ACM HotMobile 2013 Poster: Mitigating Distractions from Smartphones

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I. Introduction

A smartphone, with its versatile connectivity and incredible computational capability, can easily become an indispensable part of a user's day. But that same user can quickly become addicted to his/her device, constantly checking *Facebook* notifications, playing games, etc. This constant distraction can adversely affect a user's productivity and even his/her happiness.

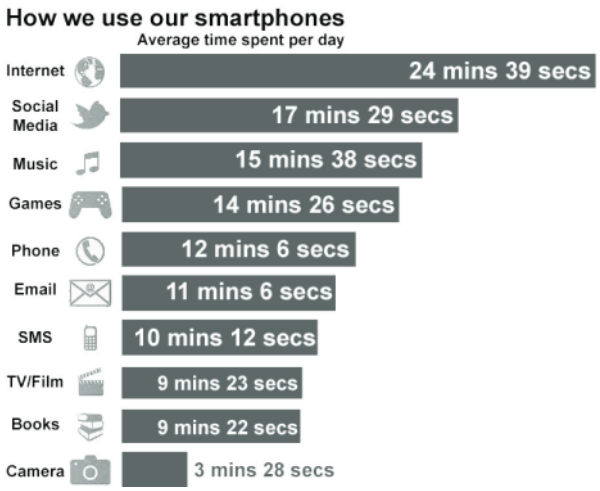

Figure 1: Smartphone usage analytics [1]

With the advent of always-on mobile devices, the torrent of incoming data follows users everywhere. As our appetite for information has grown, many have tried to warn of the dangers of a world that is constantly distracted [2]. In fact, employee distraction has been shown to decrease productivity [3]. We propose *YogiPhone*, a system that recognizes the current context, identifies distractions, filters irrelevant interruptions, and learns about the user over time.

II. YogiPhone

A smartphone is well positioned to understand its user's behavior, learn the current context, and make suitable recommendations. In addition, because of cloud storage, smartphones now have access to the same user data that a desktop computer would. We propose to use this knowledge about the user to help him/her stay connected and focused. Software like *MacFreedom* in the desktop realm and *Unplug & Reconnect* in the mobile realm claim to help you stay focused, but simply disable connectivity [4, 5]. By disabling your network connectivity for a period of time, they eliminate distractions but also eliminate the functionality of your phone. Staying connected allows for important and emergency communiqués to be delivered (imagine an email about an NSF grant from the program manager or a phone call from your child's day care center).

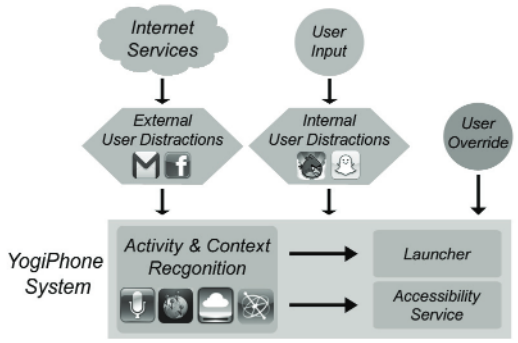

Figure 2: The *YogiPhone* architecture

YogiPhone is a system that gently nudges a user towards a more productive and healthier lifestyle without completely disconnecting he/she from the network.

III. Recognize

Context-aware sensing has finally come to the mainstream in the form of *Google Now*. By using the user's location, web searches, preferences, etc., *Google Now* automatically fetches pertinent information, like the weather at the user's location, without the user actively searching for it. We propose to use this knowledge of user data, including calendar events, emails, location, etc., to identify times when distractions should be eliminated. By leveraging multiple sensing domains, we can learn what the user is currently doing and even identify the user's habits over time.

Figure 3: Recognizing a semantic context.

Utilizing a smartphone's sensors as well as user data like occupation, calendar, etc., we must determine a semantic categorical context. Rather than simply recognizing the user's current activity, we must infer a semantic context to aid in the identification of distractions (see Figure 3). We must also be exceptionally careful about how we utilize this data. User privacy is very important and while we believe users are willing to let a system access their information, we must ensure that privacy and security are taken into account.

IV. Identify

YogiPhone classifies distractions by separating them into two distinct groups: *internal* and *external* user distractions. *Internal user distractions* are distractions that are generated due to the user's immediate actions (e.g. a user launching an entertainment application like *Angry Birds*). *External user distractions* are simply the opposite (e.g. an incoming email or *Facebook* notification). The challenge here is that depending on your current context, certain actions and notifications could be considered distractions or just expected activities.

V. Filter

As shown in Figure 2, we deal with each type of distraction separately. By using a custom *Launcher*, we can selectively disable applications that are deemed distracting to the user. By either time-limiting or disabling certain applications, we significantly decrease potential distractions to the user. Through an *AccessibilityService*, we intercept incoming notifications, calls, etc., and only let through important notifications (e.g. calls from family members, emergency texts, severe weather, etc.). What is filtered will depend not only on the user's context, but also on their previous habits.

VI. Learn

Although the system's intention is to push the user towards a better lifestyle, there will be times when the user would like to ignore the system's recommendations. By providing the user with an override, we nudge him/her rather than simply using brute force. Each time the user chooses to override the recommendations, we can adjust future ones accordingly. For example, if a notification was incorrectly silenced, a you could simply tap on that notification when you check your phone. A swipe or dismissal of that silenced notification can be a sign of implicit approval that you agree with our decision. Over time, we can learn which kind of notifications the user deems important and vice versa - gradually adapting to the user. Our challenge here is that any user override has to be easy to operate, but not too easy. *YogiPhone* and the user have to coexist; the user shouldn't feel encumbered by the system.

VII. Ongoing and Future Work

We are working on a prototype using a Google Nexus S, on Android OS 4.1.2. Using knowledge about the user, along with sensor data, we can determine the user's activities and current context and then infer whether or not we should activate the system. For instance, we could use short audio samples to determine if a user is in a noisy area where distractions don't need to be eliminated, or vice versa. We plan to evaluate *YogiPhone* using a user study, comparing a control's number of distractions to the number of distractions a user running the proposed system encounters. In the future, we'd like to expand *YogiPhone* so it offers just-in-time reminders to nudge users towards healthier lifestyles (e.g. telling a user to take the stairs instead of the elevator). In addition we plan to analyze *YogiPhone* users' similarities to improve recommendations for all users.

VIII. References

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