

# The Incidental Approach to Mobile Healthcare

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**Abstract**—In this paper we present the concept of *Incidental Mobile Healthcare*, as part of a design background to inform the development of mobile applications whose primary purpose is not to provide healthcare. We discuss how non-health related applications could be used as hosts to provide incidental healthcare information (*healthy info-snacks*) to support the naturally occurring pattern of interaction bursts that users display with their mobile devices.

**Keywords**—mobile healthcare, information snacking, ubiquitous systems

## I. INTRODUCTION (HEADING 1)

Mobile Human Computer Interaction has been a field of study for several years, though it is still considered a “young discipline”. However, one of the immediate and most fundamental outcomes from research in this field has been the admission that the way people interact with their mobile devices is radically different from the way people interact with personal computers. One way in which interactions differ is in the length and purpose of the interaction. Mobile devices tend to be used in short “bursts” of interaction, when a spontaneous need to access or generate information arises [1][2]. This fact can be attributed to factors that arise from the environments and situations where mobile devices are typically used. In situations of mobility (even when the user is being transported rather than being a mode of transport themselves), a significant competition for cognitive and physical resources exists, for example glancing to check one’s whereabouts, looking out for traffic while walking, bumping into an acquaintance etc. In general it is well accepted that users attention is very fragmented and that it is very unlikely that interaction with a mobile device or service will occur over long periods of time. Users tend to postpone or abandon interactions that are likely to require significant attention spans, mostly because they are engaged in other tasks [3].

Given the almost “incidental” nature of information needs in the manner in which they arise for mobile users (SOHN), it seems that designing applications for healthcare on mobile devices have significant obstacles to overcome. One obstacle arises from the fact that it is unlikely that intended users would interact with the application for any significant length of time, in order to retrieve or generate information. Other obstacles arise from the particular characteristics of mobile healthcare application users themselves. Many systems have focused on mobile healthcare users that suffer from particular mental or

physiological conditions (or combinations thereof, e.g. the elderly). These conditions bring additional requirements to the design of applications, which are sometimes conflicting and impossible to satisfy in their entirety. Further obstacles arise from societal, organisational and psychological factors that arise through the use of Ubiquitous Computing technology for healthcare.

Most systems additionally aim to provide interventions that will help an existing condition rather than help prevent it from occurring (typically through monitoring and alerts)[4]. It would appear that this fact in itself is another element to compete for the attention of the mobile device user and force them to postpone or forget interactions (possibly indefinitely) in order to act on more important issues (e.g. taking medication is far more important than remembering to take a note on one’s mobile that medication was taken).

## II. INCIDENTAL MOBILE HEALTHCARE

It is often said that prevention is the best cure for any disease. We believe that while Ubicomp systems and interventions can be successfully utilized in aiding users overcome and manage existing conditions. However, we feel that many opportunities lay in the closer observation of natural patterns of interaction with mobile devices and the provision of *incidental* information that would help users keep their health in check, without explicit need to interact with a dedicated application. As such we define the term *incidental mobile healthcare* as the implicit provision of healthcare-related information snippets to mobile device users through non-dedicated applications or means of interaction.

As stated by our definition, incidental care does not utilize dedicated communication channels (applications) to feed information back to users, but takes advantage of the fact that people will interact with their mobile devices for other purposes to provide healthcare services through these channels instead. As such, incidental care can be considered to be background layer that can inform and add value to the provision of other types of services, or indeed a paradigm of symbiosis between health-related information and host applications. Incidental care does not particularly aim to help with a given condition, although in certain circumstances, incidental care services could be influenced so as to perform with a particular condition or health risk factor in mind. The healthcare information snippets (“*healthy info-snacks*”) can be visual, auditory or haptic but should not override the display of

the primary information a host application is meant to provide, or detract from the usability of the host application.

In the remainder of this paper we would like to present two scenarios for incidental mobile healthcare as an illustration of our concept. The first scenario discusses the insertion of incidental healthcare within a mobile application whose primary purpose is to help users plan and manage urban journeys using multimodal transportation. For an application such as this, it is normal to consider that the information to be present should hardly relate to healthcare, and indeed transport studies show that data most often required by commuters when planning or during a journey is a) reliability of public transport services, b) travel time and c) cost of a journey, as well as clear instructions on how to use the available modes of transport.

We designed an application that offers an additional layer of incidental information that would be relevant to healthcare by also displaying the physical activity levels required by each journey, in the form of calories expended through it (Figure 1). We allowed in our design the planning of a journey using multiple criteria that a commuter might normally expect, such as time available to get to the destination, preferred modes of transport. Additionally, we allowed planning by allowing users to specify physical exercise as a criterion, affording the user the ability to form complex query criteria for planning (e.g. "I want to go from A to B and I can spare a maximum of 25 minutes. Can you give me the route that involves the most physical activity?").

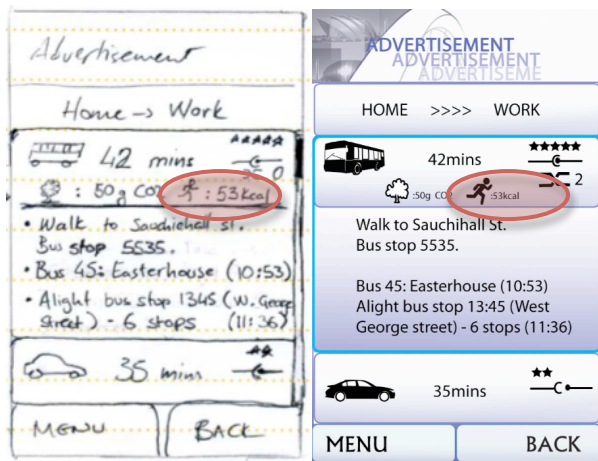


Figure 1. A public transport application that provides “incidental” feedback on the health-related aspects of a journey (Lo-Fi prototype left, Hi-Fi right). The *healthy info-snack* in the form of energy expenditure is circled.

Most mobile phones today have embedded music players and these are often used “incidentally”, whilst walking from the train station to work or on the journey back etc. In a second scenario, we looked at how we could take advantage of this “dead time” when music players in mobile devices are used to see how these might be used to help users take advantage of incidental physical activity, such as walking to meet pre-determined lifestyle goals (e.g. undertake 30 minutes of moderate exercise per day). We created a prototype (SportsHero) that allows users to specify a certain physical activity target (e.g. 80 steps/minute) and then monitors their physical performance while music is played in the background.

Should the user be found to be exceeding or falling short of the pre-determined target, the music is dynamically altered, with the playback speed being “sped up” or “slowed down” accordingly. One might think of this as “Guitar Hero” for physical activity. The distortion of music provides feedback to the users on their performance and motivates them to stick to their target (moderate performance for losing weight, higher for improving cardiovascular condition). It also provides an interesting distraction during otherwise unused time, that can be seen as a game, with statistics displayed at the end of each “session”.

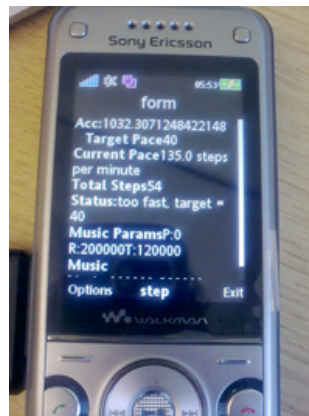


Figure 2. The SportsHero prototype. From the top: Current accelerometer data, current walking pace, total steps taken, Status (too fast!). Music is being played at 2x normal speed (Music Params R=200000).

### III. CONCLUSIONS

We presented our concepts on incidental mobile healthcare and showed how applications that are normally not considered to be related to health can be used to offer healthcare services to their users on an ad-hoc and implicit manner.

We are investigating our concepts for their effectiveness and are considering several other re-designs of popular applications (e.g. the mobile calendar, address book) to implicitly help carry health-related information and ubiquitously offer healthcare services to users. Our designs are likely most suited at the prevention or management of illnesses and conditions.

### REFERENCES

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### Authors' Research background

The main research interests of the authors relate to Computer Supported Collaborative Work, Mobile HCI, Mobile Information Access and Information Retrieval.

### Research Discussion Statement

We would like to discuss the concept of incidental provision of mobile healthcare services and the design of application and systems that offer such services as an added-value element.