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Abstract. Location based services in social networking mobile applications are on the rise. Considering the benefits of incorporating location for collaboration amongst users, we were approached by a client to develop a location based social networking mobile application for a specific requirement. The mobile application thus developed was evaluated with users. Findings from the user study are summarized and recommendations for implementation and adoption of location based mobile social networking applications are discussed.

Keywords: Location based design; Social networking; Mobile application

1 Introduction

With the advent and growing ubiquity of mobile devices, there has been an increased use of such devices for social interactions. A significant value addition to such mobile social networking platforms can be in the form of location based services. Considering the benefits of incorporating location in mobile social networking platform, we were approached by a client to develop a location based mobile application for parents to collaborate. Our client, being a single working parent who had newly shifted to an area, faced problems because she did not know many other parents in the vicinity. As she did not have time to go and network with other parents in the vicinity, she realised the need of having a location based social networking mobile platform for parents to collaborate and requested us to build such an application (app).

Before proceeding with the app development, we delved into the challenges of incorporating location based services in mobile apps. One of the main technical challenges was excessive bandwidth consumption due to rendering of maps. Several mobile apps, particularly those developed for the tourism and travel domain, make use of maps to optimise user experience. Maps are one of the important visual cues in the case of location as they aid the user to view his or her position with respect to other elements in the app. However, the difficulty of rendering maps due to excessive bandwidth consumption must be considered, as well as privacy aspects of displaying location [1]. In this regard, studies [1, 2, 3] emphasise the importance of giving users

the control and choice to specify the situations where they want to reveal their location and also allow them the flexibility of choosing how it is displayed to other users.

Apart from the above technical challenge, users' privacy is also considered as one of the critical challenges in designing location based services [4]. However, past studies conducted in investigating users' perception towards sharing their location in a mobile platform, have contradicting viewpoints. For example, Tan et al [1] highlights that users are reluctant to share their location with unknown users and discuss privacy controls to limit display of such information. On the contrary, Barkuus and Dey [5] state that the willingness of a user to share their location is directly correlated to the usefulness of the app to the user. While distinguishing between position aware apps (which simply displays users' location, automatically retrieved by the app or device) and location tracking apps (which actively use users' location to perform a task, typically mapping or tracking the users' route), the researchers [5] claim that location tracking apps are more intrusive than position aware apps. Thus, users were comfortable using and sharing location in position aware apps, particularly for socialising. In line with these findings, in a study on understanding the impact of location sharing on users' privacy, Fusco et al [6], say that users' comfort with sharing their location increases over a period of time and with increased use.

After exploring the literature, we understood the technical challenges involved in developing location based services in mobile apps and incorporated a few suggestions to our design as suggested in the literature. It is also observed that, past studies have differing views on users' perceptions towards sharing location with unknown users. For investigating this further, we conducted user studies with real users. In sum, the purpose of this case study is to design, develop and evaluate location based services in a mobile social networking application for parents to collaborate.

2   Design and Development

For the time being, our client is interested only in the basic aspects in the app. She has plans to commercialize this later with added features. The beta version of the app we developed mainly consists of a location specific discussion forum for parents to collaborate. Along with this, there are other features such as book swap to facilitate creation of a virtual library, a message feature enabling one to one communication between parents and calendar synchronisation to keep track of scheduled events.

The app was developed using Android Studio. Considering that the primary focus of our users is to get to know other parents who live in areas near to them and not their exact location, we realised that we do not need to make extensive use of maps. This gives our users the privacy of not sharing their exact location as well as the benefit of interaction driven by location. Minimising the use of maps also enables faster rendering of screens and processing of location information, thus improving the overall user experience. Further, location filtering is done internally by the system and the area of filtering is visible to the user as text. However, the user must be aware of his own location so that he can make effective use of the app. To ensure this, we have provided the user a map as well as a text display of his location on his home screen.

Filtering threads by location is done by comparing the location value for the threads from the database to the current location. Threads are displayed if the area

value in the address matches the user location area value. Filtering is done in a similar manner for other features of the app such as the book swap feature, which shows users, the books available in their vicinity.

3   User Study

After implementing the beta version of the app, we evaluated it with nine parents (ages 43 to 46; six female and three male). These parents mainly use location tracking apps (Google maps, Ola/Uber services) and find them very useful though some of them raised privacy concerns.

We gave a few tasks (such as opening and participating in a discussion thread, lending and borrowing books and creating an event to meet a parent) to the participants and observed them while they performed these tasks. All the participants were able to complete the tasks quickly (10 to 15 minutes). After the participants completed the tasks given to them, we interviewed them to probe further about their opinion on our app. The observation and interview sessions were audio recorded and transcribed individually and analyzed qualitatively. The analysis showed that all the study participants found that adding "location" to the discussion forum is very useful, making it a great source of finding help nearby and bringing parents together. Many of them specifically mentioned that "location filtering" is a very useful feature.

When asked about any concerns using these apps, two of the participants raised concerns on the topic of discussions in the forum and that there should be a mature communication. About future usage of this app, all the participants were ready to download and use it if launched on the Google Playstore. They felt that incorporating location in such discussion forums is an interesting concept and it will be of great help for parents to collaborate. One of the participants said that the app is a great beta version as the idea behind it is very good and upon refining it further, it can be an extremely useful app. Few participants suggested adding a nearby events feature to the app for sharing information of upcoming events in the vicinity.

4   Challenges

One of main concerns in incorporating location is users' privacy. In order to handle this, we did not make extensive use of maps in our app (unlike location tracking apps, our users simply need to know other parents in the vicinity, not their exact location). This gives our users the privacy of not sharing their exact location. Minimising the use of maps also enabled faster rendering of screens. However, a few participants in our user study still raised privacy concerns but found our app useful and did not mind sharing their location. The idea of collaborating with other parents might have made the participants feel more secure. Also, as highlighted by Barkuus and Dey [5], people are comfortable sharing location in position aware apps (like ours) rather than location tracking apps.

Another concern by the study participants was having mature content in the discussion forum as it is about parents discussing about their children and their activities.

We have incorporated a moderator facility in the forum, ensuring that content can be moderated by the moderators, depending on how appropriate it is.

All the study participants were ready to use this app in future when it is refined and launched on Google Playstore as they found location based social networking apps an interesting and useful concept. Perhaps people are becoming comfortable with sharing location as the benefits they offer outweigh any concerns. Also, when the requirement is specific, they prefer such apps over social media groups. As highlighted by one of the study participants, these apps present information in an organized manner unlike any social media groups.

5   Recommendations

The study conducted showed that filtering threads by location is a very useful feature in the app. Also, there were suggestions for adding a "nearby events" feature for sharing information about upcoming events in the vicinity. Adding events such as book sale in the vicinity is not only useful for parents but can be commercially beneficial. We plan to incorporate this feature as well some other features (as requested by our client) before releasing the app to the market.

Implementation of location based services helps to build communities of support in the vicinity by facilitating communication and collaboration among users. The beta version of the app is an initial step in understanding the challenges of developing location based services in mobile social networking platform. The small scale user study may not be an actual indication of users' adoption intentions. Large scale investigation is preferred in this regard. However, designers and developers can use the recommendations summarized in this study for considering viable approaches to taking location based technology ahead.

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