Enhanced TV for the Promotion of Active Ageing

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Abstract. We present an architecture that promotes home TV sets to a platform for tailored interactive contents and services allowing for more active ageing of elderly people. The employed interactivity paradigm based on conversational avatars meets particular requirements of elderly people, resulting in a learning slope near to zero. ISO/IEC 24752 Universal Remote Console standard conformance allows for personalized user interfaces. Furthermore, we outline a prototype setup showing the system's capabilities. In addition to that we present a validation plan for testing our architecture.

Keywords. Enhanced TV, Interactive TV, Conversational Avatars, Active Ageing, Ambient Assisted Living, Elderly People, Cognitively Impaired People

Introduction

Nowadays, watching TV is the main leisure activity of elderly people in modern societies [1], resulting in long periods of physical and cognitive passivity. In the long term, this behaviour worsens their quality of life, by fostering loneliness, health worsening, and social isolation.

The elderly are a heterogeneous group of people who need special adapted technical aids. Many of them suffer from degenerative diseases that cause significant sensorial, physical, and cognitive impairments [2, 3]. Moreover, the number of elderly people grows rapidly and they will have an important impact on our society in the next decades. Today, senior citizens make up 16 % of the total population in Europe, and this percentage is expected to climb to 27 % in 2010 [4].

According to SeniorWatch [5], many elderly people have access to information and communication technologies (ICT) and make use of them. Specifically, 98.3% elderly from 60 to over 80 years possess and regularly use a TV set. Therefore, TV sets are a very well suited technological platform to improve the quality of life of elderly people through tailored ICT based applications.

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1. Purpose of Work

Based on the facts described above, we propose that the TV can offer enhanced services to promote a more active and independent ageing that consequently will have a positive impact on our ageing society. Specifically, we think that the following three requirements must be met to accomplish this goal:

a) Watching TV must be an interactive experience. Users must be compelled by the TV resulting in positive and active reactions.
b) Tailored interactive content must be developed to address users' particular needs.
c) A suitable and accepted natural interactivity paradigm is required to achieve zero effort at the time to learn how to use the system.

2. State of the Art

Most work for the promotion of active ageing of the elderly people using mainstream interactive TV platforms has been carried out for educational TV shows or for interactive PC applications [6]. Remarkable developments in this field are mind training games for several gaming consoles, such as Brain Age (Nintendo DS) [7]. However, these games provide a fixed exercise set that have been designed for the general public and not for user groups with specific needs.

Also, digital media and home network technologies developed vividly over the past years. Related standards such as DVB, MHP, UPnP-AV, and MPEG video are now supported in mainstream home entertainment products. Corresponding standardised platforms have been evolved: Intel Viiv™, AMD LIVE!™, and Microsoft Windows Media Center (WMC). These developments establish new distribution channels for digital media, just as they improve media experiences and services.

Products such as the Dream-Multimedia Dreambox and Microsoft WMC are high-end programmable set-top boxes (STB). These small computers are extendable by plugins and offer a large feature set. However, a solid knowledge of computer metaphors is required for efficient use. The whole consumer electronics industry is suffering from this complexity crisis [8].

Solutions to this complexity crisis are coming from several directions. On the one hand, natural interfaces such as conversational avatars have been well accepted by elderly users with cognitive impairments [9]. On the other hand, several standards have recently been proposed to provide universal accessibility, such as ISO-24752. It defines a user interface abstraction infrastructure for true accessible universal remote console (URC) and allows personalized user interfaces that can be adapted to personal needs and preferences. [10].

So, at the light of these findings, a programmable STB can be a suitable URC for users with special needs, by exploiting interactive digital streaming media and natural interfaces to improve accessibility of new media technologies and thereby supporting users in their everyday life.

3. Proposed Architecture

Currently, the TV setups in most of the homes are typically composed by a TV screen, a remote control and a STB for decoding TV broadcasts. We propose to upgrade this setup by introducing an interactivity server (IS), connected to both the Internet and STB (figure 1).

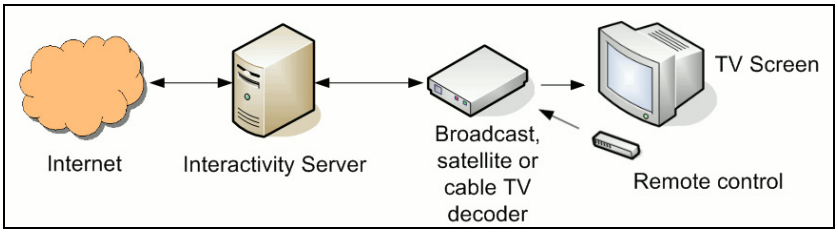

Figure 1. Proposed architecture to upgrade current TV setups.

The aim is to provide interactive contents and natural, user-tailored interfaces to promote more active ageing. The interactive content is stored in the IS and then displayed on the TV screen via the STB. Users are giving feedback by pressing buttons of the remote control. Regarding natural interfaces, conversational avatars can be rendered in the IS and then streamed to the STB. These avatars are able to involve and guide the user while using the interactive contents. Apart from avatars, the architecture could also support other advanced natural interfaces such as voice recognition.

Finally, our IS conforms to ISO/IEC 24752, the URC standard, which abstracts devices and services to enable full functional and personalized remote operation, optionally through virtual intermediate devices and intelligent agents.

4. Materials and Methods

Our prototype system consists of two main components. First, the ISO-24752 conforming IS which provides a C# development environment. The second main component is a Dreambox 7020-S STB. Its main user interface is overridden by our plugin which is developed using the open development environment of the Dreambox [11]. Our plugin implements avatar video playback and GUI rendering, as well as two-way communication and data exchange with the IS module. Moreover, it gathers user input by listening for remote control events.

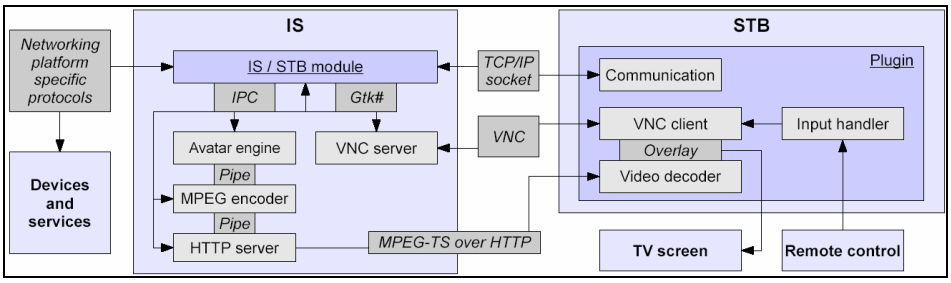

Figure 2. Prototype System - Component Interaction Scheme

The basic component interaction scheme is illustrated in figure 2. The STB functions are similar to a thin client. It receives all contents over the network from the IS, i.e. the avatar video and 2D GUI which is being composes with the avatar video or the current TV channel.

The content creation is steered dynamically by our IS module. An external application renders the avatar using OpenSceneGraph [12] for graphical, and Loquendo 7 for speech output [13]. The raw avatar video is supplied to FFmpeg [14] for real-time encoding to MPEG-TS. A HTTP streaming server conveys the video to the STB, which is sufficiently reliable for cable home networks.

The 2D GUI is also created on the IS using a VNC X-server [15]. Widgets are created dynamically within the IS module using Gtk# [16]. A VNC client in the STB plugin receives the GUI from the IS and renders it to the frame buffer of the Dreambox. It also transfers user input back to the IS. We use a Weemote® dV programmable remote control for user input. It is especially designed for ease of use, targeting children and elderly people [17].

Figure 3 shows our prototype setup. We also implemented a reminder service based on memos stored in a calendar. The avatar naturally conveys the memos to the user. This setup will be used for validations as described in the next section.

Figure 3. Prototype showing an avatar on TV

5. Validation Plan

The prototype will be validated with real users such as frail elderly people and people with mild Alzheimer. Each user group has different requirements and thus different user tests will be prepared to check the usability and accessibility of the system. Validations will take place at a day-care centre owned by Matia Foundation in San Sebastián, Spain. The tests will be performed in special usability laboratories and in real environments. Usability experts will observe, record, and annotate the results in usability reports.

6. Conclusions

We described a new architecture that upgrades home TV setups using an interactivity server to provide tailored interactive contents and services for the promotion of a more active and independent ageing of elderly people. An interactivity paradigm has been devised that uses realistic conversational avatars to convey information in a natural way to the users and that requires a learning effort near to zero. The concept integrates the ISO/IEC FDIS 24752 URC standard to allow for personalized user interfaces and to ensure universal accessibility.

Finally, a fully functional prototype ready for the validation plans for has been built. It provides a smooth and seamless integration of a realistic conversational avatar in a typical home TV setup. Planned validations will involve frail elderly people and people with mild Alzheimer to assess our concept.

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