Informed Consent and Users' Attitudes to Logging in Large Scale Trials

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Abstract

The HCI community has begun to use 'app store'-style software repositories as a distribution channel for research applications. A number of ethical challenges present themselves in this setting, not least that of gaining informed consent from potential participants before logging data on their use of the software. We note that standard 'terms and conditions' pages have proved unsuccessful in communicating relevant information to users, and explore further means of conveying researchers' intent and allowing opt-out mechanisms. We test the hypothesis that revealing collected information to users will affect their level of concern at being recorded and find that users are more concerned when presented with a personalised representation of recorded data, and consequently stop using the application sooner. Also described is a means of allowing between-groups experiments in such mass participation trials.

ACM Classification Keywords

H.5.2 User Interfaces: Evaluation/methodology

General Terms

Experimentation, human factors, theory.

Introduction

Many smartphone platforms have launched 'app stores' in recent years as a simple means of software

distribution. This has been an extremely popular phenomenon with end users [2], and several academic research projects have also recently begun to use such stores as a means of recruiting participants and deploying software [1][5][8], benefitting from the potential to reach tens of thousands of users without the practical challenge of supplying hardware to such a large population.

While reaping these benefits of 'mass participation' trials, researchers should be aware of a new set of ethical challenges which arise from conducting research in this way. One significant consideration is in the gathering of informed consent from trial participants. Accepted ethical practice in a more standard trial dictates that each participant is instructed on the nature of the experiment before taking part, and told about the data to be collected on their behaviour or use of trial software. A consensus is still lacking as to how researchers involved in mass participation research should best present this information and to what lengths they can practically be expected to go to ensure consent before collecting data.

Here we describe exploratory work on gaining truly informed consent from users beyond potentially ineffective standard 'terms and conditions' (T&C) pages. A previously released mobile game [8] was augmented to remind users they were being studied and to provide users with greater control over the data recorded for analysis, in order to see which types of data users are most concerned about. We examine the hypothesis that reflecting our analysis back to users will affect their level of comfort about being logged. This research is conducted using a described means of running between-groups experiments in app store-style trials.

Related work

A number of research projects in the last few years have used online repositories of software for mobile devices to recruit participants but few have reported their efforts to ensure consent in any detail. While most seem to follow the example of commercial programs and use boilerplate T&C screens, there are some exceptions, such as CenceMe's [9] second T&C screen reiterating the research focus as required by those researchers' ethics committee. Böhme and Köpsell show that subtle differences in the presentation of consent dialogs can affect the amount of attention given to them as well as the proportions of users accepting the terms [11].

Recent media stories seem to indicate that the public are becoming more aware of the potential for mobile applications to log data on their activities, and there has been some backlash against this, e.g. researchers covertly tracking the Bluetooth devices of thousands of people [6]. TaintDroid [3] on the Android platform is a utility that displays the information transmitted by other applications, further informing users on data being logged.

Hungry Yoshi

Hungry Yoshi is a ubiquitous computing game on the iOS platform that uses detected WiFi access points (APs) as a game resource; password-protected APs are shown as small creatures ("yoshis") and open APs are shown as plantations that grow fruit which the user feeds to a yoshi to earn points. The game was released via an app store public software repository in

September 2009 and since then has been downloaded to around 185,000 unique devices.

Previous work [8] has described how the software use was analysed using both quantitative and qualitative means, despite the challenges of running the trial at a distance without direct contact with users. In particular, users' interactions are recorded along with contextual information and periodically uploaded to a database over the same Internet connection required to play the game. Further details are available for both the SGLog logging framework [7] and complementary SGVis desktop analysis toolkit [10]. An in-built questionnaire mechanism also allowed researchers to query users on specific areas of the trial as it was running. Questions were presented as game "tasks" and users were awarded with points for participation. In this paper, Hungry Yoshi is used as a basis to specifically examine issues of informed consent and users' reported comfort at being logged.

Is a 'Terms & Conditions' page sufficient to gain informed consent?

On first launch after installing Hungry Yoshi, users are presented with a set of terms and conditions that must be agreed to before use of the game can commence. Here, the nature of the research and all the various forms of logging are explained. A contact email address is provided and it is explained that all recorded data will be destroyed on request. As the software has been released globally, this information is provided in four major languages.

Despite this T&C page, further probing of the users via the game's questionnaire mechanism revealed that only 30% of respondents had realised that their use of the software was part of an academic trial. Of those interviewed none had read the T&Cs. These results bolster research conducted on the number of people who read T&C pages on installation of desktop software, with [4] reporting this figure as only 28%. In light of these findings, it has been seen as an important ethical responsibility to find further means of informing users of the log data being recorded and their role as participants in an academic trial.

Giving users finer control over data logging

As mentioned above, providing T&C pages does not ensure that users have read them or understood the consequences of logging. The log data collected on Hungry Yoshi users covers three main areas: location, device information (unique ID, OS type etc.) and game-specific information such as button taps. The game was recently updated to provide three separate logging control switches, allowing any or all of these areas of logging to be stopped by the participant. This allowed users to continue to use the application while withholding some or all data, whereas previously their only course of action was to cease playing the game. We sought to explore whether there would be a considerable number of users who would wish to continue playing but prefer not to be logged on certain aspects of their usage.

The following sections describe an experiment to test the hypothesis that users would show a reduced level of comfort with being logged if they were shown information collected during their use of the application.

Conditional experiment design

We propose a method of separating users into different groups based on hardware identifiers. Each device has

a globally unique identifier, or GUID, which can be used to identify participants. A hash on the GUID can be calculated and used to assign each user to a group. In this study, one experiment and one control group were created, each exposed to different data. To our knowledge this is the first use of such an experimental design in app store-style trials.

Reflecting gathered data back to users

This section describes an experiment where we examine users' comfort with being logged, and whether a separate group react differently when shown some of the data gathered during their use of the software.
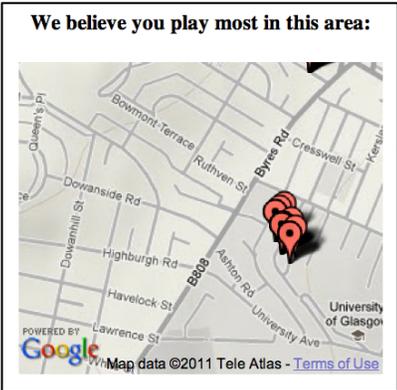

For users in the first experimental group, this map is also shown. The map indicates the recorded locations at which the user has most frequently used the application. The second group was given no such user–specific historical data.
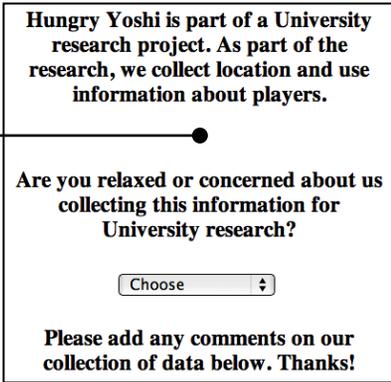
Figure 1. Survey question shown to users. Both groups were shown this text, but one group was shown a map (left).

Two groups were created, as described in the previous section. Both groups were first reminded that the game recorded information that could identify their locations. One group was shown a map, as in the example on the left, on which points were drawn to reveal historical data on the locations at which user had played the game. Members of a control group were not shown such historical data. Members of both groups were then

asked to rate their comfort with this data logging on a 4 point Likert scale, and a text-box was provided to optionally make a more detailed response.

Results

Data collected from both groups was analysed, examining reported levels of comfort with being recorded, the number of people who took action to switch off logging, and subsequent behaviour in terms of continued use of the application. In total, data from 377 users has been recorded so far. Results fall into three main sections.
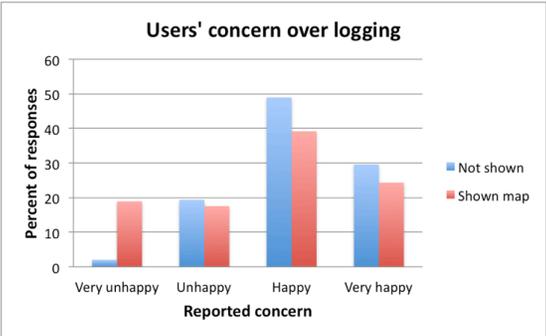

Figure 2. Reported concern about application logging, and how this varies between the group shown a map of recorded location data and the control group.

Showing users recorded location data and effects on users' concern over logging

Figure 2 shows the results of the Likert scale test, querying users in their level of comfort with being logged. It can be seen that there is a noticeable difference between the two conditions. 10% fewer users who were shown the map claim to be happy with being logged than the control group (39% as compared

to 49%), and the number of very unhappy users differs by 16%: 2% (control) compared to 18% (map).

In addition to providing a level of happiness, 21% of users also submitted text. Responses were provided by roughly even proportions of happy and unhappy users. Example quotes range from "I don't like that people knows that much about me" to "I have no problem! if this help to gather info I would participate in it."
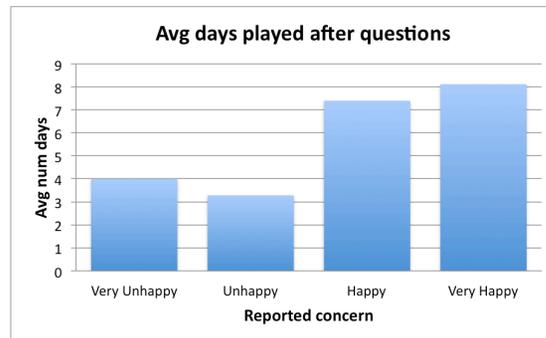
Figure 3. The average number of days the users continued to use the application after being asked about logging, and how this varies by reported concern.

Effect of presenting gathered location data on subsequent use
We examined the link between the concern expressed with the logging of data and the number of days the user continued to play after giving this response. This is intended to verify the extent to which the comfort survey results are reflected in observed behaviour, although we note the possibility that those who said they were unhappy might have become more self-conscious about their questionnaire answer rather than the data logging. Keeping this caveat in mind, we note that users who offered responses of Happy or Very

Happy continued to play for twice as long, on average, as shown in Figure 3.

Users' comfort with different forms of logging
We also examined the number of users who switched logging off. Of the users who opened the screen in the application that presented the logging controls, 83% chose to keep the application logging, with only 17% making any alterations. Of those making alterations we observed 88% turn off location logging, 82% turn off game-specific logging and 76% turn off device information logging. 69% turned off all logging.

Conclusion
The recent rise of large-scale deployments of research applications via app store-style distribution channels raises significant ethical challenges, and the community has yet to reach a consensus on how best to gain informed consent from trial participants recruited in this manner. Many applications provide terms and conditions that explain the nature of the trial, but with research suggesting that such pages are seldom read, it is perhaps incumbent on researchers to go to greater lengths to ensure that users understand and are willing to participate in the research.

To explore alternative approaches, we modified an existing mobile application. Participants were reminded that their activity was being recorded, not just in a T&C page on first launch, but again during use of the application. We also devised a means of running a between-groups experiment using a single application deployed via an app store repository. On querying users on their level of concern at being logged, we found that the group of users shown a map that revealed location data had a larger negative reaction

than the control group who were not shown the map. These users stopped using the application twice as quickly as those who reported being confortable with the logging process. Future work will further examine users' motives for ceasing play.

Finer controls were also provided over what usage data was logged. In looking at which aspects of logging caused users most concern, it was notable that most users who changed their logging settings chose to switch off all three types of logging at the same time. While we would wish to accommodate user requests if there were *some* aspects of logging they were specifically concerned about, this lack of discrimination in logging may discourage the provision of such controls in future research deployments. Researchers are in effect compensating users for their participation, not with money, but by providing a free application, despite associated maintenance and running costs. There is little research benefit in letting users who turn off all logging use the system, which invites the question of whether program use should be conditional on acceptance of logging.

These are preliminary results, but we intend to study larger groups of users and to look beyond merely location to other aspects of recorded data. Our findings so far suggest that the majority of users allow their activity to be recorded even when greater opportunities are provided to stop. However, a number of users did request logging to cease, and therefore additional measures beyond standard T&C pages are important in fostering understanding and providing opt-out mechanisms. In particular, showing the consequences of logging with real world examples might be helpful in ensuring that users' consent is truly informed.

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