

Design of a multi-modal user-interface for older adults

Mario Drobits, Martin Litzenberger, Angelika Dohr

Safety & Security Department, AIT Austrian Institute of Technology GmbH

Abstract

Within the AAL-Joint-Programme project FoSIBLE a Social TV community platform for older adults, augmented by game technologies and smart furniture has been developed. The platform aims at providing support for social interaction between peers, friends and families. We present first results from our approach of utilizing different multi-modal interaction techniques for an integrated Smart TV with Social Community solution.

1 Motivation

Our research aims at bridging spaces to foster social interactions and experiences for older people by acknowledging the diversity of life worlds, needs, preferences and interests. Smart-TVs offer a great platform for integrating new services, especially for older adults who use the TV set in a regular manner. The technology supports communication and interaction in the context of the television infrastructure, using entertainment console and media center technologies to provide different communication, broadcasting and entertainment services. Traditional remote controls are perfectly suitable for simple interactions like changing TV channels, but they have strong limitations when it comes to more complex interaction patterns necessary to interact with a Smart-TV solution (Mitzner et al. 2010). On the one hand, the remote control might not always be available when the TV is also used for gaming and social communication. On the other hand, traditional remotes are limited in their functionality and only offer a passive way to interact with the system, i.e. they always require the user to look at the TV screen. On the whole our aim is to use this medium to increase the well-being and the self-esteem of elder people by filling in their loss of companionship and entertainment.

2 State-of-the-Art

Currently, TV and PC manufacturers are starting to offer different solutions to these problems. One approach is to provide more advanced remote controls, eventually even integrating a full keyboard (Logitech). Other approaches use voice and gesture recognition to interact with the TV set (Samsung, Panasonic) or the PC (Microsoft). These approaches are influenced by recent approaches from the gaming industry.

In some AAL related projects, a combination or single use of TV sets and tablet-PC-based input devices has been presented (Seewald et al. 2010) (Mitzner et al. 2010) (Loureiro & Rodrigues 2011).

3 Approach

3.1 Overall Concept

Within the FoSIBLE project, a Social TV community platform for older adults has been developed (Kötteritzsch et al. 2011). To ensure high usability and acceptance among the heterogeneous user-group of older adults, a novel combination of input methods is used. The central element of the application is a Smart-TV system, which is used to display messages, images and videos. A dedicated application is running on the Smart TV and provides chat functionality, as well as games and message boards. To encourage the users in dealing with this application, different input methods are supported. Multi-modal input approaches for controlling Smart-TV systems offer the user the possibility, to choose the appropriate input method depending on his actual abilities and needs individually for a given task. Especially the user group of older adults has special needs (e.g. regarding readability of text), which can easier be addressed using a variety of interaction concepts.

Within FoSIBLE, gestures can be used for navigating through the menus in supplement to the traditional manufacturer-specific remote control. Additionally, a tablet-PC provides the possibility to perform more complex interactions and to view content directly on the screen. Either way the end-user has the choice between different input methods depending on his/her current daily routine. The system is completed by sensor information and smart furniture (chairs with pressure sensors or a table with a capacitive table board) to detect the presence and state of the user. In Figure 1 an overview on the different user-interfaces is given.

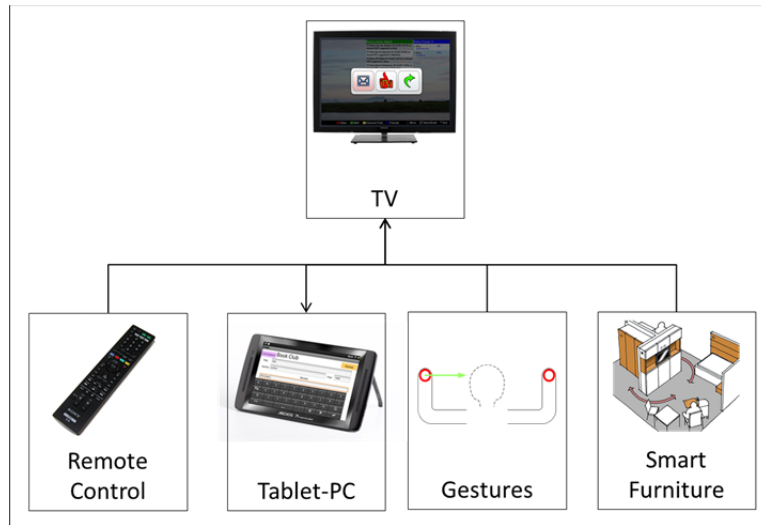


Figure 1: System Overview

3.2 Gesture Interface

The Smart-TV application offers the user the possibility to chat with other users while watching TV, recommend TV shows, post articles on a message board and start external games. While traditional remote controls are perfectly suitable for changing TV channels, they have strong limitations when it comes to more complex interactions. Entering text is especially difficult and frustrating for longer texts. Thus, two alternative user interaction methods have been developed. Firstly, gestures can be used to interact with the menu system of the TV. This is intended to support the user when the remote control is not in reach, for example when playing a video game. Secondly, a tablet has been integrated to allow the user not only to navigate through the menus and enter text more easily, but to provide an additional display, too. This is especially important for older adults, which might have a limited field of vision or other visual impairments.

Gesture recognition promises to provide a simple to use, intuitive interface - especially for the elderly - for interacting with electronic systems such as social media platforms. The appearance of Microsoft's "Kinect" 3D-sensing device leads to a boom in the development and demonstration of gesture control interfaces. However, the "Kinect" device itself allows just the three-dimensional scene recognition and an additional PC and software are necessary to perform the actual gesture recognition in real time. The embedded 3D sensor system developed in the Fosible project is able to distinguish dynamic hand gestures and has the potential to directly control devices like TV-sets or set-top-boxes, without the need for an additional computer. Typical control actions performed with the gestures involve menu control like browsing up/down/left/right through a menu. Further actions include "home" and "select" operations without the need to grab an additional device like a remote control.

To select the appropriate mode of interaction and a suitable set of gestures, an end-user evaluation has been carried out with a Kinect device, involving 24 persons. The results showed, that a pointer-based approach is more preferable and that a high degree of accuracy can be achieved (Bobeth et al. 2012).

The ethernet interface of the Smart TV could be used to directly control the menu with gestures. At the moment, the FoSIBLE project only operates menu functionalities with gesture recognition – game controls are not implemented yet.

3.3 Tablet Interface

For some interactions with the system it has turned out that gestures and traditional remote controls are not sufficient. This is especially relevant for selecting items from larger lists or entering text. Therefore it was decided to provide an additional input terminal, which can be used to navigate on the TV, but also to enter text (e.g. during chats or when writing a short article). As traditional input devices like keyboards and mice are quite cumbersome to use in a living-room environment, it was decided to use a tablet PC, which is easily integrate-able in the living room atmosphere. The tablet can additionally be used to display messages, in the case the TV is switched off.

To synchronize the tablet and the TV application, a remote data-broker is used. Thus, it is even possible to extend the concept to smartphones, which can be used remotely to read and write messages abroad. The tablet application can either be used as a stand-alone application or as a remote control for the TV application. In the latter case, the TV application sends a request to the data broker when user input is required or content shall be displayed. The data-broker forwards this request to the preferred device. This can either be the TV or the tablet which show the according element on the screen. After the user has provided the requested input, the input is sent back to the data-broker and shown on either on the TV or the tablet.

4 Outlook

The integrated FoSIBLE Social TV community system will be deployed in multiple home environments throughout France and Germany later this year, delivering more results from the real-life usage and more insights about the end-user acceptance and usability for novel multi-modal interaction techniques for Smart and Social TV systems.

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Contact

Mario Drobits, Martin Litzenberger, Angelika Dohr
Safety & Security Department
AIT Austrian Institute of Technology GmbH
Donau-City Strasse 1, A - 1220 Wien
eMail: mario.drobits@ait.ac.at