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+TV4E: Interactive Television as a support to push information about social services to the elderly

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Abstract

Ageing is a global phenomenon that in the last decades has led to a significant inversion of the ageing pyramid in the developed societies. This fact has been introducing deep changes in societies leading to increase attention towards seniors' concerns and needs and has leverage the appearance of multiple gerontechnologies. In this context television as an enabler technology is a promising option for the elderly, enabling to serve this population segment through features such as distance help, support of services that promote social interaction or provision of medical information. Despite the important investments that have been done by the State for the dissemination of such services, the existent technical solutions are mostly web-based, implying a "pull-oriented" activity rather than the "push-oriented" informative dynamic that most seniors are familiarized. In this paper we discuss the key set of features of an iTV application, aiming to enrich the television experience with interleaved informative content personalized to the user's profile. Also a special attention is given to the state of the art in the field of gerontechnologies enabled by interactive television systems in order to identify the gaps in features related with public and social services information spreading.

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1. Introduction

Nowadays the aging of developed societies is leading to an inversion of the ageing pyramid. In Portugal elderly population is increasing consistently as confirmed by the Portuguese National Institute of Statistics [6] with the number of people over 65 years old being higher than children under 14. Concerned with this deviation, different stakeholders are increasing their attention to senior's concerns and needs and developing multiple gerontechnologies. Many of these technologies intend to promote senior's quality of life by increasing the feeling of belonging to a community, enlarging their social networks and improving the well-being and literacy levels, as it will be showed in the next section of this paper. Despite not being a gerontechnology *per se*, television has an interesting potential in this purpose. Actually, TV has been, not only an enhancer of information acquisition, but also one of the main agents of socialization, by promoting conversations between people. In addition, and because the television is the nearest technology for elderly (Portuguese elderly spend more than 21 hours per week in front of their TV sets) [25], it can be an important technological device to serve this population segment, through features such as distance helping, support of services that promote social interaction on collective viewing, provision of medical information or information dissemination about public services. There are some examples of approaches to publicize this type of information, but most of them imply that the user search for the information (a "pull-oriented" activity from the user's perspective) rather than simply get that information, in a "push-oriented" dynamic that most of seniors would probably prefer. In the current scope, the elderly are commonly in a disadvantaged position for not knowing how to have access to public services or which sort of assistances they can benefit from (e.g. medication discounts, medical appointments, etc.). This usually leads to a high informational dependence of their caregivers' network. In the light of the aforementioned context, in this paper we aim to discuss the set of features of an iTV application targeted to the Portuguese senior population, taking in consideration their specific issues, needs and expectations in the use of public services, like the public social security and tax office. Considering this scenario we propose to develop an interactive television (iTV) platform (+TV4E) that should allow the enrichment of the television experience, by interleaving the normal broadcast with informative spots related to public and social services edited accordingly to the user's profile (age, geographic localization, clinical condition, etc.). To exemplify the central idea of the solution, one can consider the following use case centered on a change on the incomes tax system (e.g. people over 66 years old become eligible for a discount by delivering a declaration). The information about this event will trigger a system responsible for the automatic creation of a brief video spot explaining the actual changes in the tax system, that will be sent to seniors viewers while they watch TV in the following way: a) over the TV content a warning message appears stating that an informative content (the brief video spot) will be presented shortly; b) if the user does not cancel this content presentation, that is to say, if he does not press a special key in their remote control to cancel the forthcoming information content, the current TV broadcast will be paused and temporarily replaced by the informative video spot. This functional dynamic has some similarities with the Radio Data System (RDS) [23] although with differences in: i) the media support (in this case the TV set); ii) the context aware nature of the service, since the informative contents are adjusted to the user's profile and informative needs; and iii) the continuous flow of the experience (since the TV program is resumed just after the end of the informative video spot - at the exact moment where it was interrupted).

2. State of the art

The falling of birth rate and increasing life expectancy of populations is an unavoidable phenomenon in today's developed societies. The socio-demographic implications and changes in the lives of individuals resulting from the aging process [5, 29] – often associated to financial difficulties, loneliness and isolation from younger generations [18] – brought up new concerns regarding the role of seniors in the XXI century society. The "third age" is no longer considered as a euphemism for loneliness. It now comprises personal fulfillment, development of new life habits and a bigger investment in time spent with family and friends [27], while "quality of life" becomes a concept that overcomes the physical and cognitive well-being and extends to the maintenance of social relationships, autonomy and functional capacity [30, 23]. It is important for seniors to have the opportunity to engage in pleasant activities and to interact with others in a regular basis [12]. The use of Information and Communication Technologies (ICT) by seniors can bring improvements to their quality of life, namely in terms of autonomy [11]. In this context several projects were developed in order to foster the creation of online communities and to provide seniors regular

opportunities to interact with others. In the Portuguese context, the SEDUCE project [12], aimed to assess the impact of the use of ICT in older adults' emotional variables. The "European Year of Active Ageing and Solidarity Between Generations 2012" Portuguese action plan, developed online communities to be used for individuals aged over 50, being the following projects aligned to this scope: "IdadeMaior" and "TIO" – Terceira Idade Online". Other initiatives, either nationally or locally promoted, are being developed in order to provide a stronger connection between seniors and the community through ICT, thus reducing isolation and providing the extension of their social support networks [12, 18, 14]. Most digital interfaces were not designed taking in consideration the sensory, physical and cognitive constraints of seniors [13, 22]. Physical challenges to using technology, skeptical attitudes regarding the benefits of technology, complex security settings and even the complexity of basic online services related with social security, finances, or health services emerge as potentially dissuasion factors for the use of ICT by seniors. In some extent, this situation may contribute for the seniors' info-exclusion [29]. When working on strategies designed to promote the access of information by seniors, it is important to understand them and be aware of their information consumption habits. In Portugal, 99% of the Portuguese households have television, with seniors watching around 21 hours of television per week [25]. In this scenario, television appears as an excellent intermediary familiar device between services and the older population, easing the difficulties related with dealing with technology.

Interactive Television (iTV) has a great potential to provide seniors with access to information, health and well-being services in their own homes [3]. In Germany, the "SmartSenior" project designed and implemented smart services for seniors that were integrated in the home TV and media system, in order to help them in their everyday lives. In the health field, in the scope of eCAALYX project [10], it was developed a TV-based interface for patients to keep track of their health conditions and to promote interaction between the seniors and caregiver's networks. Also in the health field, the CogKnow project [6] aimed to help seniors with Alzheimer through prototypes that included audio and visual reminders and guidance messages on TV. In the safety field, the T-Asisto project (Spain) [19] integrated tele-assistance services with television using DTT technology; it was possible to receive alerts from gas, smoke, fire, movement sensors; and to detect emergency calls from the users. In Portugal, the team of "iDTVsaúde/iDTV-Health" project [8] [2] developed an application – also available through smartphone – for seniors, where they can create an individual profile and access videos about diabetes, local hospitals, how to live with the disease. In a study conducted by Batista *et al.* [2], the research team found out that when presented through television, the application had a higher rate of acceptance by seniors. In this framework is worth to refer the "iNeighbour TV" project, where it was developed and tested in a field trial an iTV application to trigger medication reminders; to enable social interaction over the TV content; and to access information regarding services such as pharmacies, weather and community events [1]. The relevance to stress the "iNeighbour TV" comes from the fact that it succeeded in implementing an iTV application with a smooth integration with the reception of TV programs. As it will be seen, this is a key differentiator factor. Despite all these efforts to enhance the life quality of elderly throughout iTV, there are a few projects using iTV applications to inform about social and public services.

The governmental entity responsible for the taxes processes in Portugal (*Autoridade Tributária e Aduaneira*) released in YouTube some videos to explain how to fill in the taxes forms. Nevertheless, these videos were build in a hermetic language and they are only accessible throughout YouTube platform. Also Portuguese companies "Montepio Bank" and "UWU Solutions" created videos about how to build taxes declaration in Portugal. Despite these efforts, elderly have to search for the information in the Internet, and very frequently they do not know how to get it. In this context, a push-oriented approach is much more effective than a pull-oriented one.

3. Research problem and motivation

Portugal, like other developed countries, has an increasingly ageing population. Additionally, the Portuguese senior population in average has low literacy and is very dependent from their caregivers [5]. These problems lead to other difficulties, such as the access to information of specific domains like public and social services. Due to physiological and cognitive effects of ageing, providing an efficient way for the elderly access this type of services is not an easy mission. As mentioned before, the use of information and communication technologies by seniors may carry some improvements in their quality of life. Television, in particular, has the potential to increase wellbeing and literacy levels. For this reason it also offers attractive opportunities for the provision of information related to social and public services, helping to solve the explained problem. Actually, projects and initiatives in this research area are essentially

centered on network communities and health applications; opening up an interesting opportunity to research how an iTV solution can be developed to inform seniors about social and public services assisting them to manage their financial and social dynamics. This iTV application can run on set-top boxes and be based on a push-oriented approach, interleaving informative contents (about public and social services) with the television content. These informative contents should consist of a combination of several types of media (sound, video and text) and they should be built considering the user's profile. As we aim to maintain the continuous flow of the TV experience, the functional dynamic of the system should be based on the following steps (Figure 1): i) based on the user's profile an AV content building (AVCB) module selects (from different sources of information) what is new and relevant to be notified; ii) the AVCB module automatically creates an informative video spot; iii) the iTV application generates a subtle message displayed over the TV image notifying the user that an informative video spot is going to appear after x (5 to 10) seconds – in addition the message also warns the user that he can avoid the video spot by simply pressing a dedicated key in his remote; iv) if the user do not take any action, after the announced period the TV content is replaced by the informative video spot; v) when this reaches its end, the TV content is resumed - right at the exact moment where it was interrupted. In addition to the information displayed on the TV set, the iTV application should have the ability to allow the senior to receive additional content on the same topics through other platforms or services, for example via e-mail. As identified in state of the art section, a research study in Portugal, in this area, will have a great potential, since there is

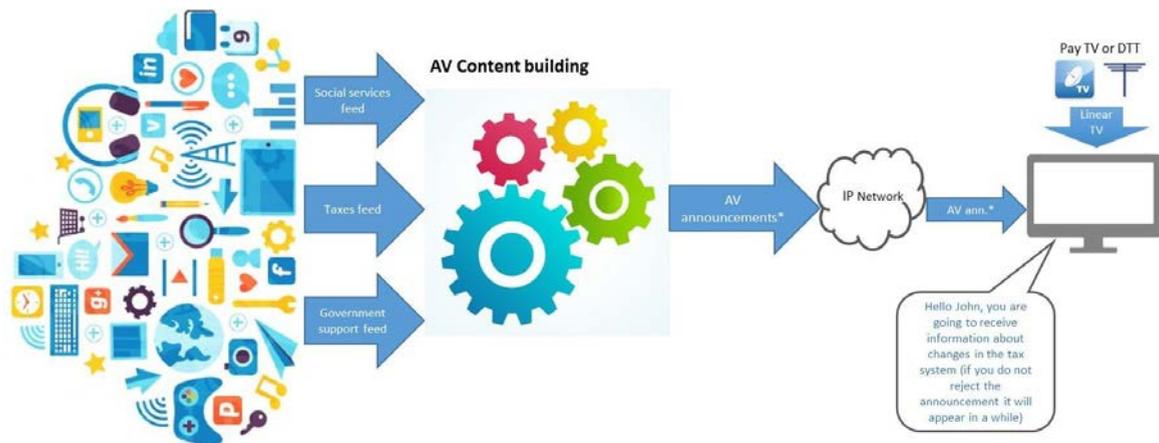


Fig. 1. Content construction and delivery

a growing number of older people and there is a need for the construction and implementation of social policy measures appropriate to the resolution of the problems and difficulties of this group. Currently this fact gains particular relevance because in Portugal these practices are not sufficient, and there is a lack of a true consolidation of institutional practices centered in the elderly and in their social, economic and familiar background. Related to this situation, the elderly are the segment of population who watches more television considering the act of watching TV their main leisure practice.

4. +TV4E: Interactive Television as a support to push information about social services to the elderly

As mentioned before, senior citizens bring to any ICT project several demanding challenges. In this scenario, the development of an iTV-based solution provides advantages, by using a well-known (to seniors) media device that may support elders to remain active and/on in their community. Considering this fact, iTV can work as a basis for the development of an information platform about public and social services, which promotes a better understanding of such services by the senior population. +TV4E is a project proposal that intends to take advantage of the proximity between elderly and TV to deliver information about public and social services in a “push oriented” approach. Figure 1 depicts a generic solution architecture. As it is possible to understand from the figure, in the development stage of this architecture, a set of technological and societal challenges will arise. First, it is necessary to develop a script able

to collect information about social and public services. This script should be able to collect data from governmental sites and build a TV video content to be delivered to elderly (Figure 1). The development of this script will have to consider: 1) guidelines to build AV content related with social services tuned to the elderly; 2) a technical solution to gather user's profile information in order to create adjusted content; 3) a technical solution to perceive if elderly users see the AV content in order to adjust new content creation. From studies like [9,14,27,32] the development team can get important clues about how this script would be build. Along with the solution for the script of content creation it is necessary to define which technology should be used to deliver the AV content. As depicted in Figure 1 it is necessary to have an IP connection to carry the content about public and social services to each user. Thus, it is required users to have a set-top box with an IP connection that decodes "Digital Video Broadcasting –Terrestrial" or "Hybrid Broadcast Broadband TV" or an IPTV broadcast and store the AV content and user's selections. To get the solution to this issue it is necessary to make a detailed study about TV broadcasting in Portugal and understand senior population needs. The IP connection between Set-top boxes and +TV4E content creation infrastructure will allow to enhance the content creation, like adjusting it to the user's profile. To solve the identified problems +TV4E research work should be conducted in order to achieve the following outcomes: i) a detailed report specifying the problems of the Portuguese senior population relating to public and social services access; ii) a set of guidelines for designing informative iTV applications about public and social services (e.g.: the best way to interpolate informative contents, the frequency for the transmission of TV contents interruption, etc.); iii) a set of guidelines for presenting the informative contents about social and public services (e.g.: the best format and/or the best format combinations -audio, video and text - to deliver this type of contents through TV, etc.); iv) a fully functional iTV application, targeted to seniors, for delivery information about social and public services, which meets the created reports and guidelines; and v) a research field trial to understand the effectiveness of the platform, and, if possible, enhance it.

5. Final remarks

The main goals of the project, detailed in this paper, seems to be in line with the concerns that rises from the evolution of ageing of the developed countries. The proximity that seniors have to the TV set can be used as catalyser of system usage thus contributing for the promotion of quality of life of this target audience. Being the project goals achieved, it is worth to say that Portuguese seniors will have the opportunity to be better informed about, for example the public services that they can use, changes in taxes formulas, how to access to home of elders, etc., as the iTV platform will allow them to be informed in real time. This information will be sent to seniors while they watch TV in a graphical overlay (a warning appears stating that an informative content will shortly be presented). The user can cancel this content presentation, but if the user does not press a dedicated remote control key, it will appear replacing the television content for a few moments. As it is possible to see from the state of the art analysis, the project concept is completely new in the national and international iTV panorama, as it is supported in the concept of a push system that informs seniors, enhancing the possibility of this target audience to stay informed. The research team considers that this iTV platform will be an important tool to empower seniors, helping to integrate them into a more inclusive and informed society. The technical problem addressed in this project is somehow easy to solve, being the main issues related with the automatic construction of personalized audio-visual content and the way it can be delivered to the senior viewers.

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References

1. Abreu, J., Almeida, P. and Silva, T., iNeighbour TV:A Social TV Application to Promote Wellness of Senior Citizens. Information Systems and Technologies for Enhancing Health and Social Care, Chapter: iNeighbour TV- a social TV application to promote wellness of senior citizens, IGI (Eds), pp.1 -19, 2013

2. Baptista, A., Á. Sequeira, I. Veríssimo, C. Quico, M. Cardoso e M. Damásio. "Using Digital Interactive Television to Promote Healthcare and Wellness Inclusive Services", *Digital Human Modelling and Applications in Health, Safety, Ergonomics, and Risk Management. Healthcare and Safety of the Environment and Transport*. V. Duffy, Springer Berlin Heidelberg, 8025: 150-156, 2013
3. Blackburn, S., Brownell, S. & Hawley, M. S., A systematic review of digital interactive television systems and their applications in the health and social care fields. *Journal of Telemedicine and Telecare*; 17, 168–176, 2011
4. Breitenberger, P., *Probes in Design Research: Frameworks and Guidelines for Designing, Applying and Evaluating Probes*. 1st edition. Germany: AV Akademikerverlag, 2013
5. Carrilho, M., & Gonçalves, C., Dinâmicas Territoriais do Envelhecimento: análise exploratória dos resultados dos Censos 91 e 2001. *Revista de Estudos Demográficos*, 36, 175 -192, 2004
6. Carrilho, M., *Revista de Estudos Demográficos*, 55, 2015
7. CogKnow. Living independently with dementia. Retrieved January 21th, 2015, from <http://www.cogknow.eu>
8. Comunicação em Saúde: avaliação de conteúdos audiovisuais lineares e aplicações interactivas sobre saúde e bem-estar. LUSOCOM 2014, Vigo, Spain. 11–12 de April 2014. Retrieved January 20, 2015.
9. Doman, K., Tomita, T., Ide, I., Deguchi, D., Murase, H., Event Detection based on Twitter Enthusiasm Degree for Generating a Sports Highlight Video. In *Proceedings of 22nd ACM International Conference on Multimedia (ACM-MM2014)*, pp.949-952. <https://dx.doi.org/10.1145/2647868.2654973>, 2014
10. eCAALYX. Enhanced Complete Ambient Assisted Living Experiment, Retrieved January 20th, 2016, from <http://www.ecaalyx.org/ecaalyx.org/index.html>
11. Comissão das Comunidades Europeias 2007, *Envelhecer bem na sociedade da informação*. Retrieved January 15, 2016, from http://www.umic.pt/images/stories/publicacoes200710/com2007_0332pt01.pdf, 2007
12. Ferreira, S., Veloso, A., Mealha, O., Sociabilidade online e os participantes seniores. In *Proceedings of the I Congresso ISKO Espanha e Portugal / XI Congresso ISKO Espanha, 2013–01–01*, ISBN 978-989-8648-10-5, 1133-1155, 2013
13. Gregor, P., A. Newell e M. Zajicek, Designing for dynamic diversity: interfaces for older people, *Proceedings of the 5 int. ACM*, 2002
14. Jiang, W., Cotton, C., Loui, A., Automatic consumer video summarization by audio and visual analysis. In *Proceedings of International Conference on Multimedia and Expo (ICME)*. Pages 1-6. <http://dx.doi.org/10.1109/ICME.2011.6011841>, 2011
15. Koçak, A. e B. Terkan.. "Media use behaviours of elderly: A Uses and Gratifications Study on Television Viewing Behaviors and Motivations." *GeroBilim - Journal on Social & Psychological Gerontology*(1), 2009
16. Krueger, R. and Casey, M., *Focus groups: a practical guide for applied research*. 5th Edition. California, USA: SAGE Publications, 2014
17. Lowdermilk T., *User-Centered Design: A Developer's Guide to Building User Friendly Applications*. 1st ed. California, USA: O'Reilly, 2013.
18. Martins, R. (2008). *Ser idoso hoje*. Instituto Politécnico de Viseu. Retrieved January 18, 2016, from <http://repositorio.ipv.pt/handle/10400.19/358>
19. Net2u, Aragón, I. T. d., Aragonesa, S. B., Investrónica, S. A. I., & Quavitae, M. (2008). *TAsisto, Desarrollo de una plataforma de servicios interactivos para la teleasistencia sociala través de televisión digital terrestre*. Retrieved 06-3-2012, from <http://tasisto.net2u.es/servicios.html>
20. Newell, A., J. Arnott, A. Carmichael e M. Morgan, *Methodologies for involving older adults in the design process*. HCI International 2007 Conference Beijing, China, 2007
21. Obrist, M., R. Bernhaupt e M. Tscheligi, *Users@Home: Implications from studying iTV*. 20th International Symposium on Human Factors in Telecommunication, Sophia Antipolis, France, 2006
22. Pereira, L., Abreu, J. Alvelos, H., The focus' behaviour in iTV interfaces versus its users' expectations: a complex dialectic for elders. In *Proceedings of the 3rd International Conference of Integration of Design, Engineering & Management for Innovation*. A.A. Fernandes, R.M. Natal Jorge, L. Patrício, A. Medeiros (Eds) Porto, Portugal, 4-6th September 2013
23. R, Deepak, G. Bhavani, "Health monitoring using Radio Data Systems (RDS)," *Communications and Signal Processing (ICCSP)*, 2015 International Conference on, Melmaruvathur, 2015, pp. 1748-1752, doi: 10.1109/ICCSP.2015.7322821
24. Rice, M. e A. Carmichael, Discovering older adults' user perspectives on undefined TV applications. 6th European Conference on Interactive Television, Salzburg, Austria, 2008
25. Rosa, M., *Os Reformados e os Tempos Livres*, bnomics, 2015
26. Seniores e Idade Maior. *Comunidade Online para os 50+*. Partilha de fotos, Vídeos, Grupos e Blogs. (2015). Retrieved January 26th, 2016, from <http://www.idademaiores.net/>
27. Sgarbi, E., Borges, D., Structure in Soccer Videos: Detecting and Classifying Highlights for Automatic Summarization. In *Proceedings of 10th Iberoamerican Congress on Pattern Recognition (CIARP 2005)*. Lecture Notes in Computer Science, Volume 3773, pp 691-700. https://dx.doi.org/10.1007/11578079_72, 2005.
28. Silva, L., From old age to third age: the historical course of the identities linked to the process of ageing. *História, Ciências, Saúde - Manguinhos*, 15(1), 155-168, 2008
29. Verona, S. M., Cunha, C., Pimenta, G. C., & Buriti, M. A. (2006). Perceção do idoso em relação à Internet. *Temas em Psicologia*. Sociedade Brasileira de Psicologia, January 19, 2016, from http://pepsic.bvsalud.org/scielo.php?pid=S1413-389X2006000200007&script=sci_arttext
30. Wilhelmson, K., Andersson, C., Waern, M. & Allebeck, P., Elderly peoples' perspective on quality of life. *Ageing and Society*, 25 (4), 585-600, 2005
31. Wysocky, R., *Effective Project Management: Traditional, Agile, Extreme*. 7th Edition. Indianapolis, USA: Wiley, 2014
32. Yang, J., Huang, Y., Tsai, C., Chung, C., Wu, Y., An Automatic Multimedia Content Summarization System for Video Recommendation. *Educational Technology & Society*, 12 (1), 49–61. <http://eric.ed.gov/?id=EJ833416>, 2009