending new contacts to users. To demonstrate the usefulness of Find & Connect, we conducted a field trial at the UbiComp 2011 conference. Results show that users tended to consider historical physical encounter information to be the most important when they wanted to know someone or add other users as contacts, and that homophily works as a factor in users' decision to add contacts.**

Keywords- proximity, homophily, mobile social network, ephemeral social network, social linking, user behaviour

I. INTRODUCTION

At a conference, the main objective is to meet people that are in your research area and to establish connections with them. With the quick dynamics of the conference (social events and conference program) and the many people there, it is often very difficult to find similar people in your research area and when you do find them, to try to connect with them later. People still need to carry business cards to exchange contact information which is tedious and requires physical interaction. In addition, there are many times where you may have talked with someone but did not know who that person was or did not get their contact information, therefore making it difficult to contact that person after the conference. It would be easier to just look at their profile and download their business card.

McPherson et al [26] show that we tend to form friends with others based on similarities, which is called homophily. This is exploited in online social networks and social media like Facebook and Flickr where common friends, common topics or interests, and common shared objects (like photos in Flickr or articles/links in Facebook) are used for friend recommendations. In addition, we often meet people regularly but do not know them. Therefore we have these opportunistic encounters where we can record these people as possible individuals to add to our social network. Our research problem is to determine how to use proximity and homophily to connect attendees in a conference. Based on our previous work [5,19,23,24], we use Find & Connect, a system and platform for recording physical proximity and social interactions in a conference and deploy it at the UbiComp 2011 conference. We used adding contacts as the social interactions.

Results show that users tended to consider historical physical encounter information most important when they wanted to know someone or add other users as contacts. That is, if two people encountered before, they would be more willing to add each other as a contact. Our survey also suggests that homophily works as a factor in users' decision making of adding contacts. If two people share similarities, like having similar research interests, attending same activities, and having same contacts, then these two users would tend to add each other as contacts, and is confirmed in our user study. The usage shows that Find & Connect helped users to become better aware of their physical interactions with users and homophily among them, and by offering them a new experience on mobile devices, it expanded and strengthened their social links in an academic conference.

Our contributions are the following. First, we create Find & Connect, a platform combining the conference program with indoor location and proximity. Second, we deploy Find & Connect to the top international conference of ubiquitous computing researchers called UbiComp 2011 and according to our knowledge, this is the only trial that has had the largest number of participants to date (200+). Third, we use social network analysis to identify properties and metrics combined with data mining and survey techniques in order to understand the user behavior during the conference.

The paper is organized as follows. Section 2 describes related work on homophily, physical proximity and location-based services. Section 3 presents our system and user interface for Find & Connect that we deployed at the UbiComp 2011 conference. In Section 4, we describe the trial and present our results studying the offline proximity and online connections and compare them to our previous work. In Section 5, we discuss the implications of the results for our research. Finally, Section 6 concludes the paper and discusses areas for future work.

II. BACKGROUND AND RELATED WORK

A. Homophily Principle

Homophily principle [26] in the formation of network structures and ties, presents that we tend to connect with similar people and be friends with them. The intrinsic homophily between individuals such as similar characteristics, interests and beliefs, and the surrounding context factors like studying in the same school, have been validated to contribute to the usual preferential ties [14, 26]. The fact that people form social ties based on certain same characteristics they possess is often termed social selection [26]. In social selection, people may have more opportunities in the social environment to form friendships with other like-minded individuals, due to the shared characteristics [10,30].

Guy et al [11] examine nine diverse information sources from three categories (people, things and places) to define user similarity, with which people form ties guided by the homophily principle. Backstrom [18] utilities self-reported address data from Facebook users and their network ties to measure the relationship between geography and friendship. The authors find that in social selection, Facebook users' probability of friendship is roughly inversely proportional to their distance at medium to long-range scale, while in shorter distance scale, the probability is less sensitive to the distance. Eagle et al [28] and Quercia et al [8] use Bluetooth technologies to define the relative physical closeness and infer the friendship in social selection through encounter duration and frequency. Laneet et al [27], under the homophily principle, build Community Similarity Networks in order to model the classification in recognizing human activities and context from mobile sensing data by incorporating inter-person similarity measurements into the classifier training process.

However, previous works on social selection do not consider physical proximity information or only consider proximity in outdoor environments which is in rough granularity. Our work, on the other hand, focuses on indoor physical environments and studies the social selection role on physical proximity in people connecting to each other.

B. Physical Proximity

Physical proximity is a significant metric to quantify users' offline behaviors. Eagle et al. [30] use the location data they collected through GPS on mobile phones and analyze proximity of the users at certain times like working hours, weekend and the number of co-locations, in order to present the properties of users' offline location tracks. Cho et al [9] give a comprehensive analysis on human mobility by investigating numerical data collected from location-based social networks and cell phone dataset. They find that people's movements follow a periodical process between several central locations (like 'home' and 'work') within a bounded region, and one's location track is highly influenced by the track of his friends. They develop a model to predict human location tracks based on Gaussian distribution and occasional influence of social network structure.

Some services take the proximity encounters detected by radio frequency identification technology (RFID) [32,33], or Bluetooth as friend recommendation evidence such as Aka-Aki [1]. Others use proximity encounters to introduce people and infer one's social network like Serendipity [17]. Considering that GPS positioning methods [12] have accurate limits (on the order of 50 meter error) that cannot omit the noisy proximities when no interaction is happening, outdoor co-location does not always infer the interaction. We believe that collected proximities from Find & Connect obtained through a RFID positioning system [20,29] can better present or infer the offline interaction between users.

C. Location-based services and analysis

There is a boost in the number of location-based applications and services due to the ubiquity of mobile device usage and mobile network coverage. For instance, Home-Explorer [4] is designed to search and find physical artifacts in a smart indoor environment, while applications such as Foursquare and Gowalla use location as a check-in mechanism to allow users to post, share their own locations and view locations of others in order to recommend relevant friendships that would be difficult for users to have obtained before. Besides these commercial services, we also find an increasing number of applications in the research area, such as Intel's PlaceLab [13] and MIT's iFind [31], both of which focus on improving accuracy and its impact on social networks. SociableSense [16], a smartphone-based sensing platform, is proposed to quantitatively monitor and measure the social behavior between colleagues in the workplace. A social feedback component is provided to users in order to help them in fostering their interactions and improving the collaboration. They show that it is a good method to increase the sociability of users and cooperation strength of groups. WhozThat [3] is a system built on mobile phones to create a context-aware mobile social network, but does not utilize how location awareness offers facilities to users.

There is also a host of conference proximity analysis in current literature. Isella et al [22] give the detailed analysis of the time-resolved face-to-face contact networks under two different scenarios: a scientific conference (a 'closed' system in which a group of individuals interacts in a repeated pattern) and a long-running museum exhibition (an 'open' environment with a flow of individuals streaming through a baseline). They utilize RFID badges to collect face-to-face proximity data of individuals. A comprehensive data analysis is done from different aspects including static properties, dynamic properties, and network vulnerability test. Similarly, Cattuto et al [7] collect data from the office environment and academic congress by RFID to build and analyze the dynamics of person-to-person interaction networks. The triadic interaction duration and inter-contact time are evaluated and they find the super-linear behavior: the node strength, represented by the sum of contact duration of those nodes, grows super-linearly with the degree. Moreover, Barrat et al [2] utilize the Live Social Semantics application to collect and analyze data from both physical and virtual interaction networks, including friendship at online social network, co-authorship network, and face-to-face contact network during a conference. By defining scientific seniority, they find a clear assortative mix behavior, in which people tend to mix with others with similar seniority levels.

These applications or systems fail to help users create and maintain their social network at the same time to bring convenience and facilities to users. To address this, we design and create Find & Connect that combines a user's location, social events and social context in the physical world, like in the workplace for managing workplace resources [24] or in the conference for enhancing conference participation [19]. We also utilize one's physical proximity in the form of encounters to broaden her social connections by creating an online social network service that suggests people to connect to, based on location and encounter history.

III. REQUIREMENTS AND DESIGN

We designed and developed Find & Connect to help UbiComp 2011 conference attendees better manage their conference schedule and help them expand their social networks with others through disclosing their homophily information and historical offline interaction. In this section, we outline the requirements for the system, explain the system design and then describe the feature design of the application.

A. Requirements

The objective of Find & Connect is to allow conference attendees to connect with each other during the conference based on their location, the sessions that they have attended, and the attendees that they have encountered over the course of the conference. Find & Connect then provides a mechanism for attendees to continue to connect offline after the conference is over. We use active RFID as the technology for locating an attendee. The whole idea is to create a system for connecting to new people in the conference. The current problem is that we meet people ad-hoc but then forget who we have met. Find & Connect is designed to solve this problem through the use of proximity interactions which we call encounters.

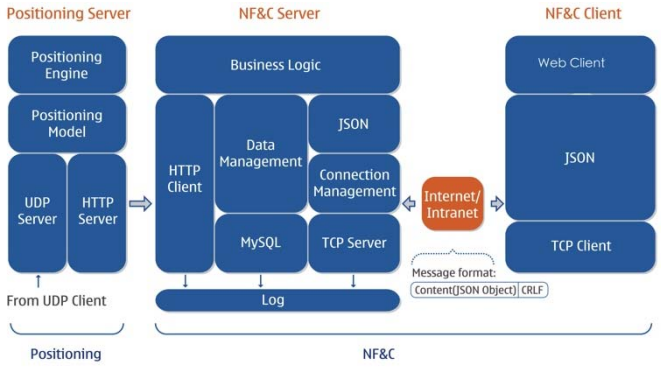

Figure 1. The system architecture of Find & Connect

B. System Overview

Find & Connect provides an integrated interface on the mobile phone to bridge the gap between online social networks among people and physical interactions including proximity and offline resources, like sessions at a conference or meeting events. As shown in Figure 1, Find & Connect uses RFID to set up a positioning system that records the updated locations of all the users by the RFID badges carried by the user (shown in Figure 2), and records this location data. We adopt the LANDMARC algorithm [23] for translating the RFID signal strength into the appropriate (x,y) location based on the room map. Thus, every time a RFID badge updates location, the positioning system can calculate and record the physical proximity between the user and other online users. This physical proximity (which we call an encounter) is defined in our previous work [6] and our system architecture follows that which we did for a previous conference [19].

We use a web application to present the features to the user in order to allow our system to be used on any mobile device such as mobile phones and devices like the iPad. The web application (accessed from any web browser) sends requests to and receives responses from the Find & Connect application server, which not only processes application data corresponding to feature requests on our web user interface, but also communicates with the RFID positioning system to provide the physical proximity interactions between conference attendees and also show where users are.

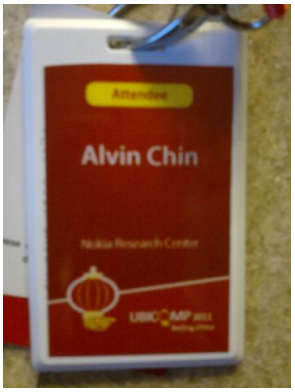

Figure 2. RFID badge used at the UbiComp 2011 conference.

C. Features

1) People

In this feature group, we provide a view for grouping people based on location so you can view who these people are, then decide if you want to establish a connection with them. Searching is also offered by using names of target users. The user interface is shown in Figure 3.

Nearby, Farther and All. The People page in Figure 3 is broken down into view tabs that shows a list of all people that are nearby (within 10 meters of your location), farther away (greater than 10 meters but still in the same room where you are), or all attendees. From here, you can view each attendee's profile by selecting the icon of that attendee. You can also select "Interests" to group the list of users according to their research interests (which they enter in their Profile). We designed it like this so users can select others based on similar research interests easily.

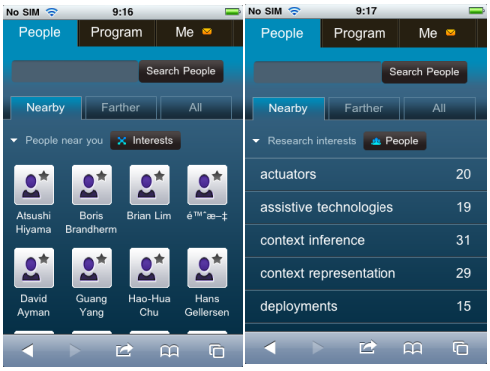

Figure 3. Nearby page in Find & Connect.

Profile and In Common. Figure 4 shows an example of a user's profile page which you arrive at when selecting a user, and you can find the similar interests, common contacts, sessions you both attended and the historical encounters (based on our RFID indoor positioning system) in the "In Common" tab. We designed the "In Common" feature to allow you to view proximity and homophily information with another user before deciding if you want to add that user as a contact. This improves on existing social networking systems which do not disclose what you have in common with another person except for common friends, same network, same location and similar interests. Our new features are the common sessions attended and encounters.

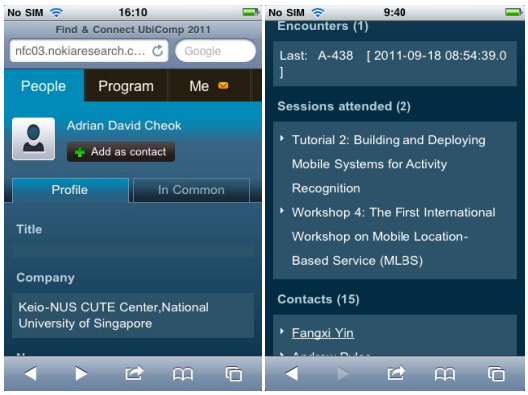

Figure 4. Profile page of a user and the common research interests, common encounters, sessions attended and common contacts with that user.

Adding a contact. Once you have viewed the user's profile, you can then add this user as a contact by selecting "Add as contact", and optionally send a message to introduce yourself as shown in Figure 5. After, there is an acquaintance survey that asks why you add this person as a contact. We designed and integrated this acquaintance survey within the contact addition process because present systems for adding friends/contacts provide limited reasons for how you know this person (e.g. LinkedIn only provides colleagues, classmates, we've done business together, friend and other where you provide an e-mail address as acquaintance reasons), and are general (include free form text). They do not incorporate specific reasons for why you want to add this person based on previous acquaintances such as you met this person from an event, as well as additional homophily information such as attending the same event. These are important as it provides more information to the user to help them decide whether she should add this person or not [28]. The acquaintance reasons shown in Figure 5 are based on our survey that we administered to users before the conference (described in Section 4C).

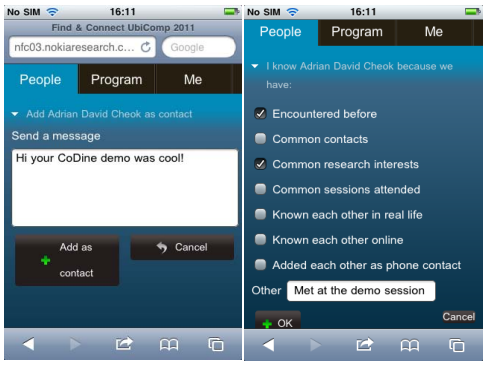

Figure 5. Adding a contact and displaying acquaintance reasons.

2) Program

In the Program shown in Figure 6, you can see the conference schedule and session details just like other conference systems [2, 25], and then decide which ones you want to attend [19]. However, we add the feature of showing the users that attended a particular session ("Attendees" button in the session page) because we know the position of each attendee. This is especially useful for finding out whether a particular user is also in the same session as you, and for adding speakers to your contact list during their presentations so you do not forget later. From this list of attendees at the session, you can easily select any attendee and browse and connect from her profile.

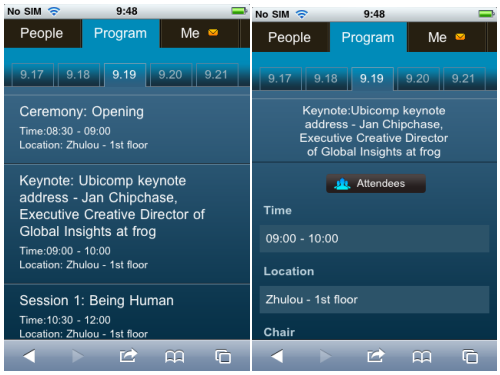

Figure 6. Viewing the conference program and sessions.

3) Me

In the Me page as shown in Figure 7, all the features are personalized to you. You can see the notifications including

users who have added you recently (Contacts Added), your recommended contacts from our contact recommendation system (Recommendations) and also Public Notices. You can also see your contacts list (Contacts) and edit your own profile (Profile).

Figure 7. Notifications of who added you as contacts from the Me page.

Contacts added. The second screenshot in Figure 7 shows the list of users who recently added you as a contact. You can then select and view the message associated with the contact request. By selecting "View Profile", you can directly view the user's profile and then decide whether to add that user back as a contact.

Recommended contacts. Selecting the "Recommendations" button shows a list of all people that you should become contacts with. This list is based on the Find & Connect contact recommendation algorithm called EncounterMeet+ [5] where we use physical encounters and homophily information (as shown in the "In Common" page of Figure 4). By selecting on a recommended person, you are brought to the person's profile page in Figure 4 where you can see the similar or common features that you both share in the "In Common" page. Then, you can decide whether you want to add someone as a contact.

IV. USER BEHAVIOUR ANALYSIS

In this section, we describe the trial that we conducted at the UbiComp 2011 conference, summarize the usage of the features, then conduct an analysis of the online and offline connections established using Find & Connect in order to understand the user behavior of attendees.

A. Trial Setup and Demographics

The Find & Connect trial was setup at the UbiComp 2011 conference in Tsinghua University, Beijing from September 17 to 21, 2011. It was open to all registered attendees in the conference to use. From a total of 421 registered attendees, 241 (57%) used our system. At the conference, attendees wore RFID badges to identify themselves and for updating their positions to RFID readers installed in the conference rooms, which recorded their positions to our positioning server. All participants used our Find & Connect web client and we discover that the majority used an Apple mobile device like an iPhone, iPad or MacBook (31.34% of all web visits came from the Safari web browser), 23.85% came from the Google Chrome browser, 22.12% came from the Android browser (Android phone or tablet), 9.08% came from Firefox and 8.29% came from Internet Explorer.

TABLE I. CONTACT NETWORK FOR REGISTERED USERS AND REGISTERED USERS THAT HAVE A PAPER FROM FIND & CONNECT AT UBICOMP 2011 CONFERENCE

	All registered users	**Authors who are registered users**
# of users	112	62
# of users having contact	59	55
# of contact links	221	192
Average # of contacts	7.49	6.98
Network density	0.1292	0.1293
Network diameter	4	4
Average clustering coefficient	0.462	0.466
Average shortest path length	2.12	2.05

B. Usage Analysis

We tracked the usage of the features of Find & Connect on our server by using Google Analytics. We discover that participants spent an average of 11 minutes and 44 seconds in Find & Connect per visit with an average of 16.5 pages browsed per visit, which shows that users did spend a significant amount of time using the system, demonstrating that it was useful. Usage rose from the beginning of UbiComp which was the tutorials (Sept. 17) until the first day of the conference (Sept. 19) when most people arrived and then decreased, as expected since people started to leave. By examining the page views, we see that the feature used the most was finding people nearby (11.66%), followed by notices (10.30%), login (6.27%), program (4.97%) and finding people farther away (3.29%). We discover that Find & Connect was primarily used for finding people nearby and for making new connections (where the contact requests are shown in the Notices page). This is expected because when the user logs in, the first page she sees is the finding people nearby page which motivates them to explore who are the people nearby in the room that they are in.

C. Online Connections: Contacts

We now examine the online connections that users made in UbiComp 2011 by adding contacts from Find & Connect. We use social network analysis similar to our previous work [6, 19] and present the results in Table I.

Network properties. We compare the results between all registered users who used Find & Connect (112) and added at least one contact or was added at least once by someone else, and the authors (62) which are 55% of all registered users. There are a total of 571 contact requests of which 40% of them are reciprocated by the recipients. We can also see that the contact network is strongly driven by the authors. Almost all authors (55) out of all registered users (59) that had contacts added at least one contact (93%), and the large majority of contact links come from authors. In addition, the network density, network diameter, average clustering coefficient and average shortest path length are almost the same for authors and all registered users. The network diameter is 4 meaning that any user can be reached and added as a contact at a maximum of 4 hops. This is similar to the social influence theory of 3 degrees of separation in social networks [15]. With an average shortest path length of about 2, any user on average can be indirectly contacted via another direct contact.

Degree distribution. By examining the degree distribution of the contacts as shown in Figure 8, we discover that it appears to follow (although not strictly due to many gaps) an exponentially decreasing distribution with the majority of participants having 1-2 contacts and very few having more than 10 contacts. This shows that users did not add many contacts, contrary to our expectation. Perhaps the reason for this could be explained by either users are too busy to look up the other user in Find & Connect and add as contact, or users already exchange business cards so there is no need to use Find & Connect because there is no incentive for doing so.

Contact acquaintance. In examining the contact network formed from the UbiComp conference, we also study the reasons behind why participants add others as contacts. We performed a survey asking participants before the conference why they add others as friends in online social networks (sample size = 29), and then also ask participants to select the reasons for adding a contact when they add contacts in Find & Connect (571 contact relationships), to evaluate the responses. The results of this are tabulated in Table II.

TABLE II. REASONS FOR ADDING FRIENDS/CONTACTS FROM SURVEY BEFORE UBICOMP 2011 CONFERENCE AND FROM FIND & CONNECT AT UBICOMP 2011 CONFERENCE

Reason for adding friends/contacts	Survey	Find & Connect	Rank (survey)	Rank (Find & Connect)
Encountered before	59%	37%	2	2
Common contacts	48%	12%	3	5
Common research interests	24%	35%	5	3
Common sessions attended	7%	24%	7	4
Know each other in real life	69%	39%	1	1
Know each other online	34%	9%	4	6
Added each other as phone contact	21%	4%	6	7

From the table, we can see that the top 2 reasons for adding friends/contacts for both the survey and Find & Connect are the same, which are that they know each other in real life and have encountered before. This validates our motivation for how Find & Connect does help to make new friends or contacts. We also discover that having common contacts is an important reason for adding a person as a friend/contact as well as having common research interests validating the homophily principle and social influence theory of 3 degrees of separation [15]. However, three interesting results emerge. First, common sessions that a user and another person have attended before do not affect that user from adding that person as a friend in an online social network, however it becomes a factor during the conference when you can add that person as a friend/contact directly with Find & Connect. Second, to our surprise, knowing a person online does not much affect adding that person as a friend/contact in the online social network or the Find & Connect social network. Third, another surprise is that people that are in a user's phonebook are not the primary reasons for adding them as friends/contacts in online social networks or in Find & Connect. Perhaps the explanation for this is because contacts in a phonebook can be considered as strong ties and online social networks are mainly used for weak ties as evidenced by previous researchers [21], and also due to privacy concerns. Phonebook contacts are private and personal and many users do not want to share them online with others, therefore users do not want to cross the offline/online networking boundary.

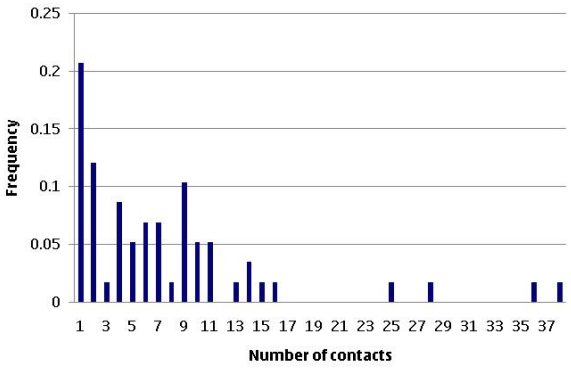

Figure 8. Degree distribution in the contacts network.

Contact recommendation. One of the novelties of the Find & Connect system is the contact recommendation system which uses proximity and homophily as factors in the contact recommendation algorithm. Users find the contact recommendations in the Notices tab of the Me page as shown in Figure 7. We use the EncounterMeet+ algorithm as in [5] except that we substitute common sessions attended for common meetings, and do not use passby, mobile Q&A and messages. For proximity, we use encounters whereas for homophily, we use common research interests, common contacts, and common sessions attended. At the UbiComp 2011 conference, our algorithm provided a total of 15252 contact recommendations of which 309 of them are added by 63 users, resulting in a total of 2% of the contact

recommendations being converted into contact requests. To our surprise, it seems that the contact recommendation was rarely used for making contact requests and that users made contacts through manually finding them. Even though the Notices page was the second most accessed page, users mostly browsed the contact recommendations rather than adding the contact from this page.

D. Offline Connections: Encounters

For recording the offline connections at the UbiComp 2011 conference, we used encounters according to the definition described in [6]. Altogether, there are 12,716,349 encounters and we describe the properties of the encounter network in Table III.

TABLE III. ENCOUNTER NETWORK FROM FIND & CONNECT AT THE UBICOMP 2011 CONFERENCE

	Registered users
# of users	234
# of encounter links	15960
Average # of encounters	68.2
Network density	0.5861
Network diameter	3
Average clustering coefficient	0.876
Average shortest path length	1.414

Network properties. From Table III, 234 users had an encounter with another attendee at the conference with 15960 unique encounter links established between any two people. Each user had an average of 68 encounters with other users. The encounter network is very dense (network density = 0.5861) as expected due to the many people being co-located together during the session. The encounter network density is significantly higher than the contact network density. The network diameter in the encounter network is smaller than that in the contact network (3 vs. 4) showing that any user can be indirectly encountered at a maximum of 3 hops (which is the same number as in social influence theory for establishing friends [15]) with an average shortest path of 1.414 hops (direct encounter). This means on average, users can directly encounter others at the UbiComp conference, without having to encounter another person first. Also as expected due to the conference environment, encounters between users are highly clustered (average clustering coefficient = 0.876) compared to the clustering in the contact network (0.462).

Degree distribution. Figure 9 shows the degree distribution of the encounters which shows it as exponentially decreasing with the majority of users having up to 10 encounters with others. The encounter degree distribution closely resembles an exponentially decreasing function compared to the contact degree distribution.

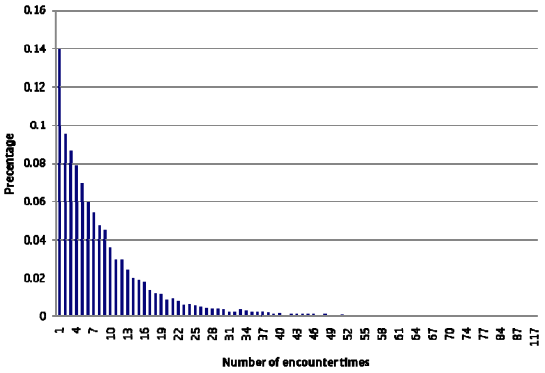

Figure 9. Degree distribution in the encounters network.

V. DISCUSSION

The network properties of the contacts network in the UbiComp 2011 conference are fairly similar to the properties of the contacts network in our previous work at the UIC 2010 conference [19]. Even though the proximity technology used was different (UIC used WiFi), nonetheless, for different conferences, it appears the user behavior in making contacts is the same, regardless of the conference which for the most part is expected.

The results show that our Find & Connect application could better help people build connections in a conference. Compared with online social networks such as Facebook, our Find & Connect social network is slightly different, since it is highly related to the real activities in the conference and based on people you have met. The evolution of the Find & Connect social network follows accordingly with the occurrence of encounters and activities. This is why the common sessions attended before will significantly influence the relationship establishment in Find & Connect. It is also why users rarely add people from their phonebook as friends/contacts in Find & Connect because people prefer to add those whom they have encountered at some place or event. Thus this event-based social network is unique in that we cannot use traditional methods to analyze it as in online social networks. Moreover, since this unique network is strongly connected with the physical network, we need to further study the relationship between the online and offline network, in order to better know the properties and evolution of the event-based social network.

For the contact recommendations, the conversion percentage of recommendations to contact requests (2%) is lower than from our results from the UIC conference [19], which was 10%. We found this to be a surprise but we realized that the reason for this could be because a) most people did not have the time to view the recommendations from the Notices page, b) manually add the contacts, and/or c) found it difficult to find since the recommendations are buried in the "Me" page which based from the usage, few people accessed. This was also confirmed in our post-survey after the conference when we asked if they used the recommendations of which 43% of the respondents did not use it (out of 14 respondents).

With regards to user experience, from our post-survey, most of the respondents found our features useful and the user interface as average (on par with existing mobile applications) and within their expectations. Again, our post-survey results also validate that the reasons that are important for contact recommendations are proximity and homophily related which are encounters, common contacts, common research interests and acquaintance from real life. This demonstrates that recommendation systems should include this type of information.

In summary, Find & Connect offered users a platform to better connect with others in a conference and similar scenarios. Using physical encounter also proved to be effective for users to add new contacts to their social networks. With an improved user interface, our trial in Ubicomp 2011 showed better results in both recommendations and network evolution.

VI. CONCLUSION

In this paper, we describe a mobile service called Find & Connect which was designed and developed as a conference navigator application, but more importantly, a new mobile social network service for conference attendees, collecting and using the homophily and physical encounters information to help users build new social links. Results proved the effectiveness of Find & Connect both for conference schedule and for personal social requirements in a conference. We discover that authors primarily make use of Find & Connect to add contacts to make new connections, the contact and encounter network follows the social influence theory of around 3 degrees of separation, and that the encounter network is more dense than the contact network. Surprisingly, users did not make many contacts as we had expected. Proximity and homophily strongly influenced the reasons for why users added others as contacts, in particular whether the two users encountered before, had attended the same session, and had common research interests. Also, to our surprise, the acceptance rate for adding contacts based on contact recommendations was fairly low but this may be due to the environment because in Find & Connect, it is fairly easy for users to add contacts just by looking at their profile and their location.

In the future, we plan to further improve the user interface for the application design and include more social networking features where users can post directly to their online social networks and also add friends directly to their online social networks. Moreover, we need to study the relationship between the online and offline social networks to further study user behavior. In addition, we will create a model for identifying groups of encounters that can indicate activity-based social networks within the larger event-based social network.

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