Lock n' LoL: Mitigating Smartphone Disturbance in Co-located Social Interactions

Minsam Ko
Knowledge Service Engineering
KAIST
msko@kaist.ac.kr

Chayanin Wong
Computer Science
KAIST
cwong@kaist.ac.kr

Sunmin Son
Computer Science
KAIST
thstjsals@kaist.ac.kr

Euigon Jung
Electrical Engineering
KAIST
1994lion@kaist.ac.kr

Uichin Lee
Knowledge Service Engineering
KAIST
uclee@kaist.ac.kr

Seungwoo Choi
Knowledge Service Engineering
KAIST
sw.choi@kaist.ac.kr

Sungho Jo
Computer Science
KAIST
shjo@cs.kaist.ac.kr

Min H. Kim
Computer Science
KAIST
minhkim@vclab.kaist.ac.kr

Abstract

We aim to improve the quality of time spent in co-located social interactions by encouraging people to limit their smartphone usage together. We present a prototype called Lock n' LoL, an app that allows co-located users to lock their smartphones and limit their usage by enforcing users to ask for explicit use permission. From our preliminary study, we designed two modes to deal with the dynamics of smartphone use during the co-located social interactions: (1) socializing mode (i.e., locking smartphones to limit usage together) and (2) temporary use mode (i.e., requesting/granting temporary smartphone use). We conducted a pilot study ($n = 20$) with our working prototype, and the results documented the helpfulness of Lock n' LoL when used in socializing.

Author Keywords

Smartphone usage; Socializing; Synchronous awareness
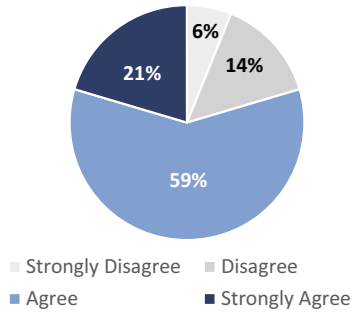
ACM Classification Keywords

H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous.
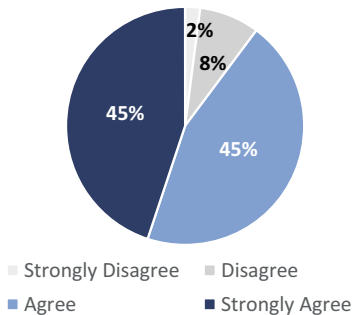
Introduction

Smartphones have stretched the boundaries of socializing by allowing users to exchange instant messages and share daily activities/contents in social network services (SNSs). However, smartphones can sometimes be a distraction in

Q. I was disturbed by smartphones while socializing.

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

Q. We should limit smartphone use while socializing.

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree

co-located social interactions. For example, conversations were found to be disturbed by frequent notifications or habitual checking of online contents such as status updates in SNSs. According to our preliminary survey with college students ($n = 49$), 80% of the respondents reported that they were disturbed by smartphones in a co-located socializing situation. In addition, the majority of the participants (90%) agreed that limiting smartphone usage is needed during co-located social interactions.

Prior studies have demonstrated that limiting smartphone use can improve the quality of in-person social interaction. For example, Misra et al. [8] found people who had conversations without mobile devices reported higher levels of connectedness and empathetic concern than those with mobile devices. Also, people are more likely to feel social responsibility such as sympathy or engagement of social interaction in the absence of the smartphone [2]. However, self-regulation of smartphone use is still difficult in many cases due to its various functionality and high accessibility [3].

In this paper, we present a prototype of Lock n' LoL ('locking' smartphones to 'laugh out loud' together), a mobile application which helps users to collaboratively manage their smartphone usage by providing synchronous social awareness (i.e., others' usage/limiting behaviors while socializing). As we iteratively prototyped Lock n' LoL, we conducted a pilot study ($n = 20$) that showed the helpfulness of Lock n' LoL in co-located socializing and also provided additional design suggestions.

Related Work

Disturbances by smartphone use
Disturbances by smartphones in our daily activities (e.g., studying or working) have been reported in recent studies [1]. According to our preliminary survey,

smartphones also could disrupt socializing activities by interrupting conversations or causing users to unintentionally show disrespect. To deal with such disturbances, people often try to limit their smartphone usage through physical separation or by turning the phone off [6]. However, self-regulation of smartphone use is more complicated than it seems due to its accessibility and functionality. While smartphones are always carried by users and typically serve as gateways to numerous services ready at hand (e.g., information seeking and social networking), stimulating mobile contents may lead to excessively long usage [5]. In this work, we consider dynamic contexts of smartphone usage and design a tool to help users manage their usage during co-located socializing activities.

Tools for self-regulation of smartphone usage
In order to deal with negative side of smartphones, diverse intervention methods for improving self-regulation of smartphone usage have been proposed such as monitoring usage amounts [7] and locking screens [4]. Furthermore, social supports are utilized to improve self-regulation of smartphone usage [3]. While earlier studies mainly focused on giving asynchronous awareness on group members' usage/limiting behaviors, none of the work specifically considered co-located social interactions. For example, co-located users who want to manage smartphone usage need to keep track of how much time each of them did (not) use smartphones. Our work allows co-located users to manage usage together, and to have interactions among themselves for synchronously requesting and granting smartphone use.

Preliminary Study

We investigated smartphone usage in socializing via an online survey and interviews. We conducted a survey which consisted of four-point Likert scale questions about

Q. When do smartphones disturb socializing?

"I unconsciously check personal message **notifications** *instantly, which sometimes disturbs my conversations."* (P2)

"I **habitually** *use the smartphone to resolve for awkward silences and idleness."* (P5)

Q. When are smartphones good for socializing?

"I used my smartphone to **search** *recent fashion trends and do online shopping with friends."* (P3)

"Sometimes, I play smartphone **games** *with their friends to get along."* (P7)

how smartphones disturb socializing and what people thought about the necessity of managing smartphone usage in socializing. Following each Likert question, we asked respondents to describe the reason in an open-ended question. The survey was posted in online forums and SNSs in Korea, and 49 participants responded to the survey (gender: 32 males and 17 females; ages: $M = 27.73, SD = 9.42$). We also interviewed seven participants to supplement the survey (gender: males=5 and females=2; age: $M = 23.43, SD = 11.87$) by inquiring the details of when smartphones are (un)necessary for socializing.

Results
Many participants (79.5%) reported that they were disturbed by smartphones while socializing ($M = 2.93, SD = 0.76$). Also, the majority (89.7%) responded that smartphone usage should be limited for better socializing ($M = 3.32, SD = 0.71$). In order to understand the detailed contexts of disturbances by smartphones, we created an affinity diagram with the responses related to disturbances from both the open-ended survey questions and interviews.

Disturbances were specifically found to be triggered by externally cued usages such as push notifications. Many of the participants reported that their conversations were interrupted by constant notifications that either made sounds or vibrations. In spite of such disturbances by notifications, however, the participants simply seemed to forget to set their phones to silent mode while socializing. Another type of disturbing socializing activities was by the participants' lack of self-regulation. Many admitted that they habitually checked their smartphones while socializing. Others said that they unconsciously picked up their smartphones, which broke the ongoing conversation. Here, the problem usually occurred when their usage

lasted longer than they had intended. They unconsciously started to check SNSs and online portals and quickly became too occupied with their phones, paying less attention to the co-located friends with whom they were socializing with.

On the flip side, we discovered that smartphones can be also used to socialize. Most of the cases were related to the smartphones' capability of conveiniently accessing information. Especially, the participants acknowledged the need of using smartphones for information seeking. Some of the participants commented that they sometimes used smartphones to resolve conflicts or find answers during a dispute or a discussion. Also, smartphones can enable co-located friends to have social activities such as sharing photos and playing mobile games.

Discussion
Based on our study results, we drew design implications in order to help smartphone users to manage their usage while socializing. First, we found that socializing was often disrupted by external usage cues (e.g., notification alarms) and habitual checking patterns (e.g., checking status updates or online contents). Therefore, it seemed necessary to design intervention mechanisms to prevent these usage behaviors in order to minimize disturbances in their socializing. Second, the study participants also reported the usefulness of smartphones in socializing. If smartphone usage is totally limited while socializing, usual behaviors in socializing (e.g., taking a photo or posting events into SNS) can be also limited. Therefore, intervention mechanisms for limiting usage should be flexible in order to help users determine when to allow use and when to limit use during co-located social interactions.
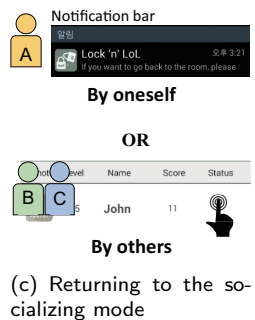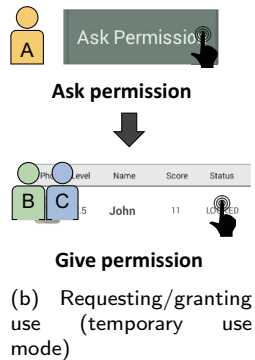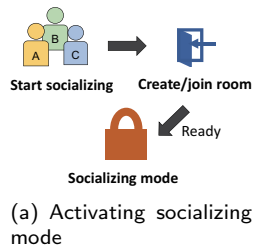
(a) Activating socializing mode

Ask permission

Give permission

(b) Requesting/granting use (temporary use mode)

By oneself

OR

By others

(c) Returning to the socializing mode

Figure 1: Main processes of Lock n' LoL

Working prototype of Lock n' LoL

We followed an iterative prototyping process to develop Lock n' LoL. Here, we describe a current working prototype. It consists of three parts: (1) activating socializing mode, (2) requesting/granting use, and (3) monitoring socializing activities.

Activating socializing mode
We designed a socializing mode that locks co-located users' smartphones in order to deal with the two usage behaviors that disrupts socializing (i.e., externally cued usage and habitual usage). Figure 1(a) shows the process of activating/finishing the socializing mode. When a user starts the socializing mode by touching 'Create' (See Figure 2(a)), a virtual room is created with a unique room ID. Other users can join the created room by tapping 'Join' and entering the room ID provided by the room creator. When everyone taps 'Ready', the socializing mode begins automatically as shown in Figure 2(b).

During the socializing mode, smartphone use is limited by locking the screen and the usage of other apps; at the same time, notifications are muted. In the socializing mode, we allowed users to check time and respond to incoming calls. When everyone taps the 'Finish' button, the socializing mode terminates and shows how much time each user spent in the socializing mode.

Requesting/Granting use
Considering the needs of temporarily using smartphones for socializing, we designed a temporary use mode which allows a user in the socializing mode to ask other users for permission to use his/her smartphone as shown in Figure 1(b). If use of a smartphone is temporarily needed while socializing, the user can ask for permission by touching 'Ask Permission'. This temporary use mode starts when another user gives permission by touching

his/her status. During the temporary use mode, the user is allowed to use his/her smartphone without any restrictions.

There are two ways of coming back to the socializing mode from the temporary use mode (see Figure 1(c)). The mode can be changed by the user herself from the shortcut in the notification bar. Alternatively, any other user can assist in remotely restoring the user's mode by tapping on her status.
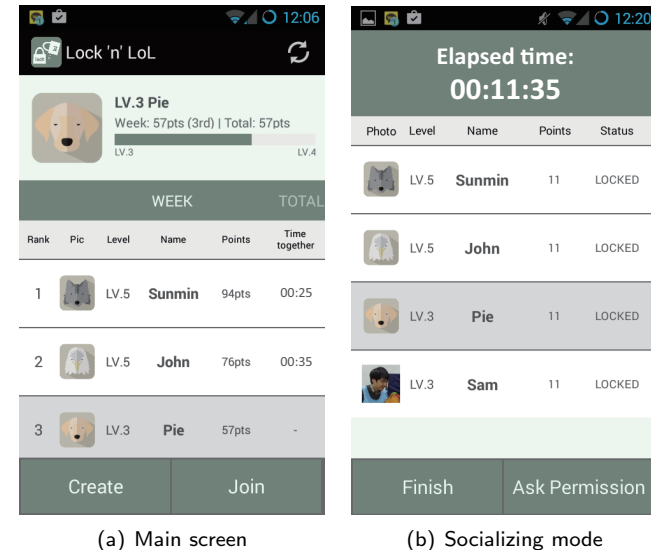

(a) Main screen

(b) Socializing mode

Figure 2: User Interfaces of Lock n' LoL.

Monitoring socializing activities
Lock n' LoL allows users to monitor their socializing groups' activities via ranking screens and a level system in order to motivate them continuously. There are two ranking screens: weekly and total. The weekly screen ranks the users based on the points that is equal to the
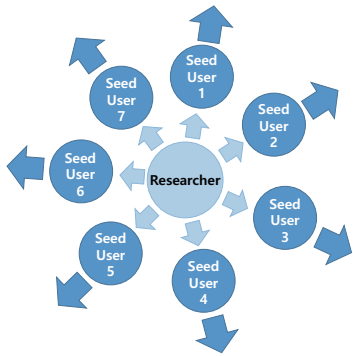
Figure 3: The first working prototype was distributed to seven seed users.

Figure 4: All participants used Lock n' LoL with their friends without our interference).

minutes that they were in the socializing mode for a given week (the time spent for the temporary use mode is excluded), while the total screen shows cumulative results since the beginning of its usage. The time together column provides data of how much time together the user spent with friends in the socializing mode. Also, the level of a user is another presentation of desirable behaviors like socializing ranking. The higher the level, the longer the user spent in the socializing mode.

Pilot Study

As part of our iterative prototyping process, we conducted a pilot study with the first working prototype shown in Section 4. We initially recruited seven undergraduate students in a large university and illustrated how to use Lock n' LoL. They were asked to use the app during co-located socializing situations with their friends in their everyday lives. This snowball sampling resulted in a total of 20 users; i.e., we have seven user groups who used Lock n' LoL (gender: 16 males and 4 females; ages: $M = 21.2, SD = 1.06$). In addition, we invited them to interview sessions, and they were asked to describe their experiences of Lock n' LoL use.

Results

Contexts of Lock n' LoL Use. We could find various contexts in which users used Lock n' LoL. The participants usually used Lock n' LoL with their friends. Some of the participants mentioned detailed contexts of Lock n' LoL use such as eating with friends, meeting in a small group, and chatting at a cafe. A participant utilized this app for a group study. He commented, *"I used this app so that I won't be distracted by my smartphone while studying for the final exams at the library with my friends."* (P13)

Overall, participants stated that Lock n' LoL was suitable and useful in the following context: when there was a

general consensus among a group of co-located users that their smartphone use should be limited. If this condition was met, they would use the app as long as they felt easy with other co-located users (e.g., the same age group).

Socializing Mode. Next, we interviewed the participants to find out their experiences in the socializing mode. Most of the participants reported that they could limit smartphones together while socializing. One participant responded, *"We were able to endure the restrictions that the app imposed on us after becoming aware that we had initially locked the phone for a better time together."* (P4)

Many participants stated that the benefits of limiting smartphones while socializing was greater than its inconveniences. Most of the participants said that when they locked their phones together, their smartphone use significantly decreased, thereby accomplishing what they aimed to do with the app. Furthermore, many participants confirmed that they had a positive experience reflecting their previous experiences without its use: *"We were able to spend more time talking because our conversation was not disturbed as much. Even if we were, we tried to continue by bringing in a new topic instead of diverting our attention to our smartphones,"* said one participant (P5). Also, there was an instance of using Lock n' LoL as playing a social game, and one participant said, *"It became a form of game and a topic within our socializing activity."* (P1)

Temporary Use Mode. We observed how the participants used the temporary use mode. Overall, the temporary use mode helped users to overcome inconveniences from entirely locking smartphones during social interactions. Some participants reported that they could utilize smartphones mostly for facilitating their socializing. One participant reported, *"[Using the*

temporary use mode] I was able to bring in interesting topics into the conversation while other phones stayed locked." (P10) Also, some participants reported that they liked using Lock n' LoL because they could minimize its usage; also, they felt less guilty of disrupting the co-located social interaction since they asked for permission to use the smartphone for individual use.

However, we also found a limitation in our temporary use mode. Currently, it requires the user to ask for permission whenever the user wants to use a smartphone. However, some of the participants expressed an opinion that some productivity/life apps need to be excused (e.g., camera and dictionary apps). We acknowledge that some apps may not require significant user attention and their usage could be permitted. *"I felt uncomfortable because even though I knew that I could use my smartphone temporarily without disturbing the socializing activity, I had to ask for permission."* said one participant (P8).

Future Work
We plan to improve Lock n' LoL's design with better synchronous awareness support by sharing more detailed usage information (e.g., app usage in the temporary use mode) and visualizing current status more effectively (i.e., texts). Furthermore, we can improve our requesting/granting process considering excusable app usage in which their usage had minimal impact on disrupting co-located social interactions (e.g., camera, dictionary). We can allow users to decide which apps to excuse before the socializing mode starts. Also, this manual process can be augmented if we support automatic recommendation based on usage log data. Finally, we will conduct user studies to observe how Lock n' LoL improves in-person social interaction by measuring diverse aspects of the quality of social interaction such as connectedness or empathetic concern [8].

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