

Augmented Reality Interfaces to Support Ageing-in-Place

Shaun Lawson and David Nutter
Department of Computing and Informatics
University of Lincoln
Brayford Pool, Lincoln, UK, LN6 7TS
{slawson,dnutter}@lincoln.ac.uk

The field of assistive technology has focussed hitherto on developing systems and techniques to ameliorate the problems caused by the declining physical capabilities of the older people. As information systems increase in daily importance, the possibilities of their use in caring for the older population expand and the problems older people experience in interacting with such systems become more pressing. Under the auspices of the SPARC programme, we are conducting a Wizard of Oz (WoZ) evaluation of novel interfaces to an on-line reminder system to support the daily activities of older people with non-intrusive and persuasive reminders.

Augmented Reality, Ageing, Telecommunications, Persuasion

1. INTRODUCTION

Though information systems presented through the web and other mediums are increasingly embedded in everyday life and support activities including shopping, travel and social interaction, they are under-utilised by the older population[1,2]. Barriers to adoption include systems targeted at “younger” audiences, the difficulties that older people experience when interacting with computers[3] and psychological barriers to adoption: such as believing that information systems are “not for them”. The web in particular has significant problems as a service delivery mechanism due to the potential inconsistency of the web interfaces when viewed using different browsers, the anarchy and unfamiliarity of the medium compared to traditional information sources and support required to introduce general purpose computers to novice users. Consequently the unmodified web is not currently suitable for delivering information to older people.

A divide between the haves and have-nots in the information society has been noted and it is clear that the class of “have nots” contains disproportionate numbers of older people compared to the general population. The promise of information systems for reducing isolation and providing support for older people should not be ignored[4], but the shortcomings of their interfaces must be addressed. To this end we propose the use of augmented reality techniques to deliver information to older people via the objects and devices found in most homes. The chosen application is the issuing of context-sensitive reminders to perform daily activities of varying degrees of importance. Commodity pervasive computing devices such as the Palm Treo already provide such functionality for business users, but such devices are inappropriate for older people due to their excessive complexity.

2. REQUIREMENTS FOR PERSUASIVE REMINDERS

When reminding oneself or others, a human accounts for the situational context and the urgency of the required action before delivering the reminder. For example, a reminder to water house plants is not particularly urgent yet a reminder to take medication is essential and may be time-critical as well. At the beginning of this research programme a number of scenarios were developed which captured daily activities such as taking medication; locking doors and windows; caring for pets and suggestions for lifestyle improvement. The types of reminders required to support each activity were then identified, leading to the following requirements for reminders:

1. **Non-essential and time-independent.** Reminder should be unobtrusive yet persistent. Example activity: watering house plants
2. **Essential and time-independent.** Reminder should be initially unobtrusive, persistent and subject to an escalating level of intrusion. Example activity: taking a daily medication that has no hard dosage time requirements
3. **Non-essential and time-dependent.** Reminder should be initially intrusive but non-persistent. Example activity: watching a particular TV programme.
4. **Essential and time-dependent.** Reminder should be initially intrusive and persistent. Example activity: taking a medication with strict dosage requirements. The reminder should be persistent as though the it may be impossible to perform the intended activity after the moment has past, remedial action such as contacting a care worker may be possible or necessary and to undertake this it is necessary that the recipient of the reminder should know what they have omitted to do.

The possibilities offered by use of augmented reality allow us to escape the confines of typical information systems. Regardless of the source of information presented by the system the user interface will be presented through items or furniture that is already familiar. The mode of the reminder may be selected from visual, auditory and tactile modes or a combination of these things. For example, a non-intrusive, persistent reminder may overlay

information on a television screen, much in the same manner as sports scores are overlaid upon the video of the live event. A more intrusive form of reminder may cause the telephone to ring and deliver a tailored message, much as a care worker may telephone a patient to remind them of an appointment.

2.1 System Description

Using commodity hardware and software, a system which can schedule and present a variety of reminders will be developed. Interface hardware includes two SIP telephones, a remote control similar to that supplied with many televisions, a large monitor and a speaker system. Using these devices it is possible to simulate a “home” with a television, radio, telephone system which the user can interact with. Figure 1 shows a simplified system diagram.

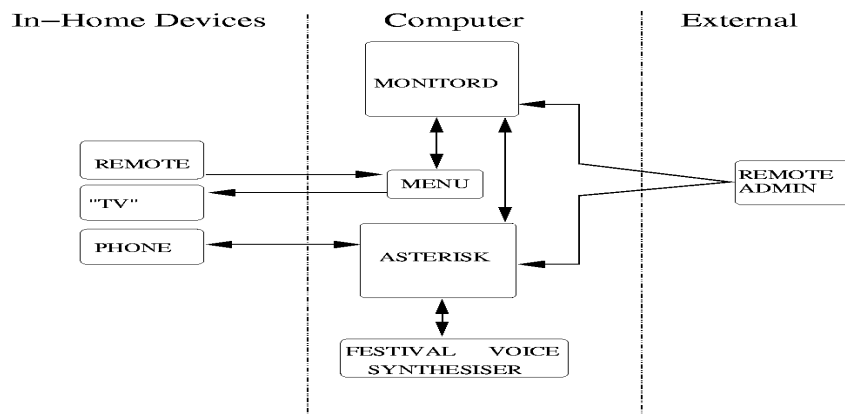


Figure 1. System Block Diagram

The interface devices on the left of the diagram are controlled by a monitoring daemon (monitord). This displays a menu interface or other information when necessary on the “television”, playing sound through the speakers and handling input from the remote control. The second major computer-based component is the Asterisk PBX system, which controls the telephones, providing custom extensions for the user to dial to access applications, including a menu system consistent with that displayed on the television. Additionally Asterisk, with the help of the Festival voice synthesiser, can cause the phones to ring and deliver audio reminders to the users. External inputs complete the picture: in a production system this might represent care workers administrating the system remotely, in our experimental system these represent a deus ex machina: the hidden researcher controlling the experiment.

This is a short-term, “pump-priming” research project. Consequently it is impossible to build a complete version of the reminder system envisaged so the presence of a researcher is required to provide the invisible “brains” of the system. This allows for use of “perfect” voice recognition technology and rapid “modification” of the system to account for new findings as the researcher merely needs to change their behaviour to “modify” the system. The system simulated should remain within the bounds of possibility and so the researcher’s capabilities must be constrained by use of a script when interacting with the experimental subject, for example over the telephone.

3. EVALUATION

This use of the researcher is an artefact of the Wizard of Oz[5] (WoZ) evaluation specified for the project. The purpose of WoZ is to test unimplemented technology, generally to refine usability issues before excessive effort has been expended in developing a working system. The involvement of the target user group with development is therefore of paramount importance. Consequently our data collection steps comprise an initial structured interview with a representative sample of the older population in Lincolnshire and then a follow-up structured interview for a selected subset of this group delivered as part of the participation in the WoZ evaluation.

The initial structured interview has two purposes, firstly to confirm that some of the findings from previous studies of the elderly and technology hold for Lincolnshire’s older population and secondly to determine which types of reminder are acceptable to older people in certain contexts. The follow-up interview and evaluation is intended to determine the user’s reaction to the reminders we can provide, which may differ from the user’s initial opinion captured in the original structured interview.

REFERENCES.

- [1] Dickinson, A. Eisma, R. Syme, A and Gregor, P. (2002) *UTOPIA – usable technology for older people: Inclusive and appropriate*, in Proceedings of British HCI'02.
- [2] Goodman, J. Syme, A. and Eisma, R. (2003) *Older adults' use of computers: A survey*, in Proceedings of HCI'03
- [3] Graf, P. Li, H. and McGrenere, J. (2005) *Technology usability across the adult lifespan*, in Proceedings of British HCI '05.
- [4] Miskelly, F.G. (2001) *Assistive technology in elderly care*, Age and Ageing, vol. 30, pp. 255-258.
- [5] Maulsby, D. Greenberg, S. and Mander, R. (1993) *Prototyping an intelligent agent through Wizard of Oz*, in Proceedings of SIGCHI '93, pp. 277-284, Amsterdam, The Netherlands