Community Reminder: Participatory contextual reminder environments for local communities

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ABSTRACT

Many projects have looked at how communities can co-design shared online repositories, such as Wikimapia and Wikipedia. However, little work has examined how local communities can give advice and support to their members by creating context-aware reminders that may include advice, tips and small requests. We developed the Community Reminder environment, a smartphone-based platform that supports community members to design and use context-aware reminders. We have conducted a one-month field study of Community Reminder to crowdsource and deliver safety-relevant information in a local community. The results show the benefits of involving community members in reminder design and connecting different perspectives. We also show that the proposed approach can broaden participation in local communities.

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1. Introduction

Improving local communities can require costs and efforts beyond the capacities of local governments or a small number of experts. Citizen participation has been a focal point of discussion as a way to overcome the limitations to traditional approaches for improving the quality of life in local communities. Conventional methods for citizen participation include various types of face-to-face meetings and activities, which can require substantial commitments to participate. Mobile crowdsourcing as a means of lightweight pervasive collaboration and communication has the potential to change the landscape of participatory tools in community settings.

Most of the conventional mobile crowdsourcing tools require users to "pull" tasks reminiscent of its desktop counterpart. However, many crowdsourcing tasks for local communities can be tied to specific locations and contexts. Making meaningful contributions to local communities would thus require participants to remember to "pull" tasks at the right contexts, which can be extremely cognitively demanding and consequently impractical. In this context, one may opt for active mechanisms to remind citizens of relevant tasks based on context-aware computing. Currently, there are no established tools, processes or practices for integrating active reminder-based mobile crowdsourcing in local community environments although they have significant potential to activate lightweight contributions

in all kinds of indoor and outdoor environments, broaden participation to many people including passers-by, and connect different viewpoints, knowledge, and feelings within and across the boundaries of local communities.

In this paper we present and evaluate Community Reminder, a system designed to allow community members to create contextual reminders for other members in the community. While many projects have looked at how communities can design shared online repositories, such as Wikimapia (Wikimapia, 2016) and Wikipedia (Wikipedia Foundation, 2016), little work has examined how local communities can give advice and support to their members by creating context-aware reminders that may include advice, tips and small requests. For example, context-aware reminders can deliver messages such as *"it's raining and the road in this area gets flooded easily. Better to change your route"* or *"car stolen here last week. Did you see suspicious people lately?"*

The crucial characteristic for effective context-aware reminders is the ability to foresee relevant situations. Thus, we argue for a system that exploits a participatory approach to create and use contextual reminders. A key differentiation between our proposed idea and conventional systems for sharing information in the local community (e.g., LOCQL (LOCQL, 2011) and Naver KiN 'here' (Park et al., 2014)) is that the latter require proactive searching and do not necessary react to users' context.

Existing context-aware reminders such as Nixle (Everbridge,

2016) focus on the mechanisms to trigger reminders rather than the process to create reminders. In practice, a "curator" would have to define the contents and behaviors of reminders in many cases. This approach does not necessarily scale, as an expert is needed to create reminders. Also, these are usually one-way information channels (i.e., users just "consume" contents, and they cannot generate contents). Therefore, it is not easy to transfer a system to a different local community. Furthermore, a "curator" may not be aware of local information and knowledge that are critical to integrate context-aware reminders into community-centric mobile crowdsourcing environments. We thus take advantage of communities and discuss how people create and receive reminders in relation to collective concerns of a community.

The key research question we address is how communities can, through a participatory process, develop valuable contextual reminders for other members of the community so as to improve their living environments together. We iterated the design of a context-aware reminder system by maintaining frequent contact with the members of a local community, and developed the system by integrating a participatory design tool and mobile clients. Acknowledging the diversity of local community members in terms of the motivation to participate as well as the familiarity with information technologies, the system welcomes different types of participants, some of whom carry out small pieces of work using smartphones such as answering short questions or taking photos in response to contextual reminders while others collaboratively design reminders as active volunteers of the community. In addition, we developed an intuitive paper-based input technology so that community members can create reminders regardless of their levels of familiarity with information technologies. The system we describe allows members of a community to create reminders including advice, tips and crowdsourcing tasks through a participatory process, and in doing so strengthen the ties in communities, encourage members of the community to become active in local matters, and of course provide helpful advice to members of the community.

We evaluate the system based on design case studies and a one-month field study in a local community in Ibaraki prefecture, Japan. The first design case study utilized the participatory design tool to capture local knowledge from the members of the community while the second design case study exploited existing information on a website. The field study evaluated how the residents of the community used and experienced the two sets of reminders that were produced in the case studies.

The results show the benefits of using both sets of reminders. The reminders created by the community members can better fit particular local contexts and generate more empathy. The reminders that are based on existing information are more general and often easier to create, yet they were perceived as having the comparable potential to contribute to the local community, and may introduce external viewpoints that tend to be overlooked by locals. We thus argue for complementary uses of different design methods to integrate the different benefits and perspectives, thereby enabling the provision of meaningful advice, tips and mobile crowdsourcing requests in local communities. Moreover, we show that our system allows for broader participation than traditional approaches to community participation without context-aware mobile crowdsourcing.

2. Related work

2.1. Participatory data collection and sharing tools

As existing systems and research projects have demonstrated, participatory computational tools can provide a number of benefits to local communities. FixMyStreet (FixMyStreet, 2016) and SeeClickFix (SeeClickFix, 2016) are websites for local citizens to report issues such as potholes and broken streetlights. These websites may connect citizens and the people who can help address their issues, including administrative authorities in the area (FixMyStreet, 2016). Geowiki has allowed cyclists to share useful knowledge that is not available elsewhere (Priedhorsky and Terveen, 2008). Le Dantec et al. (2015) use the data collected by cyclists to inform urban planning processes. Gallacher et al. (2015) propose tangible questionnaire, which is a physical box and set-up in a specific place. In disaster situations, people increasingly use volunteered geographic information (Goodchild and Glennon, 2010), and crisis mapping platforms like Ushahidi (Ushahidi, 2016), which allows citizens to share information about human and material support, road conditions, safety, and so on. In addition, many participatory platforms allow citizens to collect sensing data such as the data about air quality, watersheds, transportation environments, parks, university campuses, and urban safety (Aubry et al., 2014; Christin et al., 2013; Kim et al., 2013; Manzoor et al., 2014; Misra et al., 2014; Reddy et al., 2010; Willett et al., 2010). People can use mobile devices to share valuable data along with relevant location information as Burrell et al. (2002) have shown in the study of a mobile guide application for university campus tours. Although these participatory data collection and sharing tools have successfully demonstrated their usefulness, they focus on a simple mode of participation based on data collection, thereby leaving a wide range of opportunities unexplored without explicitly supporting local communities to participate in the processes to create tasks, triggers and tools.

It is crucial to incentivize users effectively in participatory data collection and sharing environments based on crowdsourcing. Incentive mechanisms in crowdsourcing systems either use extrinsic or intrinsic motivators (Kaufmann et al., 2011). Extrinsic motivation is basically payment and is the *de facto* incentive mechanism for many crowdsourcing platforms including MTurk (Amazon, 2016) and Upwork (Upwork Global, 2016). However, while payment has been successful in crowdsourcing with local communities (Hosio et al., 2014), sustained user engagement is more likely to happen when using intrinsic motivators (Kaufmann et al., 2011). Some examples of intrinsic motivators that have been successfully leveraged by crowdsourcing deployments to elicit contributions from local communities include altruism (Goncalves et al., 2013a), psychological empowerment (Goncalves et al., 2014a), contextual cues (Goncalves et al., 2013b), gamification (Goncalves et al., 2014b), and other enjoyment-based and community-based factors (Kaufmann et al., 2011).

2.2. Designing tasks, triggers, and tools in context-aware applications

Existing projects have proposed models and systems to make context-aware applications useful and usable by supporting end-users to design different aspects of the environments. One of the earliest examples is the context-aware reminder environment called CybreMinder (Dey and Abowd, 2000). It is based on the Context Toolkit (Dey, Abowd, and Salber, 2001) and allows individual users to design and receive reminders. The Context Toolkit itself supports software developers to build context-aware applications easily. In a similar vein, Henricksen and Indulska (2006) propose a set of relevant models and techniques to support the development processes of context-aware applications. Alt et al. (2010) propose a location-aware mobile crowdsourcing platform in which individual users can design location-based crowdsourcing tasks. In this platform, crowdsourcing workers "pull" crowdsourcing tasks from a web server based on their locations. Location-based social Q&A services such as LOCQL (LOCQL, 2011) and