This is a preprint version of a paper submitted to HCI International, Crete, 2003

Scenario-based Drama as a Tool for Investigating User Requirements with Application to Home Monitoring for Elderly People

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Abstract

Drama on video is being used as a tool to investigate user requirements for a fall detector within the context of a monitoring system based on visual tracking. The system is being designed to have the ability to provide passive monitoring in the homes of older people so that in the case of a fall being detected, the emergency services are called automatically. As with any such system, it is important that its presence is seen as supportive and not invasive. Drama has been found to be an effective way to focus potential users on discussions about the usage of the system, prior to important design decisions being made. This paper reports on the first stage of an iterative process and the fall detector design decisions made as a result of discussions with potential user groups. Issues to be considered in future work are discussed briefly.

1 Introduction

A system providing fall detection and movement monitoring to support elderly people living at home is being developed using computer vision technology (Nait-Charif & McKenna, 2003). Demographics and the costs of care clearly indicate the need for such systems. They must be sensitively designed with user involvement to ensure that the system presence is experienced as supportive and not invasive.

The objectives of the study reported here were two-fold: (i) to establish whether drama on video would work successfully in terms of focussing discussion amongst older potential users of a home monitoring system and (ii) to gain information from potential users (including sheltered housing wardens) about issues surrounding the use of current community alarms, contexts of use and what users would wish for future systems. This study is significant because the use of drama allows elderly potential users to be involved effectively in the process of design at the pre-prototyping stage. Theatre has been used only occasionally in the context of new product design (Sato and Salvador, 1999; Howard et al, 2002). There has been related research recently on the use of scenarios (Carroll, 2000), narrative (Benyon & Macaulay, 2002) and how stories capture interactions (Imaz & Benyon, 1999).

2 Methods

Four scenarios were developed based on information from focus groups and user stories. These were performed by a local theatre group, Foxtrot, who specialise in interactive theatre that raises topical issues and follows on from the pioneering work of Boal (Boal, 1995). The scenarios were filmed and shown to three groups of older people (with 7-15 participants) and one group of sheltered housing wardens (7 participants). Design constraints and user requirements for a fall detection and activity monitoring system were explored. Each scenario was developed to provoke discussion of a slightly different aspect of system design: (i) participants experience and anxieties about falling, (ii) the way in which information about a fall would be sent to and received by carers, (iii) the information the "faller" wants and needs about the system, and (iv) issues related to activity monitoring rather than fall detection. Groups were encouraged to discuss issues that occurred to them following each separate scenario and these discussions were recorded on video. More details of scenarios used and results are provided in (Marquis-Faulkes et al., 2003). A qualitative analysis was performed in which themes were identified and important points documented. Unresolved issues suitable for exploration using drama in a second iteration of the method were also identified.

3 Results

The first objective was clearly met: drama on video was used successfully to focus discussions amongst elderly people on design at a pre-prototyping stage. The second objective: "to gain information from potential users about issues surrounding the use of current community alarms, contexts of use and what users would wish for future systems" was also met and the information obtained is summarised below under four headings.

3.1 Design of the Monitoring System For Fall Detection

There was a perceived need for a passive fall detection system and its design can be broadly specified from the requirements of potential users.

- Potential users were content to have a monitoring device based on visual tracking provided that only a computer analyzes the output. None of the participants wanted visual monitoring that allows other people to actually watch them in their homes.
- Older people, especially those who still live in their own homes, were not enthusiastic about carers having too much information about their activities except for the purposes of helping them in case of a fall.
- Participants have experience with the current community alarms where a voice comes through the system to the flat occupant to ask if they need help; from this experience, a voice connection with any new system is expected and preferred.
- Sheltered housing wardens, in particular, felt that the new monitoring system would need to be linked with the existing community alarm system, i.e. using same call centre as is used at present. It would be too confusing for tenants and carers if there were two systems in place.
- The most likely places to fall were reported as the bedroom and the bathroom with going to the bathroom in the night being a particularly risky event for older people. The lobby was also said to be an area of risk.
- Careful consideration needs to be given to the relationship of the new monitoring system to other technology such as the door lock and the security system, so that in the case of a fall being detected in a private house that carers or emergency services have access.
- In aesthetic terms the potential users would rather have something which is unobtrusive, that looks like a smoke alarm for example, so that others do not know that they have such a system in place.

3.2 Communication between the System and the Faller

Discussions have given some insight into the important area of communication between a fall detection system and the faller and between the system and the carer or emergency services. Results so far are as follows.

- Participants said that the faller needs to know that the system has "seen them and what it is doing to raise help".
- Wardens commented that they had information about tenants (e.g. medical history and personality) that enabled them to prioritise care depending on likely urgency of need. This led to the suggestion that a monitoring system should have different settings: to be more sensitive if, for example, someone had just come out of hospital.
- All the groups said that they preferred human rather than computer-based systems. It was stated that the current personal connection and verbal communication between faller and warden/call centre provided an important and reassuring link.
- It was important that a potential faller could not turn off the fall detection system completely. Users, however, do need to be able to "clear the system" in the case of a false alarm to prevent help being called unnecessarily.
- Users need to be able to press a button to call for help if necessary so that an active system is integrated with a passive monitoring system.

3.3 Errors in the System

There is the issue of errors in the system: what happens when falls are missed or when the system mistakenly reports a fall (a false alarm).

- An anxiety was voiced that, if carers are relying on the system and therefore perhaps ringing up or visiting less, it is very important that it work reliably.
- Those who had experience of the current community alarm system, confirmed how important it was that they could clear a false alarm.
- The issue of missed falls is more complex. Potentially ambiguous situations, such as falling asleep in a chair or having a stroke while sitting down, were discussed as problem areas for an automatic visual monitoring system. While it was not intended that a fall detector recognise such situations a carer might expect to be alerted and a monitoring system could be designed to cope with this by, for example, responding to prolonged inactivity.
- Research is required to explore further how the dangers of missed falls and the inconvenience of false alarms can be avoided and more scenarios are planned to explore these issues.

3.4 Activity Monitoring

There are issues and anxieties concerning the monitoring of activity, rather than simply fall detection.

- A non-invasive fall detector was felt to be useful, but there was reluctance, expressed most strongly by those living in their own homes, to have any activity monitoring.
- Potentially, a monitoring system could build up a profile of the person's normal activity patterns and then alert a carer if the person was moving around less than normal, or using the kitchen less, or the bathroom more, than normal. Whether this was acceptable was explored in one scenario and generally it was felt to be too invasive. There are situations and circumstances where it might be felt that the reduction in privacy was worth the safety issues. For example, where the monitoring system could offset a move to sheltered housing or allow a more rapid return from hospital. This needs further exploration.

4 Conclusions and Future Work

The user requirements gathering methodology of provoking discussion by using scenario-based theatre has proved of particular value with audiences of elderly potential users, enabling them to focus on the details of a monitoring system at the pre-prototyping stages. Older people, when presented with new technological possibilities in an appropriate form, are very capable of considering and discussing desired functionality. Furthermore, they provided useful and interesting suggestions about what would make such a system really useful to them. They also had strong views about what they did not want of a monitoring system. For example, they particularly did not want any images of themselves at home to be accessible to anyone and could think of no circumstances where this would be necessary or acceptable. The discussion has led to areas of further work being pinpointed and future drama being designed to explore these areas. A series of new scenarios has been filmed. The plan is that this research is iterative: the issues mentioned by potential users in the first series of scenarios have been used to make provisional decisions about the design of the monitoring system. For example, it has been decided that:

- no video images will be transmitted to carers
- a new system will be integrated with current community alarm systems
- there will be voice communication with the monitoring system's user as there is with current community alarms
- the sensor will have an appearance which is unobtrusive, like a smoke alarm for example, so that others will not know that such a system is in place.

It was clear from participants' responses to other issues that more detailed investigations were required. This was particularly the case for the following areas.

- The details of the voice communication between the monitoring system and the faller
- What happens when there is a false alarm?
- What are the subtle conditions which a human carer would immediately recognise as a potential emergency but to which a visual tracking system would not respond? How can the monitoring system be designed to minimise the likelihood of missed falls?

Involving potential users in this way allows them to play a real part in the design of a product being developed to support them to live independently; drama used in this way engages older users and focuses discussion on the functioning of fairly complex technology in an enjoyable context using relevant media. Discussions were fairly open and unstructured to allow participants to raise issues of importance to them. This meant that unexpected topics were raised that the researchers had not predicted.

Acknowledgements

This work was funded by UK EPSRC EQUAL grant number GR/R27419/01. The authors would like to thank Foxtrot Theatre especially the Director, Maggie Morgan. Many thanks to all the potential users (older people, carers and wardens) who gave their time to the evaluation process.

References

Benyon, D. & Macaulay, C., (2002) Scenarios and the HCI-SE design problem. Interacting with Computers 14, 397-405

Boal, A. (1995) The rainbow of desire, Routledge, London

Carroll, J. M. (2000) Making use of scenario-based design of human computer interactions. MIT Press, Cambridge, MA

Howard, S., Carroll J., Murphy J., Peck, J. & Vetere, F. (2002) Provoking innovation: acting-out in contextual scenarios, People and Computers XVI Human Computer Interaction Conference

Imaz M. & Benyon D. (1999) How stories capture interactions, Human Computer Interaction, Interact 99, IOS Press.

Marquis-Faulkes, F., McKenna, S. J., Newell, A. F. & Gregor, P. (2003) Using drama and video with older people in the requirements gathering for a fall monitor, Submitted to: Technology and Disability, IOS Press.

Nait-Charif, H. & McKenna, S. J. (2003) Improved particle filtering for tracking poorly modelled motion, Submitted to: IEEE Conference on Computer Vision and Pattern Recognition

Sato, S. & Salvador, T. (1999) Playacting and focus troupes: theatre techniques for creating quick, intensive, immersive and engaging focus group sessions, Interactions, Sept-Oct, 35-41