Implementation of Social Features Over Regular IPTV STB

Jorge F. Abreu
University of Aveiro
3810-193 Aveiro - Portugal
+351 234 370389
jfa@ua.pt

Pedro Almeida
University of Aveiro
3810-193 Aveiro - Portugal
+351 234 370389
almeida@ua.pt

Ricardo Pinto
University of Aveiro
3810-193 Aveiro - Portugal
+351 234 370389
ricardopinto@ua.pt

Vanessa Nobre
University of Aveiro
3810-193 Aveiro - Portugal
+351 234 370389
vnobre@ua.pt

ABSTRACT
Social TV research area has benefited in the late years from the dissemination of IPTV services and related technological possibilities. Features of presence, communication and recommendation have been proposed and are now more common in the prototypes being developed. However a high number of these experiments and proposals are not yet implemented over regular commercial IPTV platforms and can take some time to be available with a compelling graphical and interaction design.

The Social TV application WeOnTV, covered in this paper, was developed in the staging platform of PT Inovação IPTV infrastructure. The work and evaluation so far showed promising results including a successful test over the MEO - IPTV commercial solution. The paper focuses on feasible approaches taken towards the interface design and implementation of WeOnTV's social features, which can be useful as directions to other iTV developments over regular browser based set-top boxes.

Categories and Subject Descriptors: H5.2 [**Information Interfaces and Presentation**]: User Interfaces - *graphical user interfaces (GUI), interaction styles, screen design*.

General Terms: Design, Experimentation, Human Factors.

Keywords: Social television, interactive television, awareness, instant messaging, IPTV, Set-Top Box, WeOnTV.

1. INTRODUCTION
The number of events, prototypes, evaluations and scientific publications related to the integration of social features on television has grown significantly in the last decade. This is a promising indicator of the relevance of this research area, as various conferences and presented work (e.g. EuroITV and uxTV) have shown. In this context, the research and development of solutions that enable the mediation of different forms of socialization [9] fostered by television has been a constant. It is however appropriate to search for technical approaches that can be implemented in the field, namely on existing IPTV commercial platforms. This implies sticking to real specs, more limited from the ones available in prototypes based on PCs or laptop machines.

In this paper the authors report on the features and the development process of WeOnTV - a Social TV application for supporting communication around TV content. The application was developed on a staging platform of the most popular IPTV solution in Portugal – the MEO product. It relies in the integration of Instant Messaging (IM) features on television, compatible with a popular public IM service. Along with IM features WeOnTV allows users to know what others are viewing, to make channel recommendations or chat in multiple formats. The authors have tried to explore innovative design and interaction patterns when compared to what was available at the adopted IPTV platform.

EuroITV'09, June 3–5, 2009, Leuven, Belgium.

2. RELATED WORK
The sociability fostered by television, that is the key issue of Social TV, has been studied by a significant number of authors. In 1975 Martin Jones predicting the future economic and social impact of Interactive Television discussed the greater sense of community awareness that iTV could foster [7]. Later, James Lull [8], in his ethnographically study about the social utility of the television at home, concluded that television can act as facilitator of communication or as a mean to start conversations; can generate cohesion; serve as a mean of joining the family; and can encourage social learning. These findings have leveraged the authors' initial work on Social TV [2] (with the 2BeOn project) and probably some reflections on these topics paved the way for a large set of other prototypes, such as: Reality IM – Accenture Labs; Amigo TV – Alcatel; Social TV – PARC; ConnecTV – TNO; CollaboraTV – AT&T; Find-A-Friend - University of Siegen; Living@room – CSP (for more details on these prototypes see [1]) and STV – Motorola [6], [10]. James Lull's findings are still a subject on this kind of research, as synthesized by Oehlberg et al. [9]. The authors referred to the distributed dimension of current sociability (considering the remote interactions enabled by technology) and its role on designing for distributed, shared television viewing. Their work found that phatic remarks and comments related with the TV content, which generates a brief exchange of words, were the ones that contributed more to sociability. One way of supporting this type of quick exchange of messages is via pre-defined written text messages (or canned-messages as used by Motorola STV prototype [10] and on WeOnTV application).

To achieve the main goal of a Social TV application (allow that people geographically separated, watching the same program, feel as if they were co-located doing it together) the ability to see who is watching which channel is also an essential feature. The results from the evaluation of Social TV prototypes, like 2BeOn [1], revealed the role of presence and channel awareness as a promoter of conversations and a feeling of togetherness. Harboe et al. [6] also concluded that TV-centric information of presence can be complemented by ambient devices as well. Baillie et al on a field study involving "Amigo TV" concluded that 80% of the

users showed interest on having buddy lists complemented with channel information [3].

All the referred studies have contributed with important progresses in the Social TV research area. Considering these conclusions and previous work in the 2BeOn project the authors carried the development of the WeOnTV application described in the following sections.

3. THE WeOnTV APPLICATION

The application runs on a regular IPTV set-top box with MediaRoom™ middleware and the correspondent browser, with the main purpose of bringing social features to IPTV consumption scenarios, making TVs networked. Although this STB has a suitable trade-off between cost and HW specifications, it presents some constraints when demanding applications are at stake. This context brought important challenges to WeOnTV as a full set of social features was successfully implemented:

- flexible offer of text communications based on: emoticons (see figure 2:11); free text input (through triple-tap insertion mode – see 2:10) and pre-defined messages - aiming a reduction on the number of clicks, and consequently of the time necessary to prepare and send a message[1]. Through a Web application, the user (taking advantage of a more user-friendly writing environment like the PC) is able to personalise the content of these messages (according to his social and cultural context) and to organize it by categories (family, sports, television, love and answers – 2:9b);
- integration with a public IM service (Jabber based SAPO Messenger), enabling access, in TV, to the user's buddy list from its regular IM account and extending the information of TV presence and channel awareness to PC/mobile clients;
- tab management in a total of 5 simultaneous IM sessions (see Figure 2:8b);
- management of privacy in what concerns the viewed TV channels;
- TV channel recommendation (2:12).

Due to lack of overlay capability the application's user interface was organized in two main areas: "*TV mode*" and "*Chat mode*".

3.1 TV mode

The purpose of this area of the application is to give users the maximum primacy for the TV content while staying alert for any interaction from a buddy.

Messages received from others are displayed in the bottom of the screen (see Figure 1:5a/5b). These messages may include questions, to which the viewer can immediately answer "Yes", "No" or "Go to Chat" (*chat mode*); or channel recommendations which, if accepted, will automatically change the viewed channel to the recommended one. In this area the user may also get the information on how many of his friends are on-line and which is the channel being watched by the higher number of buddies. An area for video or text advertising was also foreseen (1:7).

Figure 1 - TV mode screen

3.2 Chat mode

If the user accepts an invitation to "Go to chat" or if he freely chooses to, he will be taken to the *chat mode* area (see Figure 2).

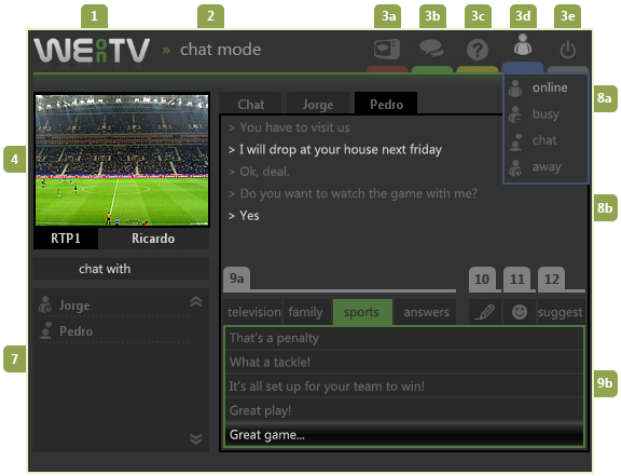

Figure 2 - chat mode screen

This area gives primacy to the communication features of WeOnTV by reducing the PiP size of the video. The area provides information of the buddies that are on-line on a TV (with channel information) and on a PC or mobile device, allowing to manage conversations with them (2:7). Using the 3 upper-right corner icons, the user may also get some contextual help (2:3c), change his status (2:3d – as seen in the figure) or return to regular TV by exiting the application (2:3e).

4. SYSTEM MODEL

The set-top box used was a Scientific Atlanta – model KMM3210. This equipment has the Microsoft Mediaroom™ operating system installed and a built-in browser with Tasman layout engine. The client module of the WeOnTV system was developed as a browser-based application optimized to run under

[1] The relevance of using these different ways of communication was studied by several authors. 2BeOn users predicted text to be less distractive than voice chat would be [2]; following studies carried by Geerts [5] and Tullio and Harboe [10] also analyzed these pros and cons with the later study providing hints towards the use of textual communication being more compatible with TV viewing.

this specific engine. Various restrictions were found, mostly related to the memory allocated by the browser for running applications (~ 8% of a total of 32MB) as well as rendering limitations.

The core communication module of WeOnTV was created with the purpose of functioning as a XMPP client. Its development was strongly oriented towards server-side connections management considering the browser's scripting restrictions.

The system's architecture consists of three main modules: i) client-side application; ii) server-side user connection manager and iii) management web application (myWeOnTV).

The modules were developed based upon different programming languages, such as XHTML, PHP and ECMAScript as reflected in Figure 3. It relies on HTML with the database interaction layer based on PHP and MySQL programming. JavaScript (AJAX) to achieve asynchronous data retrieval is also used.

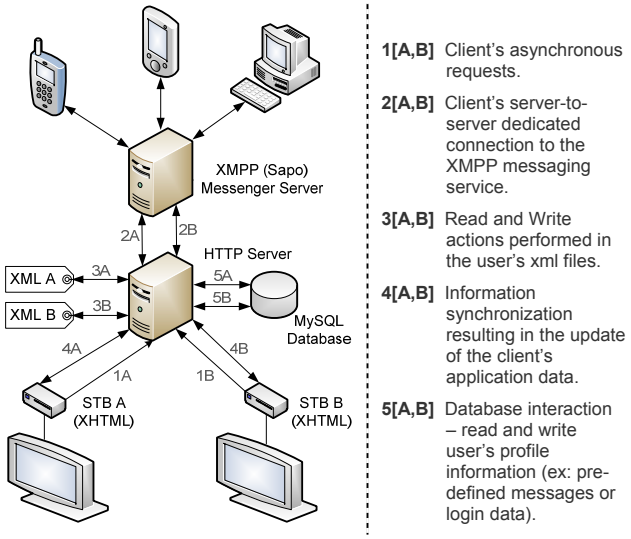

Figure 3 – WeOnTV system model

4.1 Information Update and Retrieval

Considering the browser's limitations in script execution, an optimized multiple script invocation procedure was implemented in order to achieve asynchronous updates.

Javascript's XMLHttpRequest(), when used in ECMAScript type scripts, caused the application to stop responding. Thus, the content update methodology relies on the use of an XHTML "Object" element, responsible for loading the PHP processes through the ECMAScript controlled "data" property.

Each application area contains two "Object" type elements: one dedicated to specific content updates caused by user interaction (such as a change on the user status or message sending requests) and another one focused on coordinating the update process of the various areas (i.e.: buddy's status update, message reception, ...).

To implement the automatic updating process, a specific interval was set for the application, defined by ECMAScript, at which different server-side (PHP) routines are invoked returning the data as a preformatted ECMAScript routine. Once loaded, this routine is executed. Given its client-side nature, the same script can trigger all the necessary changes on the information displayed on screen and also interact with any other ongoing method.

The system can be configured to ensure messaging communication based on XMPP server accounts. The adopted service is SAPO Messenger, the main Portuguese messaging service.

5. INTERFACE DESIGN

Never questioning the significance of the GUI and HCI upon the design [4] of this application, the short and technical nature of this paper indulges only a brief approach of this matter, underlining the crucial constraints and subsequent solutions.

5.1 CSS Specifications and Profiles

The Tasman layout engine is mostly compliant with W3C's specified CSS1 properties and CSS2 selectors. Given the fact that the browser would be running on a television set, the CSS TV Profile also applied to this project. Its style properties were acknowledged by cross-referencing the TV Profile with Tasman's compatible specifications[2].

5.2 Layout in browser-based iTV applications

This particular development setting conveys overlay constraints led by the TV stream's high stack order in the object hierarchy. In order to cope with this restriction, three specific measures were taken at hand: i) the definition of the two aforementioned layout modes (TV and Chat) focusing on different interaction purposes, ii) the dynamic display of submenus and iii) the use of the tabbed document interface model to better seize the info display areas.

TV mode's quick-reply options ("Yes", "No" or "Go to Chat") are dynamically displayed over the selected message without further interference with the remaining page objects; the user status submenu also takes advantage of this CSS and JavaScript DOM manipulation mash-up method.

The Chat mode makes the most of the tabbed browsing method, providing tabs not only for each ongoing conversation but also for each message reply method – each pre-written message category has its own tab, as well as the emoticon, free text input and channel recommendation areas.

Albeit Tasman's customizable styles for dropdown menu and list objects, these elements were still poorly solved on screen. The CSS "overflow" property provided a reasonable solution, enabling the confinement of any list within a bounded space, triggering the scroll functionality in a stable, non obstructive manner whenever the list items exceed the given area.

5.3 Stay focused

The system's slow response to actions triggered by the remote control placed some emphasis on visual feedback requirements, mostly solved through the CSS2 focus selector. Alas, this method requires further enhancement, whether by stronger visual aids or by audio feedback.

As some actions change the way the page is visually rendered (commuting some elements visibility), the browser automatically places focus on the next interactive element even if it is not the closest nor most logical object to focus on during the interaction

[2] http://en.wikipedia.org/wiki/Comparison_of_layout_engines_(CSS).

process. Forcing the focus on preferable elements through the use of JavaScript stands as a convenient solution.

6. EVALUATION PROCESS

Although the planned WeOnTV field trial was not yet conducted, the application was already tested in the commercial IPTV solution MEO in a stable way. Feedback gather during SAPO Codebits contest, where some of the 500 participants (mainly ICT developers and students) had a chance to interact with the application, was very positive and some details that can lead to the improvement of the application have been identified.

Later usability tests were performed with emphasis on ISO/IEC 13407. The tests were conducted in a controlled laboratory scenario. It involved 5 participants with different levels of digital literacy (who according to Nielsen [11] can detect 80% of the application's usability problems). The observation was direct and participative. The used testing methods included: i) Cognitive Walkthrough (in order to complete given tasks, the users were invited to explore the interface); ii) Contextual Inquiry (took place when unexpected actions were taken by the user) and iii) Thinking-Aloud Protocol (the subjects were free to share their thoughts while they browsed through the application).

The data retrieval was controlled through observation checklists, a written inquiry (applied after the session) and audiovisual recording of the TV screen interaction[3].

Preliminary analysis of the results gather so far allows the research team to identify some hints. Considering interface related issues, all the participants believed the icons were totally clear (60%) or well clear (40%) and had proper perception of the information in the screen. Some problems were identified in navigating between contacts in the buddy list. When considering the preferred modes (TV or Chat) most of the participants considered that they will give more use to TV mode (80%). Combined with the results from a question that targeted the size of the video display, where most users considered it just about the minimum necessary size, we can predict that users prefer interaction modes where the TV screen gets primacy from other information.

Participants were also asked about their desire to use such an application and built-in features. The results show that all participants would use the application. They showed greater preference for pre-defined messages compared with free written messages. The ability to personalize pre-defined messages on the web was also appreciated. Other features like channel recommendation or quick answers got high results.

Finally based on the observation checklists' analysis we can observe: i) a tendency to use the standard remote control keys to access each area (e.g. menu and coloured keys) instead of a more PC based interaction paradigm - tabbing between areas; ii) that users tend to repeat each action because of the application's response time and the lack of visual feedback. This problem was also expressed in the inquiries as an important issue to improve in the application and iii) that interaction paradigms, like triple-tap text input were very well used by participants.

[3] For images of the performed evaluations tests visit: http://labs.sapo.pt/ua/socialitv/ .

7. CONCLUSIONS

Developing a Social TV application for a commercial IPTV platform proved to be a challenging work. The STB hardware and software limitations compelled the team for alternative technical implementations and mashups. These limitations along with the usual constraints of designing for television also led to different experiments concerning the information layout and interaction patterns, resulting in some directions to other iTV developments over regular browser based set-top boxes.

The tests carried so far have revealed positive reactions towards the application related with the majority of the adopted interface solutions, the implemented social features, and the willing to have it available at the commercial public set-top boxes of MEO. Positive feedback from possible users was also obtained concerning the integration with a public IM service and the ability to interact not only in a "set-top box" to "set-top box" way but also in a "set-top box" to "PC/mobile" and vice-versa.

8. ACKNOWLEDGMENTS

Our thanks to the other WeOnTV research fellows P. L. Almeida and J. Teixeira. Also thanks to the PT In and labs.sapo/UA teams.

9. REFERENCES

[1] Abreu, J. and Almeida, P. 2009. From 2BeOn results to new media challenges for Social (i)TV. In: Social Interactive Television: Immersive Shared Experiences and Perspectives. Geerts, D., Chorianopoulos, K., P., Cesar, P. (eds). IGI Press, USA, 225-246.

[2] Abreu, J., Almeida, P., and Branco, V. 2002. 2BeOn: interactive television supporting interpersonal communication. In Proceedings of the Sixth Eurographics WS on Multimedia 2001 (Manchester, September 08 - 09, 2001). J. A. Jorge, N. Correia, H. Jones, and M. B. Kamegai, Eds. Springer-Verlag New York, NY, 199-208.

[3] Baillie, L., Fröhlich, P. and Schatz, R. 2007. Exploring Social TV. In Proc. ITI 2007: 215--220.

[4] Cesar, P., Chorianopoulos, K., and Jensen, J. F. 2008. Social television and user interaction. Comp. Entertain. 6, 1 (May-08), 1-10.

[5] Geerts, D. 2006. Comparing voice chat and text chat in a communication tool for interactive television. In Proceedings of the 4th Nordic Conference on HCI: Changing Roles (Oslo, Oct. 14-18, 06). A. Mørch, K. Morgan, T. Bratteteig, G. Ghosh, and D. Svanaes, Eds. NordiCHI '06, vol. 189. ACM, New York, NY, 461-464.

[6] Harboe, G., Massey, N., Metcalf, C., Wheatley, D. and Romano, G. 2007. Perceptions of value: The uses of social television. In Proceedings of the Euro ITV Conference 2007, LNCS, 116-125.

[7] Jones, M. 1975. The Social Impact of Interactive Television. Communications, IEEE Transactions on. Volume 23, Issue 10, Oct 1975, 1156 – 1163.

[8] Lull, J. 1990. Inside family viewing: Ethnographic research on television's audiences. London: Routledge.

[9] Oehlberg, L., Ducheneaut, N., Thornton, J. D., Moore, R. J. and Nickell, E. 2006. Social TV: Designing for Distributed, Sociable Television Viewing. In Proceedings of EuroITV Conference, 25-26 May 2006. Athens, Greece.

[10] Tullio, J., Harboe, G., and Massey, N. 2008. Investigating the Use of Voice and Text Chat in a Social Television System. In Proceedings of the Euro ITV 2008 (Salzburg, July 03-04, 2008). M. Tscheligi, M. Obrist, and A. Lugmayr, Eds. Lecture Notes In Computer Science, vol. 5066. Springer-Verlag, Berlin, Heidelberg, 163-167.

[11] Nielsen, J. 2000. Why You Only Need to Test with Five Users. In Jakob Nielsen's Alertbox, March 19, 2000. Retrieved February 4, 2008, from http://www.useit.com/alertbox/20000319.htm