Mobile Experience Sampling: Reaching the Parts of Facebook Other Methods Cannot Reach

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ABSTRACT

Location-aware Social Network Sites (SNS) are now widely used by mobile phone users, enabling users to share their location in real time to their social network. Such location-sharing may introduce privacy concerns depending on the user, the location being shared, and the people to whom they are shared. The study of such privacy concerns is difficult, as a user filling out a questionnaire may forget the exact reasons for sharing. We have explored the Experience Sampling Method (ESM) for *in situ* capture of users' experiences. This paper describes our mobile phone ESM testbed and presents preliminary results obtained from a 2-week experiment with 40 students sharing their location in real time on Facebook, a popular SNS.

1. INTRODUCTION

As ubiquitous computing technologies such as mobile and location-aware applications become more commonly available and used, the need arises to understand users behaviour regarding their privacy, not only to better design the applications and services, but also to understand the social impact, consequences, perceptions and acceptance of using such technologies. A popular application is location sharing [5, 6], which enables a user to disclose their location to the world at large, or perhaps to particular members of their online social networks.

Deploying real-world experimental testbeds provides an accurate method for studying privacy concerns in real-life settings. Using a network of mobile devices in such an experimental testbed enables the sensing and reporting of a wide range of characteristics including the concerns of mobile users. Moreover, the measured data can be linked to other data sources such as Social Network Sites (SNS) in order to better analyse and understand social interactions observed during real-world experiments.

Measuring privacy concerns, however, during the actual usage of such experimental testbeds, may be difficult or disruptive to the user. Instead, many studies involve a questionnaire or interview after the experiment to understand the privacy concerns reported by the participants. But this may result in unreliable data, with participants unable to accurately remember their particular privacy concerns at points in time during the experiment. Moreover, interviewing the users or analysing the data shared does not allow to study the data that is not shared, which is important to fully understand people's privacy concerns. To solve this issue, one solution is to ask the participant during the study instead of after. Using the Experience Sampling Method (ESM) [7], questions about privacy can be asked when ever needed to the subjects, and not only about what they are willing to share, but also about what they do not want to share.

In this paper, we present an ESM study designed to capture the privacy concerns of users sharing their location on the *Facebook* SNS with a mobile phone. We recruited students to participate in an experiment, and asked them to carry a mobile phone that automatically collects their locations and uploads these to a server. Participants could choose the information to be disclosed on Facebook, and to whom it could be disclosed. Participants also received ESM questions on the mobile phone (concerning activity, sharing choices, and privacy concerns) which were also answered through the same device. The data collected, disclosure decisions, social interactions through Facebook, and responses to the ESM questions allow us to better understand the privacy concerns of users when sharing their location through mobile phones connected to their social networks. In particular, we are interested in what location they are willing to share, when, where, why, how, and to whom.

This paper makes two contributions. First, we describe our methodology for collecting data on privacy concerns of users sharing their locations on Facebook with a mobile phone. Second, we introduce the testbed we deployed to implement this methodology, and present some overall results.

The rest of this paper is outlined as follows. In the next section we provide an overview on related works using ESM methodologies based on real-world testbed to study users behaviours. Section 3 defines our experimental design and describes the testbed used to implement our methodology. We then present some overall results in Section 4 before discussing lessons learned from our deployment in Section 5 and finally conclude the paper in Section 6.

2. THE EXPERIENCE SAMPLING METHOD

Studying users in their everyday lives is often performed through formal interviews [10] or questionnaires [9] about their general behaviour in a particular context. However, when out of the context, users may not answer accurately or forget details about their actual behaviour. Moreover, self-reported data may not be objective enough to fully understand the behaviour of the participants. A more objective method is to directly analyse the content shared on Facebook [1]. But analysing the data that have been shared on Facebook does not allow the study of what information is *not* shared, and any interviews or questionnaire may be inaccurate when the participant is asked out of context.

Hence, to collect more reliable data, the Experience Sampling Method (ESM) [7] is a popular diary method which asks participants to stop at certain times, either on a predetermined basis (signal-contingent) or when a particular event happens (event-contingent), and report about their experience in real time. These experiences can be reported as an answer to a close-ended or open-ended question. By allowing participants to self-report their own ongoing experiences in their everyday lives, this method allows researchers to obtain answers within or close to the context being studied. Moreover, this method can be used along with questionnaires, interviews, and data collected through Facebook.

Scollon et al. [8] survey how researchers have used ESM to study a wide variety of experiences. For instance, to study privacy concerns of users when sharing their locations, this method can be used to ask participants whenever their location is being shared, or not. ESM was already used in previous works by polling participants in real-time during their everyday lives with mobile phones [4] or pagers [2], but their locations were not actually shared to their social networks. Our methodology includes ESM, questionnaires, interviews, and data collected directly from Facebook. Moreover, participants' locations are actually shared to their social networks with mobile phones. We use a mobile device to not only detect and transmit the participant's location (then published in real-time on Facebook), but also to ask questions to the participant who answers through the same device.

3. EXPERIMENTAL DESIGN

We now describe our location-privacy experiment. Participants were given a mobile phone and asked to carry it, using an application that enabled them to share their locations with their Facebook social network of friends. At the same time as they were doing so, they received ESM questions about their experiences, feelings and location-disclosure choices. Conducting this experiment required the construction of an appropriate testbed, the design of an ESM study, and the recruitment of participants. We describe these in turn.

3.1 Location-privacy testbed

To collect data on participants' privacy concerns, we built an infrastructure composed of three main elements: the mobile phones, a server, and a Facebook application.

- *Mobile phone*. Every participant was given a smartphone. Each phone was running an application to detect and share locations, and to allow participants to answer ESM questions.

- *Server*. The server was located in our laboratory and composed of different modules as described in Figure 1, articulated around a central database.

- *Facebook Application*. The Facebook Application used the Facebook API (Application Programming Interface) to interact with the phones and the Facebook SNS. This application was also hosted on our server, which allowed us to control the dissemination and storage of data, but used Facebook to share locations with a participant's social network of friends.

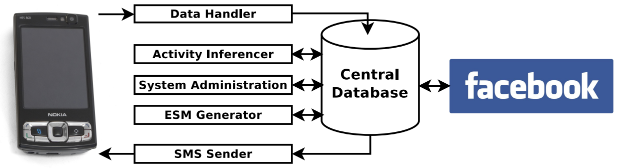

Figure 1: The testbed architecture and server modules.

3.1.1 Mobile phone

We chose to use the Nokia N95 8GB, a smartphone featuring GPS, Wi-Fi, 3G cellular network, a camera, and an accelerometer. This phone runs the Symbian operating system, for which we developed a location-sharing application in Python, *LocShare*. This was installed on the phones prior to distribution to participants, and designed to automatically run on startup and then remain running in the background. *LocShare* performs the following tasks:

- *Location detection.* Where available, GPS was used to determine a participant's location every 10 seconds. When GPS was not available (e.g., when a device is indoors), a scan for Wi-Fi access points was performed every minute.

- *ESM questions.* Questions were sent to the phone using the Short Messaging Service (SMS) and displayed and answered using the phone.

- *Data upload.* Every 5 minutes, all collected data, such as locations and ESM answers, were uploaded to a server using the 3G network.

To extend battery life and allow a longer use of the mobile phone, the location was only retrieved (using GPS or Wi-Fi) when the phone's accelerometer indicated that the device was in motion, as described in [3].

3.1.2 Server

As shown in Figure 1, the server's role was to process data sent between the mobile phones and Facebook. This was performed using a number of separate software modules.

The collected data (i.e., GPS coordinates, scanned Wi-Fi access points, ESM responses and accelerometer data) were regularly sent by the phone through the cellular network and received by the Data Handler module, which was listening for incoming connections and pushing the received data directly into a central SQL database (hereafter referred to as the Central Database).

The Activity Inferencer module ran regularly on the location data in the database, and attempted to transform these into locations or activities. This was done by sending requests to publicly-available online databases such as OpenStreetMap[1] to convert GPS coordinates and recorded Wi-Fi beacons into places (e.g., "Library", "Market Street", "The Central Pub"). We prepopulated the activity database with some well-known activities and locations related to the cities where the experiments took place (e.g., supermarkets, lecture theatres, sports facilities), but by using public databases, we avoided having to manually map all possible location coordinates into places. The places or activity names could then be exploited by the Facebook application.

Since *LocShare* runs on GSM mobile phones, we leveraged GSM's built-in SMS to control and send data to the application. SMS messages were handled by the SMS Sender module. The System Administration module allowed remote management of the devices by sending special SMS messages handled by *LocShare*, for instance to reboot the mobile phone if error conditions were observed. More important, the ESM module was in charge of generating questions, according to the current location or activity of a participant, and these questions were also sent using SMS.

3.1.3 Facebook Application

The Facebook Application was also hosted in our server but was used through Facebook to display locations and activities of participants to their friends, through their profile or notifications, depending on their disclosure choices (Figure 2).

3.2 Location tracking and experience sampling

To measure participants' privacy concerns when using a location-sharing application, we used the phones to ask them to share their locations, and asked them questions about their privacy behaviours.

Before the start of an experiment, participants were asked to categorise their Facebook friends into groups (or "lists" in Facebook terminology), to which they would like to share similar amounts of information. Example groups might include "Family", "Classmates", "Friends in Edinburgh". In addition to these custom lists, we added two generic lists: 'everyone' and 'all friends', the former including all Facebook users, and the latter including only the participant's friends.

During the experiment, participants were carrying the phone with them at all times. Six types of signal- or event-contingent

[1]http://www.openstreetmap.org/

Figure 2: The Facebook application used to share locations, collected via the mobile phones carried by participants, with a participant's social network of Facebook friends (a test account is displayed to respect participant anonymity). Locations and photos are visible to the participant and any other Facebook users (s)he has chosen.

ESM questions were then sent to the participants' phones:

- **Signal-contingent.** Signal-contingent questions were sent on a predetermined regular basis (for our experiments 10 such questions were sent each day, at random times of the day).
  1. *"We might publish your current location to Facebook just now. How do you feel about this?"*
     We asked the participant about his/her actual feeling by reminding that his/her location can be published without any consent. The participant could answer this question on a Likert scale from 1 to 5: 1 meaning 'Happy', 3 meaning 'Indifferent' and 5 meaning 'Unhappy'.
  2. *"Take a picture of your current location or activity!"*
     The participant could accept or decline to answer this question. If the participant answered positively, the phone's camera was activated and the participant was asked to take a photograph. The photograph was then saved and uploaded later with the rest of the data. Note that the reasons for declining are difficult to determine and may not be related to privacy concerns (e.g., busy, missed notification, inappropriate location).
- **Event-contingent.** These questions were sent when particular events occur. In our experiments, up to 10 questions per day were sent whenever the system detected that the participant had stopped at particular locations.
  1. *"Would you disclose your current location to:* [friends list]*?"*

We asked the participant for the friends lists to whom he/she wanted to share his/her location. We first asked if the location could be shared with 'everyone'. If the participant answered 'Yes', then the question was over and the participant's location was shared to everyone on Facebook. Otherwise, if the participant answered 'No', the phone asked if the participant's location could be shared with 'all friends'. If so then the question was over, and the location was shared with all of the participant's Facebook friends. Otherwise we iterated through all of the friend lists that had been set up by the participant. Finally, sharing with 'nobody' implied answering 'No' to all the questions.

2. *"You are around* [location]. *Would you disclose this to:* [friends list]*?"*
   This question mentions the detected place. This is to determine whether feedback from the system makes a participant share more.
3. *"Are you around* [location]*? Would you disclose this to:* [friends list]*?"*
   This is the same question as above, but we asked the participant to confirm the location. If the participant confirmed the location, then we asked the second part of the question. Otherwise, we asked the participant to define his/her location by typing a short description before asking the second part of the question. This was to determine the accuracy of our location/place-detection.
4. *"You are around* [location]. *We might publish this to Facebook just now. How do you feel about this?"*
   This question was intended to examine preferences towards automated location-sharing services, e.g., Google Latitude [6]. Locations were explicitly mentioned to determine whether the participants felt happier when the location being disclosed was mentioned. Note that this question does not ask to whom the participant wants the location to be shared: default settings given in the pre-briefing were used instead.

Hence, each participant was expected to answer 10-20 questions each day, depending on the quantity of event-contingent questions. In addition, the application allowed participants to share photos and short sentences to describe and share their location whenever they liked (Figure 3). We have designed *LocShare* to be fast and easy to use, so that questions can be answered by pressing only one key and avoid as much as possible disturbing the participant. Moreover, periods of time where each participant did not want to be disturbed by questions have also been taken into account (e.g., at night, during lectures).

3.3 Participant recruitment

Figure 3: The *LocShare* application running on a Nokia N95 smartphone as used in our experimental testbed. The participant is asked whether he/she would share a photograph with his/her social network friends.

To use this testbed, we recruited by advertising through posters, student mailing lists, and also through advertisements on the Facebook SNS itself.[2] In addition, we set up a Facebook "group", to which interested respondents were invited to join. This enabled some snowball recruitment, as the joining of a group was posted on a Facebook user's "News Feed", thus advising that user's friends of the existence of the group. Such recruitment was appropriate since we were aiming to recruit heavy users of Facebook.

Potential participants were invited to information sessions where they filled out a preselection form, and the aims and methodology of the study were explained to them. To avoid priming participants, we did not present the privacy concerns as the main focus of the experiment, both in advertisements and information sessions. More generally, we presented the main goal of the study as being to "study location-sharing behaviour" and "improve online networking systems".

From 192 candidates, we selected 40 participants, using the following criteria:

- *Undergraduate students.* We only selected undergraduate students. The main reason for this choice is that

[2]Facebook's advertising works on a maximum cost per day. We set this to £7 per day, and then adjusted the Facebook "bid" (the price paid to feature an advertisement on a Facebook user's page) each day to maximise our spend. The advertising campaign displayed our advertisement 573,714 times to Facebook members who self-reported themselves as St Andrews undergraduates, but only resulted in 209 clicks on our advertisement. It is unclear whether this was an effective method of recruitment.

undergraduate students are likely to go to more different locations during week days since they are expected to attend generally more courses than postgraduate students. Some postgraduate students only have a project or a thesis, and study in the same place (e.g., laboratory, library) most of the time. Maximising the number of different locations to be potentially shared by the participants during the study provides more opportunities to observe privacy concerns.

- *Facebook usage frequency.* We only selected candidates claiming to use Facebook everyday. Since shared locations are disclosed on Facebook, participants must actively use Facebook to see the locations shared by their friends and possibly experience privacy concerns about sharing their own locations.
- *Number of Facebook friends.* We only selected candidates having more than 500 Facebook friends. Facebook users with an extended list of friends are more likely to be exposed to privacy concerns. If the friend list is already restricted, the participant will not be concerned by the study, since his/her location would be only shared to a pre-selected number of people. We want to observe to whom locations are shared and to whom they are not.
- *Authors' acquaintances.* We only selected candidates who are not known by us, or studying in the Computer Science department. The main reason is to avoid recruiting participants who have heard about the purpose of the experiment and its privacy focus, as multiple talks have been given about the project in the Computer Science department, revealing the precise focus of the experiment.
- *Availability.* We only selected candidates with the most flexible availabilities to participate in the experiment.

These criteria were not disclosed to any of the candidates to avoid false answers. A reward of £50 was offered as compensation to the selected participants.

4. RESULTS

Our first experiment to use our ESM testbed, described here, involved 40 participants who used the mobile phones for one week in two groups of 20. Half of the participants of each group were informed that they were randomly chosen to simulate sharing instead of actually publishing on Facebook. This was to study the effect of participants virtually sharing their location (as in previous location-aware ESM studies, e.g., [4]). These results, however, are out of scope for this paper, and the data presented in this paper include both groups.

4.1 Demographics and participation

The 40 participants study 14 different subjects, but half of them study modern languages or international relations.

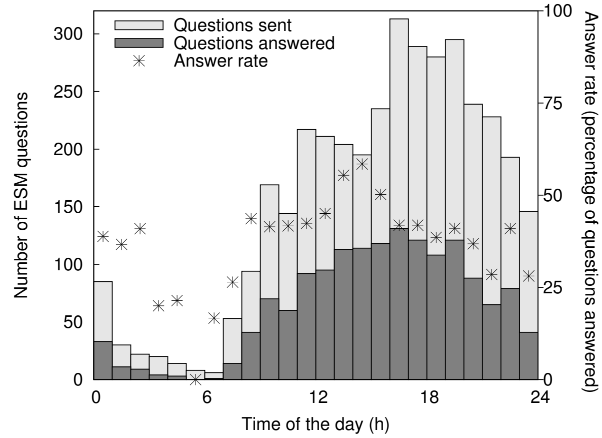

Figure 4: The participation (answering ESM questions) per hour of the day.

They mainly (32/40) come from the United Kingdom and United States, and age between 18 and 23 (20.6 on average), with 23 female participants.

Over the two-week runs, 3,817 ESM questions were sent to the phones. Not all of these questions were answered, for various reasons. Participants were asked to answer as many questions as they can, but were not obliged to do so in order to avoid false answers. They were also asked to not switch the phone to silent mode or to switch it off. This instruction was not universally followed, however, and 2 phones were returned at the end of the study in silent mode. Also, if a question has been sent more than 30 minutes ago without being replied (e.g., when the phone is out of network coverage), it is not displayed on the phone. Of the 3,817 questions, 2,054 were answered (53.8%). The participation rate depended on the participant, and ranged from 11% to 70%, with an average of 53.1% (standard deviation: 15.8%). The participation rate also depended on the time of the day. Figure 4 shows that the participation rate in the afternoon (1200–1800) is higher than in the evening (1800-0000), respectively 48.8% and 35.6%. Note that more questions were sent during the afternoon and early evening than at night and early morning. This is because most participants asked to not receive questions at night, and because event-contingent questions were sent when a user stops in a new location (which happens less frequently in the morning and at night).

4.2 Overall results

Due to space constraints, we only present here some basic results, to show how our methodology can help in understanding participants' privacy concerns in location-sharing.

We categorise location sharing into three types:

Private: location is shared with no-one.
Shared: location is shared with a restricted set of people.
Public: location is shared with all friends, or everyone.

We define the *private rate* as the proportion of sharing activities that were private, and conversely the *public rate* is

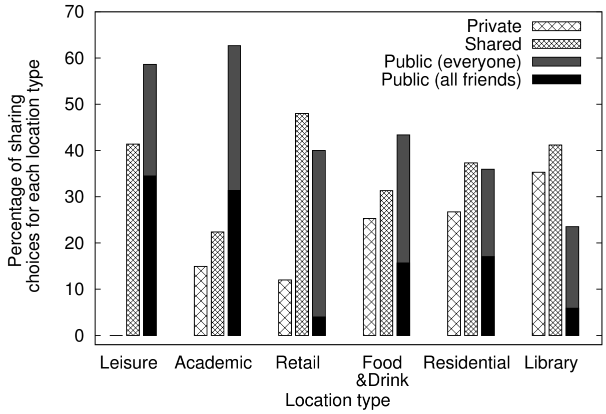

Figure 5: Proportion of sharing choices at different types of locations. Leisure locations were always shared with someone.

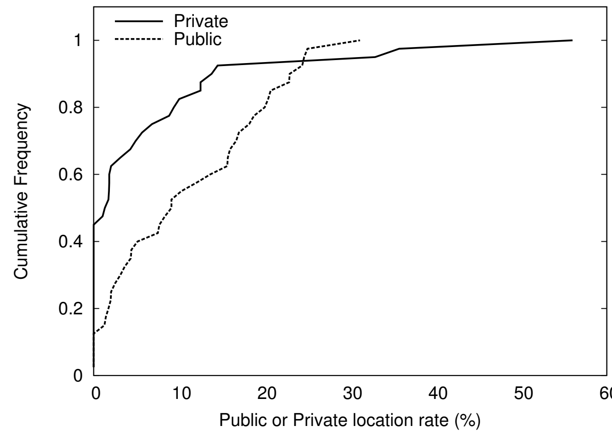

Figure 6: Cumulative distribution of participants' private and public sharing rates.

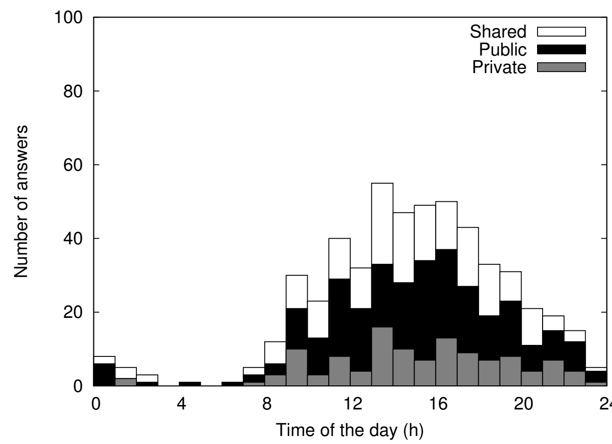

Figure 7: Number of shared, public, and private locations per hour of the day. There is no visible trend throughout the day.

the proportion of sharing activities that were public.

Figure 5 shows how participants disclose their location depending on the location type. Out of the 2,054 answers to ESM questions, 525 answers were concerning location disclosure (i.e., answers to the 3 first event-contingent questions). These answers correspond to 151 distinct locations. We manually categorised 85% of these locations into 6 types: *Leisure* (e.g., parks, cinema), *Academic* (university buildings), *Retail* (e.g., stores, supermarkets), *Food & Drink* (e.g., restaurants, bars), *Residential* (e.g., home), and *Library*. Figure 5 shows the proportion of private, shared, and public disclosure choices. When at a Leisure place, no-one ever chose to keep this information private, whereas participants decided to make this public 58.6% of the time. On the other hand, when at the Library, the location was private 35% of the time while it was public 24.5% of the time. We observe a general trend suggesting that participants were more willing to share their location when at a Leisure or Academic place than at Home or at the Library.

This behaviour is consistent with that observed by Consolvo et al. [4], where the 16 participants (not all of whom are students) were more willing to disclose their location at work than at home. Our student participants shared their location more at work (i.e., when attending courses in Academic places) than at home or at friends' home (Residential). During the debriefing sessions, participants explained that they are more willing to share when in what they believe to be an "interesting" place, which may explain the high public rate in Leisure places. On the other hand, they explained their decision of sharing their location to nobody when at the Library by their wish to not be disturbed by their friends.

Following Anthony et al. [2], we classify participants into three categories: *Variable Privacy* participants (VP) who made some locations private and some not, *Consistent-Share-With-Friends* participants (CSWF) who did not make any locations private, and *Consistent-Private* participants (CP) who did not share any location. Figure 6 shows that there were no CP participants; the maximum private rate was 56%. There were 19 CSWF and 21 VP participants. VP participants do not all exhibit the same private rate: one of them made only 1% of his/her locations private while another one made them private 56% of the time. Figure 7, however, shows that the private rate does not depend on the time of day since the proportion of private locations is regular over the day, as well as the public rate. Note that at night there are not enough location questions sent to have confidence in the public and private rates.

During the debriefing, participants were asked what motivated them to make some locations private. Out of the 21 VP participants, nine did not give any particular reason, did it by mistake, or did not remember, which may indicate that we need to perhaps ask more detailed ESM questions. The reasons given by the remainder are because the location was not interesting/exciting enough to be shared ("no one would care"), to not disturb their friends by displaying too many things on their Facebook feed, and to not be disturbed by people who would join.

5. LESSONS LEARNED

We have described our methodology, testbed and some initial results. We now describe some of the lessons that we learned during this process, so that other researchers can benefit from our experiences.

Deploying a mobile experimental testbed of this sort introduces a number of challenges. Some are technical issues requiring practical solutions when deploying the testbed, while others may be non-technical issues involving ethics, user acceptance, and experimental design.

Ethics. Capturing participants' behaviour in their everyday life involves many ethical issues, since it may involve disclosure of personal information, not only to the researchers, but also to their friends and beyond, in experiments involving Internet services such as Facebook. We alleviate the ethical considerations in the usual way:

1. Informed Consent: The main purpose of the study and the data to be collected (and how they will be collected) was clear to the participants and they provided consent before the start of the study, prior to the pre-briefing session. It was also clear to the students that their participation was fully voluntary, meaning that they had the right to withdraw from the study at any time without giving any explanation, but also that they could decide to decline participation to the study without any pressure or penalty.

2. Anonymity: All collected data were anonymised at the end of the study, so that any piece of data cannot be linked to an individual after the study. Note that even though participants may have shared some data with friends during the study, we still follow best practice (and the EU Data Protection Directive) by anonymising and only storing necessary data.

Participation. Convincing participants to participate in an experiment can be a hard task, since "helping science" is sometimes not enough as an argument to convince them to actively participate in a research study. Our first argument was to advertise that selected participants will be involved in a hands-on experiment, using a fun social application on a mobile phone. We also highlighted in the advertisements our use of Facebook in the experiment to benefit from the popularity of the social network among students. As often in research studies, we also offered a reward for participation. We intended this to be perceived by candidates as a compensation rather than as a motivation to participate, but one participant explicitly admitted to the researchers at the end of the study that (s)he did it only for money. The number of emails sent by the participants to enquiry about when the bank transfer will be done for the reward also suggests that the reward was also a motivation to participate. We believe that reducing the amount of the reward and adding new fun features to enhance participants' experience is likely to improve the participation quality. We expect as a counterpart to have fewer potential candidates to participate in the study.

Controlling the devices. Conducting an experiment during participants' everyday lives implies limited control over the devices and the participants themselves, as the intention is not to interfere with everyday life. Despite providing instructions, we were unable to prevent the users from stopping participation or misusing the mobile phone. Some participants switched the mobile phone to silent mode, and so may have missed ESM questions. Some of them forgot to charge the device before going out in the morning, and the device may therefore have run out of battery before the end of the day. Since we can access the mobile phone through the cellular network (via internet or SMS), we could have monitored the usage of the mobile phone in real time. For instance, we could have received an alert when a user is switching off the phone while the battery is not empty, or when a user switches it to silent mode. The participant could then be contacted and warned or reminded that the mobile phone must not be switched off or switched to silent mode.

Scalability. Any testbed should be able to cope with the expected number of participants and amount of data collected. For a testbed such as ours, there are multiple challenges. Firstly, for real-time measurements, deploying an infrastructure to monitor everyday behaviour may be difficult since the participants' movements cannot be controlled, and so any infrastructure may need to cover an unbounded area. Our solution to solve this scalability issue is to rely on existing infrastructure, e.g., commercial cellular networks for sending and receiving data, and the use of existing online resources for inferring activity and place. Secondly, scaling the monitoring and management of the devices becomes a challenge whenever an operation must be performed on several devices that are physically inaccessible, for instance rebooting malfunctioning devices, or updating the software running on the devices carried by users. We divided our deployment into two consecutive experiments involving 20 participants each, and were able to easily manage the mobile phones. More mobile phones would have required an automatic and simultaneous way of installing the application and configuring the mobile phone, or asking the participants to use their personal mobile phone and download online an easy-to-install and ready-to-use application. Thirdly, dealing with participants can be time-consuming, with prebriefing and debriefing interviews, and also providing "technical support" to ensure that users could successfully use the phones and Facebook application.

Appropriate hardware. Hardware should be appropriate for the study, in that it should not annoy the participants by interfering too much in their everyday life. Since sensing devices are worn by the participants, they had to be small, easy-to-use, and energy-efficient. A device that requires charging on a regular basis may change participant behaviour as they end up searching for power sources. Uploading data regularly, along with scanning for GPS and Wi-Fi access points, and asking questions to the participants appeared to drain the Nokia N95 battery very quickly. We optimised the use of GPS and WiFi scanning by switching them off when the accelerometer did not show any motion. While the battery life was extended, the mobile phone still had to be charged everyday. Ideally we would like to source more energy-efficient hardware to make life easier for participants.

Forgetting experience. Data provided by ESM are still self-reported, and a user can lie or ignore questions. But this is a common issue with other self-reported methods such as surveys. It is also difficult to determine whether a user ignored a question because (s)he missed the notification, or because of a privacy concern. Nevertheless, the main advantage of ESM is to capture the participants experience *in situ* so that the participant can report his/her experience with accuracy. Along with ESM, we also conducted debriefing interviews with the participants to understand better the collected data and ESM answers. Some participants, however, could not remember some of the events, even after being provided with the collected data, and were unable to provide us with further explanations on their behaviour. This could have been avoided by asking more details during the actual study through more advanced ESM questions, taking into account the tradeoff between asking too many or too complicated ESM questions that might affect participation, and too simplistic ESM questions that are not sufficient to fully understand the user experience.

6. CONCLUSIONS AND ONGOING WORK

To understand the implications of ubiquitous social networking, and to design the appropriate services and applications, we need to understand users' privacy concerns. In this paper, we presented a methodology based on the Experience Sampling Method to collect data on these privacy concerns. We applied this methodology to study the privacy concerns of 40 students when sharing their location with a mobile phone on Facebook. Over a one-week period, we monitored their activities and studied to whom, where and why they were willing to share their location.

The data collected through the experiment are not only about what participants have shared, but also about what they did *not* share: our methodology allowed us to collect 214 occurrences of locations (or pictures describing locations) that where not shared on Facebook and that could not have been measured by only collecting shared data from Facebook. Our methodology also allows us to understand where, when, and why they did not want to share this information, through 2,054 answered ESM questions, additional collected data from the mobile phones, and interviews. Preliminary results show that students are more willing to share their location when in an Academic building or a Leisure place, than when at home (Residential) or in the Library, maybe because they do not want to be disturbed or because they think the location is not interesting enough to be shared.

While this paper is focussed on the methodology and only presented preliminary results, there are still interesting collected data to analyse from this experiment. For instance, we are interested in determining whether the simulated group of participants has a different behaviour than the group actually sharing on Facebook. Another aspect that we are interested in is how students prefer to share their location, by checking whether they are more willing to share their location when described in a photo or when automatically determined as a place name or address.

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