

Lifelogging User Study: Bystander Privacy

Soumyadeb Chowdhury
Singapore Institute of Technology
Soum.Chowdhury@singaporetech.edu.sg

Md Sadek Ferdous
University of Southampton
S.Ferdous@soton.ac.uk

Joemon M Jose
University of Glasgow
Joemon.Jose@glasgow.ac.uk

Automatically and passively taking pictures (using lifelogging devices such as wearable cameras) of people who don't know they're having their picture taken raises a number of privacy concerns (from a bystander's perspective). We conducted a study focussing on the bystanders' concerns to the presence of augmented reality wearable devices in two contexts (one formal and one informal). The results suggests the need to embed privacy enhancing techniques into the design of lifelogging applications, which are likely to depend upon an array of factors, but not limited to the context of use, scenario (and surroundings), and content.

Lifelogging, Wearable Camera, User Study, Privacy, Bystander, Privacy by Design

1. INTRODUCTION

Lifelogging, a technique for digitally gathering every moment in life using wearable cameras (like Autographer, 2009 and Narrative Clip, 2012) is a growing phenomenon. The underlying problem of lifelogging cameras is that they essentially demand that an individual wearing the camera (lifelogger - LL) take photos of complete strangers, which raises privacy concerns from a bystander's perspective (BSs – known or unknown people captured in the images). Wearable cameras, may capture photos in different scenarios/contexts including, but not limited to private (living room), intimate (time spent with loved ones) and workplace. Hence understanding the privacy implications of using such devices in different scenarios from the BSs' perspectives will facilitate in supporting the needs of different actors, by embedding privacy in the user-centred design.

In this paper, we report the results of a user study conducted within two contexts/scenarios to understand the perspectives of the BSs, when a wearable camera is used. In our study, LLs are actors who are wearing the device which passively captures images, and BSs are actors who are captured in the lifelogs (may be known or unknown to the LLs). The results reported in (Chowdhury et al., 2016) provides evidence that BSs were concerned to the presence of lifelogging cameras, contrary to the results reported in Hoyle et al. (2014), where LLs reported to have encountered no opposition from the BSs. It is worth mentioning that these results are limited to understanding the reactions of the BSs as perceived by the LLs. The study reported in this paper addresses the above limitation by focussing on BSs' concerns and

perception to the presence of augmented reality wearable cameras.

2. RELATED STUDIES

Zhou and Gurrin (2012) have reported a survey on the attitudes of people towards lifelogging and identified privacy as one of the primary concerns, in addition to appearance of the device and comfort using the device. Kelly et al. (2013) has suggested that privacy and anonymity of third parties must be protected and images containing third parties should not be published without their consent. Clinch et al. (2016) have reported an experiment with 13 people over a period of 2.5 days. The study did not focus on BS privacy, rather shared the challenges of conducting such experiments, and discuss their wide applicability in the future. The study reported in Hoyle et al. (2014) has demonstrated that 26 out of 36 LLs reported positive interest from the BSs, and none of the LLs reported to have encountered opposition from the BSs. We contend that lifelogging cameras are likely to be used within many social and organizational contexts, as well as surroundings. Given the diversity of users' views about privacy, which is extremely contextual, there is a need to understand their perceptions of the BSs, when such devices are used in different scenarios. This can be achieved by conducting empirical studies, which will help to develop techniques that will address their privacy concerns in an array of scenarios.

3. EVALUATION

Privacy is individually subjective and socially situated (Ackerman and Mainwaring, 2005). We

believe that BSs' concerns regarding privacy is likely to differ for the lifelog images captured in different scenarios such as business meetings, informal gathering with friends and family. However, we are neither aware of all such scenarios nor it is easy to simulate all the scenarios in the absence of a standard experimental protocol, to understand the BSs' perspectives when lifelogging devices are used. Hence, we decided to simulate two scenarios: (S1) Use of wearable cameras during a student presentation (formal meeting where a group of students are demonstrating their projects to their project supervisor); (S2) Use of wearable cameras in a gathering among friends in the personal space of the experimenter (indoor informal meeting). We believe that the aforementioned scenarios are the most likely ones that LLs will encounter in their daily life, and covers two ends of the spectrum (i.e. formal and informal gatherings).

Five postgraduate computing science students (age range: 22-26) voluntarily agreed to take part in S1. None of them had used lifelogging devices in the past. All the subjects wore a wearable camera, around their neck. Then each subject was asked to give a 3 minute presentation on their dissertation, followed by a 1 minute question answer session. After the session, they were asked to complete a questionnaire to share their views on being captured in a series of photos, and to the presence of the device during the presentation session.

The evaluator approached a number of friends to take part in S2. 6 subjects (age range: 20-26), voluntarily participated. None of the recruits had used such devices in the past. All the subjects wore a wearable camera around their neck, and interacted with each other for 20 minutes. Out of 6 subjects, 4 knew each other beforehand and 2 just knew the evaluator. Thus the simulation comprised of a mix of people who knew each other, as well as some of them were not acquainted with everyone in the room, to simulate a real-life informal gathering, where all people don't necessarily know each other, but interact. After the interaction, the subjects were asked to answer a paper questionnaire.

4. RESULTS

According to the subjects (S1), the reasons which may curtail the use of such a device during a formal presentation are: content may be sensitive, and the presenter may not want them to be recorded; organisation policies that may prevent recording pictures during a presentation; audience may be bothered, if photographs are taken without their consent. All the subjects reported that they tend to become anxious, and are more conservative as well as serious, if they are being captured in the

images. In relation to the images that are likely to affect their privacy, 4 subjects reported that all images that are captured or even shared in a public forum without their permission and the images that show them doing something else, other than paying attention to the presentation is a breach to their privacy. Hence in a formal meeting from the BSs' perspective, the sensitivity and privacy of an image passively captured by a wearable camera is likely to depend upon how the image portrays the people present in it, and whether it is permitted to capture the contents presented during the presentation.

All the subjects (in S2) seemed to contend that a LL should take their consent before recording, and seek permission before sharing them online. Most of the subjects replied in free text that they forgot quickly about the presence of the camera because they were taken by the social environment. Hence the camera captured images in private spaces like rest rooms. Additionally, all the subjects were worried about being caught on camera showing intimate moments, or coming out negative on a photo. They were concerned about: how the lifelogs will portray themselves; how the contents will be used; what sort of activities will be captured. We acknowledge that there is often a gap between most user's stated preferences and their actual behaviour. Since the privacy sphere is relative, the results are likely to differ for users from different age groups (Caprani et al., 2012), and perhaps countries.

5. CONCLUSION

The possibility of ubiquitous presence of lifelogging devices, especially in the private sphere has raised serious concerns with respect to the BSs' privacy. We do not claim that our study with BSs is rigorous, but contend that the BSs' opinion about the privacy implications of using such devices will vary depending upon the occasion, context, content of the photos, and the manner in which the images will reflect their personality. Our study shows that the likelihood of people forgetting about the camera in a social environment and unintentionally using it in rest rooms (violating the rules of BSs' personal space), warrants development of mechanisms to filter out images captured in such spaces. In such cases the LLs may not be aware of what they are recording (unintentionally) and whose privacy they might be breaching. Hence, we contend the need to use contextual design in developing privacy friendly usable lifelogging applications, i.e. implementing privacy mediating techniques aligning to the different contexts (scenarios) in which the lifelog images are captured, without undermining the user experience, and quality of service.

ACKNOWLEDGEMENT

We acknowledge support from Integrated Multimedia City Data, a project within the ESRC-funded Urban Big Data Centre (ES/L011921/1). We are also thankful to Atanas Bozhkov (MSc Student University of Glasgow) for helping us to conduct the user studies.

REFERENCES

Ackerman, M. and Mainwaring, S., (2005). Privacy issues and human-computer interaction. *Computer*, 27(5), pp.19-26.

Autographer. (2009) The World's First Intelligent Wearable Camera, OMG Life Ltd Available from: <http://www.autographer.com> (Accessed: 20 May 2016).

Caprani, N., Gurrin, C. and O'Connor, N.E., (2012). Sharing as a motivation for lifelogging.

Chowdhury, S, et al., (2016). Bystander privacy in lifelogging. In Proceedings of British HCI 2016-Fusion. British Computer Society.

Clinch, Sarah, et al., (2016). Collecting Shared Experiences through Lifelogging: Lessons Learned. *Pervasive Computing, IEEE*, 15(1), pp.58-67

Hoyle, R, et al., (2014), September. Privacy behaviors of lifeloggers using wearable cameras. In *Proceedings of the 2014 ACM International Joint Conference on Pervasive and Ubiquitous Computing*. 571-582.

Kelly, P, et al., (2013). An ethical framework for automated, wearable cameras in health behavior research. *American journal of preventive medicine*, 44(3). 314-319.

Narrative Clip 2. (2012). Memoto AB Available at: <http://getnarrative.com> (Accessed: 23 May 2016).

Zhou, L.M. and Gurrin, C., (2012). A survey on life logging data capturing. *SenseCam 2012*.