Designing a Mobile Application to Capture Everyday Activity

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ABSTRACT
Despite the importance of physical activity to health, many people do not meet the recommended guidelines for physical activity. In order to gain a greater understanding of people's activity levels and patterns in everyday life we designed a mobile activity monitoring application, which resides on mobile phones which utilizes the accelerometer and GPS (either as an externally attached component or as in internal component) data. We designed the system to be used by any member of the public and then redesigned the system given continuous feedback from three sets of local authority workers who were just about to commence a walking led scheme. We logged their activity over a week long period.

Categories and Subject Descriptors
H.5 Information Interfaces and Presentation (I.7); H5.2 User Interfaces: User-Centered Design.

General Terms
Measurement, Design, Experimentation, Human Factors.

Keywords
Mobile phone applications, monitoring, tracking, GPS

1. INTRODUCTION
One of the biggest health challenges of the 21st century is obesity. Its prevalence has tripled in many countries in the WHO European Region [9] since the 1980s, about two-thirds of adults in the United States are also overweight, and almost one-third are obese, according to data from the National Health and Nutrition Examination Survey (NHANES) and the numbers of those affected continues to rise at an alarming rate.

It is suspected that one of the main reasons for the increase in obesity in the West is the large changes in society, for example, our work and our leisure pursuits are becoming increasingly less physically demanding. As a result sedentary lifestyles are a major contributing factor to the increasing problem of obesity among adults. One of the most significant factors that influences people's participation in physical activity (other than personal reasons) is their surrounding natural and built environment [1]. Our research question was whether we could design a mobile application that would collect the type of information needed to provide evidence of barriers to activity due to environmental issues. There have been many studies which have investigated the possibilities of combing various tools for activity monitoring [5], [4]. For example the study by [7] aimed to obtain information as to where user activity bouts were taking place relative to their home (indoors, outdoors in neighborhood, outdoors out of neighborhood) using a GPS device and an accelerometer which provided activity in counts. Another sports activity device is SpiElite [3] to monitor performance during sports training. It consists of GPS (for distance and speed), and accelerometer (body load and impact) and heart rate monitor. There are also a number of applications aimed at sports performance monitoring which provide activity related information [8][6]. These devices and studies demonstrate the capability of GPS, or the combination of GPS and activity information to provide useful data for health, general physical activity monitoring and sport specific applications. However, these devices and studies were focused on collecting short bursts of data whilst the user was undertaking an activity outdoors.

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2. METHODOLOGY
In order to test our hypothesis we designed a prototype application based on the following principles:

- ***Easy to use***: the application will be used by the general public with a median age of 40. Therefore the interfaces and interaction were designed to be as simple as possible, whilst still collecting the required data.

- ***Informative***: the user should be able to see the data that is being collected and be able to check that the information being collected is correct.
- ***Ease of control***: the user should be able to start and stop the application very quickly.
- ***Discreet***: the application should run in the background with the phone being locked (to prevent the application being stopped or started incorrectly) and be able to be worn anywhere on the body.

The application collects the accelerometer data and the GPS data in separate logs in a folder on the mobile phone memory card. Each line of data recorded was time-stamped (with millisecond precision) for analysis purposes. We tested our initial prototype set up with two university colleagues who are HCI experts and one student over one weekend. The application was found to be easy to use and start.

2.1 Pilot Test

We then gave the application to a set of pilot test users from one of our selected sites. To our surprise at the end of the week we found that very little usable data had been collected even though a training session was run and a set of instructions was supplied. The main problems were:

- having to use the keypad to enter their name and details;
- having to enter where on the body they were wearing the device;
- starting and stopping the logs for the accelerometer and GPS;
- the time taken for the external GPS unit to get a fix was frustrating (a fix took anything from a few seconds to almost a minute);
- the number of times the phone needed charged was problematic.

Also, we found that the way that we were collecting and analyzing the data was flawed when applied to people with very low levels of activity, which we found in the local authority workers. As a result of the user feedback we redesigned the application and changed the setup regarding the device. The user no longer had to enter their details and start the two logs via the options menu. They merely needed to select "Start" from the application to start working. Logging would begin automatically. Whenever the user was logging a "Help" option was available and the screen displayed the information that the log had started. To exit the user merely had to select "Exit". This system worked much better and no users had problems with starting and stopping the application. We did not hide the raw log data because the users had expressed a preference for this to stay as it showed that the device had really started to log what they were doing and this reassured them. We also changed from a two unit solution e.g. phone plus external GPS unit, to a one unit solution.

3. CONCLUSIONS

We found that designing for the type of user who would actually use the application and getting them to use it was more of a challenge than we had first expected. Fujiki et al [2] also commented on this, even though their pilot trial was a success with the research team (as was ours) their focus groups revealed that the average user did not want to undertake the maintenance (e.g. battery charging) involved in using the application they had designed. As a result of their and our findings we redesigned the logging application to be as simple as possible whilst still providing feedback to the user as to whether it is running and collecting data or not. From our data we discovered that participants in certain work place locations seem to walk very little outside. Given that one of our aims was to see if the environment affected activity it is interesting to find that it had such a high level of impact. The next stage of our work will see the initiation of a walking scheme in the area adjacent to the participants workplace it will be interesting to note if this changes the participants walking habits in the locale.

4. REFERENCES

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