Guided Sampling Using Mobile Electronic Diaries

Kenny Morrison, University of Dundee, UK

ABSTRACT

Pocket Interview is an easily configurable handheld electronic data collection and diary tool. The Pocket Interview system can be used to apply experience sampling methods that allow the collection of data in real-time and in the user’s natural environment. The system client is usually run on a personal digital assistant or smartphone. It can prompt the user to make diary entries at fixed and/or random intervals and includes an option that allows this sampling to be ‘guided’ whereby inconvenient prompts are temporarily deferred until a more convenient time through the use of contextual audio information. Subjects participating in real-time studies require high levels of commitment and exhibit difficulties maintaining their motivation. This paper describes a series of studies using Pocket Interview that explore how Guiding offers to reduce the perceived burden on study participants, improve response rates and increase the quantity and quality of replies.

Keywords: Availability, Context, Electronic Diaries, Experience Sampling, Interruptibility

INTRODUCTION

The study of interruption and availability has a long history. Recently there has been much research and study of availability with regards to human-computer interaction (HCI). The majority of the prior work with HCI based interruptions has focused on desktop computing applications, office environments and utilise a mixture of static and wearable sensors. These studies suggest that even a small set of sensors can be enough to provide valuable information regarding the user’s interruptibility. More recent research focuses on studies investigating interruptions for mobile computing users.

There are an increasing number of mobile devices, such as phones and personal digital assistants (PDAs) that seek their user’s attention. These devices act proactively to alert their owner of incoming phone calls, reminders, instant messages and can also provide services based on location such as friend-finders. Each time the device acts proactively it is competing for the user’s attention, possibly interrupting ongoing tasks and contributing to feelings of information overload.

Pocket Interview is a handheld electronic data collection and diary tool that is run on current PDAs and smartphones (Morrison, Ricketts, Jones, Johnston, Pitts, & Sullivan, 2009) and can be used to apply the experience sampling method (ESM). Studies that adopt ESM allow subjects to report on experiences and events during their daily lives. Computerised diary tools have been shown to be less susceptible to recall errors and encourage higher

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user-compliance than alternatives such as pen and paper. They can also provide greater flexibility to the study administrators and reduce errors during data-collection and entry.

There are two main parts of the Pocket Interview system: 1) the client - used for data collection and run on a PDA or smartphone, and 2) the desktop-based administration tool - used for defining questionnaires, schedules and collecting and organising the data from the devices in a suitable manner. Administrators can configure and update the data they would like to be collected and the client’s interface is subsequently created dynamically. The system is configured using the administration tool via a graphical user interface which is easily usable by non-computing users.

The Pocket Interview client will usually run on a mobile device. By its nature, Pocket Interview will interrupt the data-providers when they are prompted to make a data entry. However, participants in real-time studies can require high levels of commitment and exhibit difficulties maintaining their motivation. Pocket Interview includes an option that allows this sampling to be ‘guided’ through the use of audio analysis of the user’s immediate environment. Guided sampling attempts to automatically defer potentially inconvenient prompts temporarily until a less disruptive time. This approach uses ubiquitous mobile technologies and sensors that are embedded within the mobile device. The system does not require the use of wearable sensors as the participants may be resistant to systems that require them to wear additional equipment. There are no external sensors placed in the environment as this will tie the system to a static location. There is no development of new sensors as this will require design, development, deployment and evaluation which can be expensive, error-prone and can waste significant time and resources on something that may not even meet the desired requirements.

Guiding is a strategy that could be applied to all context-aware computing, phone call or message delivery and indeed all other prompting. As computing power continues to expand and more powerful mobile devices become available we will see an increase in the quantity and sophistication of applications that interrupt their users. This will add to user’s feelings of overload. To maximise user acceptability designers of computing systems require strategies, such as Guiding, to minimise the interruptions caused by proactive prompting.

**AUDIO RECORDING**

For the experiments described later in this paper a Dell Axim X51 PDA was used running the Pocket Interview client software (Figure 1). Audio data was sampled using the PDA microphone at 22kHz with 16-bit depth in 3-second samples. Low-resolution audio samples of 3-second length recorded by PDAs have been demonstrated as sufficient to classify different environments such as offices, streets, bars and car-driving (Ma, Milner, & Smith, 2006).

**Audio Analysis**

For the analysis, a simple sound detection algorithm that thresholds amplitude, is performed on the sample to give an indication of sound activity. The threshold value is set during an initialisation phase whereby quiet audio is continuously sampled while the threshold is increased until an appropriate value is reached. The sample is recorded using the devices inbuilt microphone. Through informal user-testing the sound-detection method has been shown to be effective at detecting nearby speech while noise from televisions and radios goes undetected, computer activity such as typing and mouse clicks also go undetected.

**Using Audio**

It has been demonstrated by many researchers that continuous audio can be a rich source of information for activity recognition. When modelling human interruptibility previous research has suggested that the presence of human speech...
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