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Connecting Elders by Facilitating Mobility

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ABSTRACT

A key aspect of staying connected is the ability to travel and visit friends and family, yet mobile situations often pose difficulties for the older population. In this paper, we discuss how technology can support older people on the move, describing work which we have done and are doing in this area and outlining some of the challenges that lie ahead. We focus on providing support for navigation, which is a key part of travel, and outline some of the results of our work, showing that electronic aids can effectively help older people with this activity.

INTRODUCTION

As the proportion of older people in developed countries increases [6], there is a growing need to provide support in new and innovative ways, such as through the use of technology. Support is needed not only for basic needs but also for aspects of life that enhance elders' quality of life. One such aspect is the establishment and maintainance of connections between older people and others around them, tackling the isolation that so many experience.

Older people often find it difficult to stay connected with their communities, friends and family due to increasing difficulties with travel. These are caused not only by physical frailities but also by decreasing abilities to cope with the demands of outside and mobile environments. In such situations, as well as inside the home, technology can provide support.

What is more, recent advances in handheld computers and positioning technology increase the scope and type of the support that can be given. Devices can provide information and communication facilties while on the move as well as information tailored to the user's location, e.g., providing information about public transport, prompting memory and aiding navigation.

However, there are also challenges to the use of such technology with older people, who have lower rates of technology use and who often find it difficult to use. Recent research has sought to overcome barriers in the design of home and desktop applications, but their results may not always translate to mobile and handheld devices, which are used in different contexts, have limited screen space and use different methods of input and output. More work needs to be done on the design of mobile devices for older people.

This paper describes some of our research in these areas. In particular, we discuss our work on navigation aids for older people and outline other work on mobile devices in general.

BIOGRAPHIES

The authors are members of the UTOPIA (Usable Technology for Older People: Inclusive and Appropriate) project, a three-year SHEFC-funded consortium of four Scottish universities [1]. As its title indicates, this project seeks to discover how useable, inclusive and appropriate technological products can be designed and developed for the older population. The project as a whole considers a wide range of technology, such as improved internet browsers and operating systems, and technology to support exercise and provide companionship. However, the authors are focusing on technology to provide support for older people outside the home, in mobile situations, as described in more detail in the following sections.

Dr Joy Goodman is a Research Associate on the UTOPIA project. In addition to her work on mobile devices, she has carried out a medium-scale survey (353 participants) of technology use among those over 50 years old in Scotland and has developed methodology for investigating requirements and evaluating technology with older people.

Prof Stephen Brewster leads the multi-modal interaction group in the Department of Computing Science at the University of Glasgow. His work centres on the use of multiple sensory modalities (such as hearing and touch as well as sight) to make human-computer interaction more effective. In particular, he has investigated the use of audio to improve the use of the limited screen space on mobile devices. This work is of particular use to older people, who often experience declines in one or more of their senses.

Phil Gray is a senior lecturer in the Department of Computing Science at Glasgow University. His main research interest is in UIST (user interface software technology). He is involved in developing a navigation aid for older people and an experiment management tool to facilitate the evaluation of this aid.

MOBILE DEVICES FOR OLDER PEOPLE

There are many ways in which mobile devices can help to support older people, making it easier for them to get around and so to maintain and develop connections with their communities, families and friends. Simply by making information and communication available while on the move can make it easier to cope with difficult situations and so reduce fear of travel. Mobile devices can also serve as memory aids, reminding older users of what they need to do or buy. They can enhance awareness of the user's surroundings, helping to make up for deficiencies in sight or hearing, provide up-to-date on-the-spot information about public transport, museums and shops, and guide the user around unfamiliar locations.

All these devices need to work in ways that older people can understand, use interfaces that older people can operate and provide information and facilities that older people really do want to use.

In order to discover how these devices can best be designed, we built on previous work on the design and development of mobile devices by focusing on the example of navigation. As we develop a device to aid navigation, we hope to discover more about mobile devices and older people in general, how such devices should be designed and evaluated, how older people can be involved in this process, and how navigation in particular can be aided.

A NAVIGATION AID

Navigation is an important mobile activity, key for maintaining mobility and independence. Without the ability to navigate, i.e., to find one's way around, one cannot travel, visit shops, attend meetings and, most importantly for staying connected, visit friends and relatives and meet people in the street and other local gathering points. However, many older people experience increasing difficulties with navigation due to declines in their perceptual, cognitive and motor abilities [5].

We designed and evaluated a simple navigation aid, in order to determine whether electronic aids can really help older people on the move or whether the difficulties with and barriers to the use of technology among the elderly would prove too strong a deterrent to their use. We also wanted to investigate the use of landmarks as a method for guiding older people around. More information about the device, its design and evaluation can be found in [3].

Requirements Gathering

The design of the navigation aid was informed by a set of focus groups with older people. We found that standard focus group methods had to be modified for use with older people [1] and for discussing mobile situations [2]. We found that it helped to present the focus group as a social event and provide times for social interaction. We also allowed participants opportunities to examine and handle mobile devices, and used scenarios to help participants to image situations in which they might use a mobile device and the ways in which it might be used.

Design

Based on results from the focus groups, we designed a prototype aid, running on a Compaq iPAQ, that describes routes using landmarks, presented via photographs, text and speech. A sample screen from the device is shown in Figure 1. It displays a photograph of a landmark that can be seen from the start of the route. Once the user reaches the landmark, he or she presses the button labelled "Next Image" to progress to the next instruction, describing a new location to head towards. A brief text description is shown above the photograph and a longer speech instruction can be heard when the "Audio" button is pressed. For example, the instruction for the screen in Figure 1 is "Directly ahead of you, you will see the University Main Gate. Please go through it." The "View Map" button shows a simplified map of the route and "Restart" returns the user to first screen at the beginning of the route.

Figure 1. An example screen from the navigation aid.

The interface was designed with guidelines for the interface design of desktop applications for older adults in mind (e.g., [4]). For example, drop-down menus and unnecessary features were avoided, text rather than icons was used on buttons and sans-serif fonts were used. However, sometimes the guidelines had to be modified to account for the smaller screen space available on a mobile device, and 11pt rather than 12 pt font was used.

Evaluation
The navigation aid was tested using a set of field experiments with 32 able-bodied users; 16 aged between 63 and 77 and 16 between 19 and 34. Participants were asked to navigate along two routes, one of them using the device and the other using the standard paper map for the area. The order of the two routes and whether the device or map was used first were counterbalanced. Equal numbers from each age group and gender were assigned to each condition. More information about the evaluation can be found in [3].

The mean times taken to navigate the routes with the map and with the device are shown in Figure 2. The older sample took significantly less time when using the device ($p<0.001$) and the differences between the age groups are significant with the map, but not with the device ($p<0.001$).
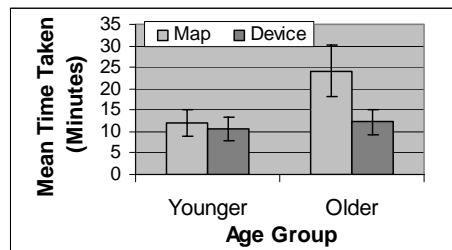

Figure 2. Mean time taken to navigate test routes (error bars show standard deviation).

Participants also indicated which method they found most useful, as shown in Figure 4. Although some felt that a map gives more freedom and control over the route, only one person (an older user) indicated a preference for the map. She explained that she was "accustomed to using maps and feels comfortable with them".
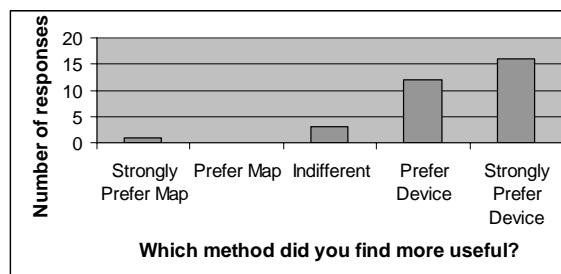

Figure 4. Perceived relative usefulness of the map and the navigation aid.

The results show that mobile devices can be used effectively and profitably by older people and that they can improve such key aspects of mobility as navigation. In fact, we found that older people derive substantially more benefit from our navigation aid than do younger users and that it speeds up their performance until it is comparable with younger age groups.

CURRENT AND FUTURE WORK
We are continuing to develop navigation aids for older people, examining different ways of providing navigation information and enhancing the capabilities of the device. In particular, we are currently comparing the effectiveness of text, speech and combinations of different modalities for presenting navigation information. We also plan to examine some more basic interface elements, such as buttons and menus. From these studies we will develop guidelines for how mobile device interfaces can be best designed for use by older people so that mobile devices can be used effectively to support elders while on the move, increasing their mobility and helping them to stay connected with their communities, friends and families.

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