Demo: Sender-Controlled Mobile Instant Message Notifications Using Activity Information

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ABSTRACT

We propose the design of *MyButler*, a sender-controlled notification management system that mitigates disruption caused by mobile instant messaging through sharing the receiver's activity information with the sender.

CCS CONCEPTS

• **Human-centered computing** → **Ubiquitous and mobile computing systems and tools**.

KEYWORDS

Smartphone notifications, interruptions, mobile instant messaging, context-aware computing

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1 INTRODUCTION

Mobile instant messaging (MIM) has facilitated ubiquitous interpersonal communication through mobile phones in our hands. People not only send messages whenever and wherever they want but also are immediately notified of incoming messages through push notifications. However, as push notifications demand users' attention, they could interrupt the on-going task of users and cause negative effects when delivered at inopportune moments [1].

In order to reduce the notification recipients' interruption, existing work have proposed context-aware notification systems based on analysis of recipients' situation and the value of notification. Based on the contextual data, notifications could be deferred until opportune moments or irrelevant ones could be filtered out. Recipients' situation can be relatively easily understood by analyzing contextual data such as location, sound intensity, and physical activity with mobile sensing [2]. However, the value of notification cannot be analyzed due to privacy concerns, so the utilization is limited to the type and title of notification, rather than its actual content [3].

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However, in case of messaging apps, which account for 75% of mobile notifications, the perceived interruptibility of a message notification varies according to its *content* even for the same notification title in the same context. Moreover, because MIM is an interpersonal process involving two parties (receiver and sender), a notification management system for MIM should further consider the social dynamics of MIM. For example, with the existing systems that control notifications on the side of recipients, including Do Not Disturb (DND) mode in most commercial smartphones, message senders are unaware of how their notifications are handled on the receiver side. They could think their message notifications are delivered immediately and possibly have false expectations for a quick response, resulting in a misconception between two parties. This could in turn affect the receiver-side behavior (e.g., habitually checking for new messages) when receivers are afraid of not meeting a social expectation or missing important, urgent, or useful messages.

We propose a novel approach for reducing interruptions from MIM notifications by engaging message senders to take part in the notification management process. We introduce the design of *MyButler*, a system that defers the control for the timing of message notification to the sender of the message and shares receiver's activity information to assist senders in making the decision. The receiver's current activity is specified by herself; e.g., 'studying' or 'in a meeting'. In *MyButler*, the content can be considered by senders who know its importance, urgency, or usefulness and have the control for the timing of notification.

In the following section, we report findings from a survey (n=206) to understand users' perception of MIM interruption in both perspectives as a receiver and as a sender; and barriers in mitigating interruptions. We further detail the design of *MyButler*, a sender-controlled MIM notification management system using the receiver's activity information.

2 *MYBUTLER*

2.1 MIM User Survey

We discuss the findings from our survey (n=206) and draw insights for our system design. We distributed an online survey via SurveyMonkey to understand MIM users' perceptions of interruption in mobile instant messaging in two different perspectives; as a receiver and as a sender.

While MIM users feel interrupted by incoming messages, they do not want to miss important or urgent messages. More than 50% of respondents reported for each of the following that it is a main source of interruption by MIM: (1) the incoming messages arouse curiosity about the message content; (2) they habitually check for new messages to not miss important or urgent messages;

and (3) they feel uncomfortable with unread messages in the inbox. The goal of *MyButler* is therefore to prevent the notifications of interruptive messages so that people are not aware of the arrival of new messages and are free from the curiosity of message contents. Meanwhile, it should provide senders with the option to bypass the prevention and send notifications for important or urgent messages so that receivers are aware of the arrival of these messages even before habitual checkings.

As users experience interruption as receivers, they as senders also consider that their message can interrupt the receiver (44%). However, they experience difficulties in (1) knowing the receiver's context and (2) sending a message without interrupting the receiver. To engage the sender in message notification management, *MyButler* should provide the sender with information about the receiver's current context and give senders the control of when to deliver the message notification.

One major concern on sharing the receiver's current context is privacy invasion. We asked people's willingness to disclose three different levels of context information: availability (available or unavailable), current activity (e.g. studying, exercising, etc.), and mobile sensory data (e.g. location, ringer state, phone in use, etc.). For current activity and mobile sensory information, respondents were given a set of 10 example activities and a set of 11 mobile sensor data and rated for each item. The percentage of respondents not willing to disclose each level of context information to anybody is 20.87% for availability, 31.6% for current activity, and 44.48% for mobile sensory information. Among the set of current activity, the percentage not willing to disclose to anybody ranges from 21% to 48%. Users are more willing to disclose productive, work-related activities (avg. 27.28%) over personal, leisure activities (avg. 41.55%). *MyButler* utilizes the context information people are generally willing to disclose—the availability and productive-related activity information.

2.2 Features of *MyButler*

We describe *MyButler* features with an example scenario. In this scenario, we refer *receiver* as the user who does not want to be interrupted by incoming messages and uses the *MyButler* app; and *sender* as another user who is trying to send a message to the receiver.

(i) The receiver activates *MyButler*: When the receiver does not want to be interrupted by unnecessary MIM notifications, the receiver turns on *MyButler* through the Notification Drawer in a similar way to using the DND mode. While *MyButler* is activated, all notifications are silenced by default. When the receiver activates *MyButler*, they set their current activity to share with others as well. In order to prevent privacy invasion, the receiver can also create a customized whitelist to limit who can see their activity.

(ii) *MyButler* informs the sender with an auto-reply message: Once turned on, *MyButler* acts like a **butler** who mediates between a master (receiver) and a visitor (sender). A scenario when a sender sends a message while a receiver is using *MyButler* is illustrated in Figure 1. When a new message arrives, it forestalls interruption by silencing notifications as similar to the DND mode. It then automatically replies to the sender, politely informing that the receiver is not available. The auto-reply message can be personalized to convey the receiver's natural tone.

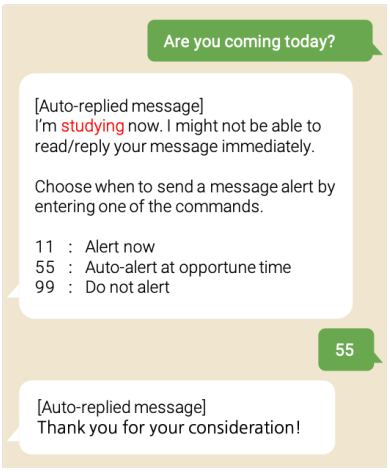

Figure 1: Use case of *MyButler* while studying.

(iii) The sender chooses when to alert the receiver: After sending a message, the sender receives an auto-replied message that informs the receiver is not available. At this moment, a sender can take one of three possible actions to choose when to alert the receiver with a push notification: (1) alert immediately, (2) defer alert until opportune moment, or (3) decide not to alert. Considering the receiver's context and the message's urgency and importance, the sender makes a decision and enters the corresponding command for the action ("11", "55", or "99" in Figure 1) to execute the action.

(iv) *MyButler* executes the sender-selected action: Once the sender types one of the commands, *MyButler* executes the corresponding action and sends another auto-reply message of acknowledgement. When the defer option is selected, *MyButler* waits and sends a notification at an opportune moment, using the transition between activities as a breakpoint. We plan to conduct an in-the-wild experiment with MIM users to study the effectiveness of *MyButler* in reducing interruptions of the receiver and raising the sender's awareness about receiver's interruptibility along with how the message behavior changes with the introduction of *MyButler*.

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