

DESIGN CONSIDERATIONS FOR ELDERLY USERS IN DOMESTIC PERVASIVE ENVIRONMENTS

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ABSTRACT

This short paper examines some of the issues within the design of domestic pervasive systems for the elderly and offers an insight into some of the considerations that need to be examined when installing/developing domestic pervasive systems for this client group. This paper arises from research currently being carried out at Loughborough University. The research is aimed at providing services for elderly users in pervasive domestic settings.

Keywords

Pervasive Computing, Design, Elderly Users, Interface.

1. INTRODUCTION

Pervasive technologies offer new and exciting interactive possibilities within the domestic (home) environment. As this new interaction takes place within the domestic arenas of our lives, we need to recognize that there will be much user diversity. These new technologies bring with them a variety of new ways to interact, that have yet to be fully explored. The way these systems are designed needs careful consideration, so as to accommodate the different users within domestic environments. One set of users that have been targeted by the designers and developers of pervasive systems have been the elderly. With an ever increasing aging population there is a necessity, both economically and socially, for elderly users to remain in their own homes. One possible way of doing this, may be to embed pervasive systems into elderly users' homes [1]. These systems could be aimed directly at the users' needs, and as such may be as simple as an automated grocery ordering system, through to a complex system monitoring the users' health, movement and power/water consumption [3].

An important consideration is the design of interfaces and interaction strategies for older users within pervasive domestic environments. Many existing interaction strategies rely upon the desktop interaction paradigm of the mouse and keyboard, but for a pervasive domestic setting this is not practical as the tasks we do may not require a keyboard and mouse, the user may be mobile and the feedback and input may be in many different rooms of the house.

1.1 Consultation

The first step in any systems design is to initially find out and understand the user's needs. This is especially important when developing pervasive systems to monitor different illnesses, as there may be different monitoring requirements and different users that use the system other than the 'patient', such as nurses, doctors, neighbours and relatives. The sort of system needed must be discussed. What can be provided needs to be established: what the system is required to accomplish and the limits of the technology involved need to be explained to the user [2]. This initial consultation will affect the implementation of the system and also allows the designer to assess if the system will facilitate the users' desired activities.

1.2 Impairment

Many elderly users have some degree of impairment, this can drastically effect the input and output modalities used. Graphical user interfaces may not be appropriate to visually impaired users, and auditory based interfaces will be of little use to users with hearing impairments, so careful consideration will be needed to appropriately design efficient and effective means of input and output for individual users. We must also consider the limited mobility of many elderly users, which means that access to any services must be provided in multiple locations that are most commonly used by the elderly occupant. This may be done by initial consultation and monitoring [3].

The manual dexterity of many elderly users is impaired, so any input devices must require only a low level of accuracy to work safely and satisfactorily. If an alternative input system is to be used, such as speech, it must be remembered that vocal degeneration can occur in the older population [5][2], so the amount of spoken commands must be limited and easily remembered. Mental health issues also need to be considered, the support of users who have a degree of dementia need to be appropriately addressed [4]. A way of supporting these users may be through the implementation of systems that are intuitive, feel 'natural' and are easy to learn. By installing such a system issues of computer non-literacy may also be addressed. Generic illness, such as diabetes also plays a part in what services and systems are put in place. The degree and type of illness can indicate the

type and level of system needed, especially if health indicators are to be monitored.

In cases where mobile or wearable computing devices are to be worn, there are special ergonomic considerations that have to be appropriately addressed. These relate to the device placement, load and stresses that exist when this type of technology is worn by an elderly user. Many mobile devices also have small screen sizes, which may prove difficult to see [6] and there is also further research that needs to be done into the use of wearable input devices while the user is mobile [7]. It may be the case that elderly users find the wearing of such technology socially intrusive, so this may be integrated into their clothing to make it less obvious and much more discrete [8].

1.3 Multi-Occupancy

One little addressed issue, is that of multi-occupancy within domestic pervasive environments. There may be a variety of users within the home all using the same and different services. This could make any system highly complex and could cause conflict at a technical and social level. Any pervasive system needs to be able to cope with a variety of users from children to the elderly. They may all have different needs, in terms of the tasks that they do and their chosen input and output modalities. Within a shared pervasive environment we must also be aware of security and privacy issues, which users are allowed to see what information, who can use what services and is user monitoring ethical?

1.4 Psycho-Social Factors

So far we have briefly looked at some of the physical issues that can affect the design of domestic pervasive environments for elderly users. In this last section we look at the psycho-social factors concerning elderly users. One of the key features of an enabling and supportive pervasive system is that it can give its users a higher level of independence, and in so doing they obtain an improved quality of life. Existing community networks amongst elderly users may also prove to be a valuable source of individuals who may be trained to offer specific support or monitoring as appropriate. By using this community network it is hoped that a greater level of acceptance of pervasive technology might be gained.

2. CONCLUSION

In conclusion, this paper has shown some of the issues associated with the development and design of pervasive environments for the elderly. Although this is not a

complete overview it raises important questions and offers a general insight into the way that some of these problems may be tackled. After examining the literature it becomes clear that there is a need for further investigation into the development of domestic pervasive environments for the elderly, in terms of the process of gathering user requirements, consultation, the physical characteristics of the user and the psycho-social impacts of the implementation of such technologies.

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