Context-Dependent Email Notification Using Ambient Displays and Mobile Devices

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Abstract

The purpose of this paper is to explore alternative approaches and strategies for email filtering and notification with the rationale of developing an unobtrusive notification interface that can adapt to the user's context.

1. Introduction

The way people use email is continuously changing, from co-ordination to task management and data exchange. To meet these new requirements the basic nature of email applications has to be reassessed. During the day, people work on different jobs and only few incoming emails are relevant to the task at hand. Although users might have their plans for the day, incoming email can not be scheduled or controlled when it arrives (Boardman et al., 2004). However, current email systems do not understand these user's priorities and deliver items to the inbox continuously, causing email overload and task interruptions (Czerwinski et al., 2004). As emails pile up in the inbox, users sooner or later will have to deal with them before they can resume with and do "real work" (Cignini et al., 2003). In a study about email usage, Jackson (2003) found that, on average, users took 64 seconds to "recover the mental thread" of what they were doing before in order to be able to resume previous tasks. Based on similar observations, Benderson (2004) points to the need for designing interfaces that let people "Stay in the Flow"; allowing people to concentrate and avoid constant interruptions.

Hence, a key aspect of next generation email systems is to notify the user only when the incoming emails are relevant to the task at hand. While previous research has focused on redesigning the email client to provide unified interfaces for emails and tasks (i.e., Kerr and Wilcox, 2004) or the design of agents prioritizing incoming emails (i.e., Horvitz et al., 1999), we took a different approach, by looking holistically at the email habitat and its practicalities.

2. Goal and Approach

Our goal is to continuously inform the user about relevant emails while trying to minimize the distractions through the use of peripheral interfaces that are more manageable and effective than traditional desktop pop-up windows. While there is a need to be permanently connected and notified of important events, users need to be able to concentrate on their primary task. We aim to provide alternative notification affordances and explore different approaches to deal with email notification using two complementary strategies: categorization of incoming emails according to their importance and unobtrusive notification using different notification devices, like PDAs and ambient displays.

3. Prioritization of Emails

To prioritize incoming emails we distinguish between three categories: "very important", "important", and "unimportant" emails. The idea is that the user is notified of very important emails and has awareness of the number of
important emails in the inbox, without being disturbed by unimportant and unclassified emails.

For the categorization of incoming emails we combine an automatic classification mechanism with user-defined preferences. We start by categorizing incoming emails using a simple email filter that suggests different priorities based on entries in the calendar, task list, and personal address book. The system collects data from the various sources and extracts keywords and names of persons. People who work on the same task, people attending the same meetings or people who reply to an outgoing email are considered to be important. Similarly, names of task and titles of calendar entries are used as keywords for classification. The system automatically classifies emails as "very important" if they are related to today's or tomorrow morning's entries in the user's calendar and task list or include keywords defined by the user. Important emails refer to topics in the near future (i.e. this week), while the rest of the received emails are regarded as unimportant.

An automatic classification is not completely reliable and might not work for informal emails. Therefore, the system allows the user to override the default settings and define individual classification rules. The user can define senders and key-words and assign individual levels of importance to them. While keywords and senders automatically extracted by the system change according to the calendar and task entries, user-defined classification rules are permanent. It is also possible to change the way of notification, directing certain emails to a specific notification device.

4. Unobtrusive Notification

The second aspect of this paper is to exploit alternative feedback channels that are less intrusive than traditional

notification mechanism. In the following section we will describe an ambient display and several mobile devices that allow users to have their inbox closed and still be notified of important emails. Our goal is not to replace email clients or desktop pop-ups, but to provide users with alternative levels of notification and interaction depending on their current context.

4.1 Notification via Ambient Displays

With the AmbiLamp artefact (see fig. 1), we developed an ambient display that seamlessly integrates with the physical environment and provides information in a calm and unobtrusive way via dynamically changing light colors. Based on experiments with different prototypes in various styles and dimensions, we designed the current version of the AmbiLamp with three differently colored light zones. Each color represents a certain level of importance, and the brightness of each segment refers to the number of emails in this category. The user can directly access the emails of each category by bringing a PDA with a special sensor module close to the corresponding area of the AmbiLamp artefact (see fig. 1).

Figure 1: AmbiLamp artefact (left) and direct email access using a PDA with a sensing module (right).

4.2 Notification via Personal Mobile Devices

To allow higher flexibility, we extended the concept through to the integration of personal mobile devices (like smart phones and PDAs) that provide two modes of functionality.

In the first mode, the mobile device acts as a persistent pop-up, displaying the sender, subject and text snippets of the body of the last emails, allowing the user to quickly retrieve the detailed information and to decide how to react. This approach transforms the pop-up notification into a calmer and better manageable mechanism. It can display alternative views to the inbox as well as a user configurable representation of the number of received emails in each category.

In the second mode, the mobile device shows a graphical overview of the inbox, representing the same information as the AmbiLamp. Differently coloured bar graphs indicate the number of received emails for each category. If a bar is touched, it switches to the first mode and shows emails of the selected category.

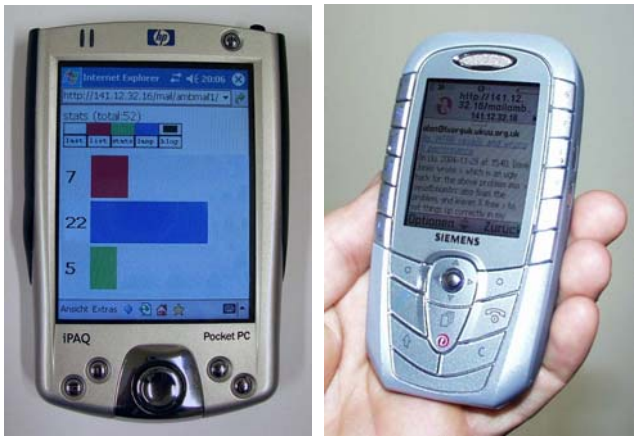

Figure 2: Notification via personal mobile devices: a PDA showing a graphical overview of the inbox (left) and peripheral pop-up notification via a smart phone (right).

Summary

As we move towards the ubiquitous computing vision where everything and everyone is connected, traditional desktop applications will be able to delegate some of their functionality to surrounding environments and devices. These will support different degrees of interaction and levels of information granularity that are suitable to different contexts. In this paper, we presented an email notification concept as an example of an application where the notification can be delegated to alternative notification artefacts helping users to deal with incoming emails in a less distracting and more relevant way.

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