Artur Lugmayr, Thomas Risse, Bjorn Stockleben,
Juha Kaario and Bogdan Pogorelc (eds.)

Proceedings of the 3rd Semantic Ambient Media Experience (SAME) Workshop in Conjunction with Ami-10

Malaga, Spain, 8th November 2010

Tampere University of Technology (TUT)
Tampere, 2010

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Preface

Since three years the Semantic Ambient Media Experience (SAME) workshop series attracts delegates and presenters from many fields including education, business, government, technology, and media to discuss and shape ambient media. As the SAME workshop series is a think-tank for creative thinkers, it's a special workshop format which aims at team-work and working together on envisioning the future of ambient media. This year's call for position papers led to 9 contributions (1 invited paper), which were published within the conference proceedings after a double-blind review process.

The SAME workshop series led to the establishment of the Ambient Media Association (AMEA), where several workshop results and outcomes can be found online (www.ambientmediaassociation). In previous years, the workshop resulted in two special issues published by Springer-Verlag:

- Lugmayr, A.; Risse, T.; Stockleben, B.; Kaario, J. & Laurila, K.
  Special issue on semantic ambient media experiences
  Multimedia Tools and Applications, **2009***, 44*
- Lugmayr, A.; Risse, T.; Stockleben, B.; Kaario, J. & Laurila, K.
  Special issue on semantic ambient media experiences
  Multimedia Tools and Applications, **(to be published 2010/2011)**

SAME took place in 2008 in conjunction with ACM Multimedia 2008 in Vancouver, Canada; in 2009 in conjunction with AmI 2009 in Salzburg, Austria; and this year's edition in conjunction with AmI 2010 in Malaga, Spain.

The workshop organizers present you a fascinating crossover of latest cutting edge views on the topic of ambient media, and hope you will be enjoying the reading. We also would like to thank all the contributors, as only with their enthusiasm the workshop can become a success.

Artur Lugmayr
Thomas Risse
Bjorn Stockleben
Juha Kaario
Bogdan Pogorelc

Malaga, Spain, 2010

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Call for Papers

Call for Workshop Position Papers

SAME 2010 - 3rd International Workshop on Semantic Ambient Media Experience (NAMU Series)

November, 10th-12th November 2010, in conjunction with AmI-10, in Malaga, Spain

http://www.ambientmediaassociation.org/node/56, http://ami2010.lcc.uma.es/

creating the business value-creation, vision, media theories and technology for ambient media

News
- Position paper submission date: 1st October, 2010 ----> EXTENDED TILL THE OCTOBER 17th (!)
- Submission system: http://webhotel2.tut.fi/emmi/Conferences/2010same/openconf.php
- We are aiming at an Springer MTAP special issue as result of the workshop (to be negotiated)

Call for Papers
Submissions are expected to be 2-4 pages position papers according the paper format of
AmI-10: http://www.springer.com/computer/lncs?SGWID=0-164-7-72376-0

The medium is the message! And the message was transmitted via a single distinguishable media such as television, the Web, the radio, or books. In the age of ubiquitous and pervasive computation, where the information through a distributed interlinked network of devices the question, “what is content in the age of ambient media?” becomes more and more of importance. Ambient media are embedded throughout the natural environment of the consumer – in his home, in his car, in restaurants, and on his mobile device. Predominant example services are smart wallpapers in homes, location based services, RFID based entertainment services for children, or intelligent homes. The distribution of the medium throughout the natural environment implies a paradigm change of how to think about content. Until recently, content was identified as single entities to information – a video stream, audio stream, TV broadcast. However, in the age of ambient media, the notion of content extends from the single entity thinking towards a plethora of sensor networks, smart devices, personalized services, and media embedded in the natural environment of the user. The user actively participates and co-designs media experience with his location based input. Initiatives as the smart Web considering location based tagging for web-pages underline this development. This multidisciplinary workshop aims to answer to the challenges how to select, compose, and generate ambient content; how to present ambient content?; how to re-use ambient content and learning experiences?; what is the characteristics of ambient media, its content, and technology?; and what are ambient media in terms of story-telling and art? And finally, how do ambient media create business and value? How can ambient media be integrated into business processes and strategies? Semantics plays a crucial role in the generation of ambient media content. It can be seen as the glue between the raw data and the ambient media. Therefore we are interested to see innovative ideas how data can be (semi-)automatically be interpreted and translated into media presentations. The workshop aims at a series, and at the creation of a think-tank of creative thinkers coming from technology, art, human-computer interaction, and social sciences, that are interested in glimpsing the future of semantic ambient intelligent empowered media technology.

Workshop Challenges
• How can ambient media be applied in business processes?
• How do ambient media create value and business?
• Business opportunities and strategic issues of ambient media?
• What is ‘content’ and how can it be presented in the age of ‘ubiquitous’ and ‘pervasive’?
• How to select, compose and generate ambient content?
• How to manage and re-use ambient content in specific application scenarios (e.g. e-learning)?
• What is interactivity between the single consumers and consumer groups in the ambient context?
• How can collaborative or audience participatory content be supported?
• Which methods for experience design, prototyping, and business models exist?
• How can sensor data be interpreted and intelligently mined?
• How can existing media such as TV, home entertainment, cinema extended by ambient media?

More information on the 1st International Workshop on Semantic Ambient Media Experience held in conjunction with ACM Multimedia 2008:
http://portal.acm.org/toc.cfm?id=1461912&type=proceeding&coll=ACM&dl=ACM&CFID=96753168&CFTOKEN=49706448
and more information on the 2nd International Workshop on Semantic Ambient Media Experiences held in conjunction with AmI-09 can be found http://webhotel2.tut.fi/emmi/forum/node/55

Best contributions will be compiled to a special issue following up the workshop - we aim at Springer MTAP after reviewing the quality of contributions Check also the Ambient Media Association (AMEA): www.ambientmediaassociation.org

Description of the Workshop

Topics
The following (and related) topics are within the scope of this workshop and shall act as examples:
* Supply chain management with ubiquitous computation
* eCommerce & ubiquitous commerce
* Business processes, value-creation, and opportunities of ambient media
* Understanding of the semantics of ambient content and methods for adding intelligence to daily objects
* Mobile and stationary sensor data collection and interpretation algorithms and techniques
* Context awareness and collection and context aware composition/selection of ambient content
* Creation and maintenance of meta-information including metadata and data management
* Ambient and mobile social networks, user generated content, and co-creation of content and products
* Characteristics of ambient media, its content, and technological platforms
* Ambient content creation techniques, asset management, and programming ambient media

* Algorithms and techniques for sensor data interpretation and semantic interpretation
* Applications and services, including ambient games, art and leisure content in specific contexts
* Ambient interactive storytelling, narrations, and interactive advertising
* Personalization, user models, multimodal interaction, smart user interfaces, and universal access
* Experience design, usability, audience research, ethnography, user studies, and interface design
* Business models, marketing studies, media economics, and 'x'-commerce of semantic ambient media
* Ambient interfaces (touch, gesture, haptics, biometrics)
* Management of information, knowledge and sapience in the context of semantic ambient media
* Methods for context awareness, sensor networks, and sensor data mining
* Semantic data mining and text mining for pervasive media
* Semantic models, semantic interpretation for ambient media presentation;
* Personalization and methods for locative media

The workshop aims at a series, and at the creation of a think-tank of creative thinkers coming from technology, art, human-computer interaction, and social sciences, that are interested in glimpsing the future of semantic ambient intelligent empowered media technology. We are aiming at multidisciplinary, highly future oriented submissions that help to develop the "ambient media form" for entertainment services, such as:
* case-studies (successful, and especially unsuccessful ones)
* oral presentation of fresh and innovative ideas
* artistic installations and running system prototypes
* user-experience studies and evaluations
* technological novelties, evaluations, and solutions

Important Dates
* paper submission: 1st October, 2010 ---> 17th October 2010
* notification of acceptance: 22nd October, 2010
* final papers due: 27th October, 2010
* workshop day: between 10th and 12th November 2010 in Malaga, Spain
* special issue articles due: December 14th , 2010 (to be fixed)

Target Audience
The target audience are researchers and practitioners in the field of ubiquitous and pervasive computation and its related areas. These include pervasive computation, emotional computation, content creation, ubiquitous computation, human-computer-interaction and usability experts, mobile industry, service creators, etc. Workshop participants shall have previous experience in this or related fields to be able to contribute on a high scientific level. The workshop participants will actively contribute to the development of semantic ambient media, due to a different method of workshop organization. Participants shall participate rather than passively contribute. The participants shall discuss and actively elaborate the topic and we plan to kick-off an international web-based informal forum for ambient media, which shall increase the effect of this workshop tremendously.

We strongly welcome multidisciplinary contributions coming from the media technology, business, artistic, and human experience side. Case studies (successful and especially unsuccessful), artistic installations, technologies, media studies, and user-experience evaluations are highly welcome, which are affecting the development of ambient media as new form of media. Especially visionary contributions shaping the future of ambient media are strongly welcome.

Workshop Chairs
* Artur Lugmayr, Tampere University of Technology (TUT) & lugYmedia Inc., FINLAND
* Thomas Risse, L3S Research Center, GERMANY
* Bjorn Stockleben, Univ. of Applied Sciences Magdeburg, GERMANY
* Juha Kaario, Varaani Works Oy, FINLAND
* Bogdan Pogorelc, Jozef Stefan Institute & Spica International d.o.o., SLOVENIA

Workshop Programme

Schedule

- 10:00-10:10 Introduction
- 10:10-10:30 Reflection
- 10:30-11:30 Presentation I (10+5 mins/4 papers)
- 11:30-12:30 Presentation II (10+5 mins/4 papers)
- 12:30-13:30 Food
- 13:30-14:00 Q&A in teams
- 14:00-15:00 Is&Maybe&IsNot
- 15:00-15:30 Coffee
- 15:30-16:30 Ideate
- 16:30-17:00 Presentation

Questions

- Business
  - How can ambient media be applied in business processes?
  - How do ambient media create value and business?
  - Business opportunities and strategic issues of ambient media?
- Content & the Media
  - What is ‘content’ and how can it be presented in the age of ‘ubiquitous’ and ‘pervasive’?
  - How to select, compose and generate ambient content?
  - How to manage and re-use ambient content in specific application scenarios (e.g. e-learning)?
- Interactive Design & Experience
  - What is interactivity between the single consumers and consumer groups in the ambient context?
  - How can collaborative or audience participatory content be supported?
- Models, Methods, Concepts & Frameworks
  - Which methods for experience design, prototyping, and business models exist?
  - How can sensor data be interpreted and intelligently mined?
  - How can existing media such as TV, home entertainment, cinema extended by ambient media?

Presentation I and II

- 10 minutes + 5 minutes Q&A
- Pitching of own viewpoint
- Clarify own viewpoint
- Present the key-issues of your work!
- *Presentation of the ‘flower’*

Team Q&A

- Q&A in 2 groups
- Build groups
- Get the experienced one’s on board
- Where are your weaknesses?
- Where are your strength?
- Where do you need help?
- Helping each other to fill the flower
- Goal:
  - filling of the leaves of the flower

- Quick Pitch:
  - 2 minutes/group of the filled flowers

Is&Maybe&IsNot

- 3-4 flowers as input
- What are ambient media?
- What are ambient media not?
- Where is the gray zone of ambient media?
- Criteria
  - core ‘subjects’/’objects’
  - + for points moving to AM/- for points moving AM away
  - conditions for moving to the ‘core’
  - combinations of ‘subjects’/’objects’

Ideate

- **Goal:**
  - Ambient media of the future are characterized through...
  - Our scenario of ambient media in 2030 is...
    - sketches, stories, drafts, paintings, ...
- **Presentation:**
  - present + discuss + evaluate
  - link to own project – how does the own project fit?

Consumer Perceptions of Additions to Geographic and Social Space

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Abstract. This position paper introduces a relationship between ambient media and pervasive games, and opens both fields up to an analysis with the Heuristic-Systematic model of persuasion based on the relationship between the two fields. The paper concludes with an invitation to discuss the relationship between the ambient media user experience and the kind of brand equity, as measured by the two-tiered persuasion model, that ambient media can build.

Keywords: Consumer Experience, Theory, Brand Equity, Advertising, Pervasive Games, Two-Tiered Persuasion Modeling.

1 Introduction and Proposition

"Ambient Media" is a term that is as clear as London fog on a misty day. Erik Satie (1866-1925) produced what he called "furniture music" (*Musique d'ameublement*), [1] the point of it being that it could insinuate itself into the environment. Later, Brian Eno created "Music for Airports" and is popularly credited with having coined the term "ambient music" [2]. The English language has the word "ambience" meaning; a feeling or mood associated with a particular place. In the computer- and design sciences the subfield of "ubiquitous computing" has produced many achievements where the qualities of a particular geographic place impacts a computing system. That line of work has begotten among other things pervasive games [3] and pervasive advertising [4], two fields of work that can both relate to the ambience of a particular place and create ambience for a particular place. So ambient media may be many things.

A common denominator however; may be that ambient media is media that "*is not*". It is not print, it is not radio, it is not TV. It is not the internet and it is not ubiquitous computing. What ambient media *is*, is that it is something that blends blurs and pervades itself into the users´ everyday life in ways that the breaks the constraints of classic media definitions e.g. Shannon & Weaver [5], hence opening up ambient media for analysis as a pervasive game. This position paper proposes a discussion about the consequences of understanding ambient media as a pervasive game and how that may or may not open for applying two-tiered persuasion modeling [6, 7, 8, 9, 10, 11] as a way to understand how ambient media creates brand equity and business value and what particular kinds of brand equity and business value ambient media can typically create.

1.1 Blending, Blurring and Pervading

The most significant quality distinguishing the user experience of pervasive games or pervasive advertising from other games and advertising, is the same quality that distinguishes ambient media from other media; the hybrid characteristics [3]. In ways that non-pervasive games, non-pervasive advertising and non-ambient media does not, pervasive games, pervasive advertising and ambient media has design qualities of "expansion" that takes into account the players´ and the receivers´ geographic location and the visible and humanly invisible qualities in the players and the receivers´ surroundings. Those expanded qualities can also take into account the same players and receivers´ social context. Those qualities are implemented in order to create a play and media experience that adapts and hence is in constant flux. The challenge to the user of perceiving that experience of flux, is at the core of the model this paper proposes.

2 The Heuristic-Systematic model, - Two Ways to Brand Equity and Business Value.

It has been asked that if the media is the message, - what message does ambient media tell us? [12] This paper proposes to approach the question from the angle of, - *how* does ambient media tell the consumers, that that it tells us? Therefore the fundament for the proposed workshop discussion is the Heuristic-Systematic model of cognition[6, 7, 8, 9, 10]. It states is that there are two ways in which humans perceive an experience. When we have a high need for confidence in our understanding of an experience humans process the perception of that experience through logical and conscious thinking based on a desire to take in and understand the full spectrum of characteristics of that experience. This is what is called the Systematic Route, running from first perception of the experience, through systematic processing, to decision making about what to do and feel next. In all other cases when the need for careful understanding and evaluation of an experience is less pressing; processing of an experience is done through the Heuristic Route. In those cases humans do not pay attention to any objective merits of an experience. Instead the experience is perceived and judged through a comparison with various surface characteristics of the experience compared with other experiences previously stored in memory.

The system of the heuristic and systematic judgments is a fluid continuum described in the "sufficiency principle. It states that in the human mind there is an ever ongoing tension between the tendency towards cognitive economy, making for heuristic processing and the wish to feel safe in ones´ perceptions and judgments making for systematic processing. Along the continuum lies two critical points lie; one designating perceivers´ level of actual confidence; the other indicating the level of desired confidence. Perceivers will strive to have the two points meet [9]. The Heuristic-Systematic model (and its´ "cousin" the Elaboration Likelihood Model [11]), has found considerable use in analyzing and predicting the effects of advertising. [6]. When the heuristic route to understanding is used in a persuasive situation then persuasion is easier achieved but more shallow, - when the systematic

route to cognition is used persuasion is more difficult to achieve, but when achieved deeper and more lasting. What typical characteristics of ambient media design drives a user towards one or the other end of the sufficiency continuum? We can see that the user actively participates and co-designs contextual media[12], by thinking about it. But the relationship between thought and design needs to be fleshed out.
Here is a tentative model that can be further discussed in the workshop.

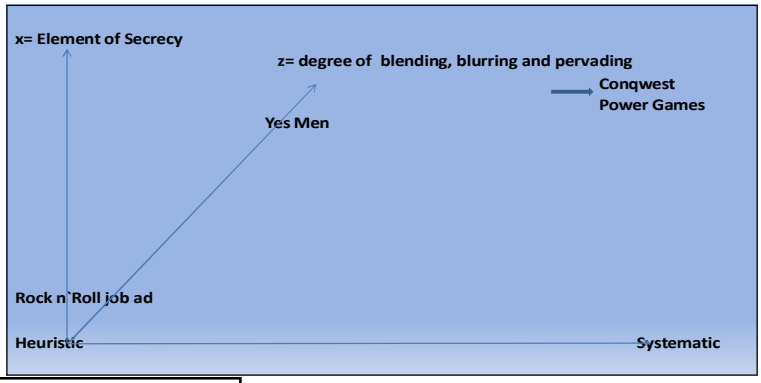

Figure 1 The Model

The model is based on three continuums. One being the sufficiency continuum (y—axis), one is the degree to which an ambient media experience leverages the element of secrecy, (x-axis), the third is the degree of blending, blurring and pervading (z-axis). The way in which an ambient media experience impacts the receiver is defined by the interaction of these three elements. The shape the active co-construction takes is defined by the interplay of these three axes of perception, (y-axis), general design, (z-axis), and particular design, (y-axis).

To flesh out the proposed model and stimulate a discussion some cases of ambient media based marketing can be plotted in.

The Power games are a series of three pervasive persuasive serious games. The three games Power Agent (2007),[1] Power Explorer (2008) [13, 14, 15, 16] and Agents Against Power Waste (2009)[2], have different game play designs, but are all based on making a households´ electricity consumption a variable in a game play system. The single channel typical of media definitions [5] has disappeared, the game is played *with* the whole house *on* its´ everyday appliances. The dishwasher becomes part of the

[1] The Power games were designed by the Energy Design Studio of the Interactive Institute, and produced by the Energy Design Studio of the Interactive Institute and the company Mobile Interaction

[2] www.aapw.se

channel. Also the player must engage the other (unwitting) household members into the game. The design informs us that the explicit aim of the Power games is to drive discussion and cognition on the sufficiency scale.

ConQwest [17] was sponsored by Qwest, a large telecommunications carrier, as a way of promoting its services. The game has elements of a treasure-hunt game play, built around finding and uploading Semacodes hidden throughout a city in a variety of formats – ads on billboards, the sides of buses and taxi tops, flyers stapled to telephone poles, posters in store windows and stickers hidden in various locations. Conqwest had clear primary and secondary targets groups and may have driven cognition on the sufficiency scale in different ways depending on wich of the the target groups experienced it.

The rock n´ roll job ad; In 2009 an advertisement from the "Arvika Rock Festival" appeared in Platsbanken an online databank for jobs run by the official Swedish Public Employment Service[3]. Platsbanken exudes connotations of being very serious in every way. However, the job ad requested seasoned rock festival visitors, having practical experience of making out in bars, listening to loud music and dancing for hours in mud. It did not take long for the Public Employment Service to take down the ad. But already the news of the bizarre ad had spread all over Swedish news media and social networks and the available "positions" had gotten several hundred applicants. The ads´ sole purpose was to spread the festivals´ brand.[4]

Yes men. In 2009 the US Chamber of Commerce called a press conference; or at least what seemed like the US Chamber of Commerce. At the press conference, an everyday common almost dour event the US Chamber of Commerce announced a series of startling turnabouts in its´ public policy.[5] This lead to immediate astonishment in the news media first via social media, and then in front page news (New York Times) and "breaking news" in TV-media (Fox News). In reality it was the political satirists the "Yes Men" that had staged the press conference playing that they were the US Chamber of Commerce. The resulting controversy has drawn some debate towards the issues of public policy that the Yes Men wished to address.

Other cases can also be plotted into the model, for example Frequency 1550 [17] , Rexplorer[18] , Red Bull Flugtag[6] and others, in order to test the model. The discussion in the workshop will be a first theoretical test of the viability of this model.

[3] http://platsbanken.arbetsformedlingen.se/Standard/Start/Start.aspx
[4] http://www.sydsvenskan.se/kultur-och-nojen/article564349/Annons-om-naken-arbetskraft-drogs-in.html
[5] http://www.youtube.com/watch?v=D67LYEacBoE
[6] http://en.wikipedia.org/wiki/Red_Bull_Flugtag

3 Discussion & Further Work

The issue that remains to model is what kind of product and what kinds of business situations are appropriate for what kind of ambient media product, as defined by the intrinsic design qualities of ambient-media design.

In marketing science issues and in particular consumer behavior issues of timing a campaign and issues of "influencing the influencer" are well researched [19].

Among our examples the Power Games are an example of a campaign aiming at "influencing the influencer" i.e. a secondary target group. The players of the game are teenagers, these do usually not hold an electricity contract. But to win the game, - the whole family including the parents must take part. The unique qualities of an ambient media product, in the shape of a pervasive game, have been designed to influence a secondary target group and drive a whole family into systematic cognition and intense discussion on a low interest topic.

The rock n´ roll job ad, was not designed to target only the ones browsing through "Platsbanken" looking for jobs, the target was the larger spin cycle it created, using the serious connotations of "Platsbanken" as the resonance for creating the spin, i.e. using society as the media platform for distributing the brand of the rock festival.[7]

But given the here presented model, how would an ideal ambient media product design look for other product situations? That is a topic ripe for discourse.

[7] The job ad was not the last attempt from the festival to use this kind of media strategy, see: http://www.dagensmedia.se/nyheter/kampanjer/article127743.ece

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Understanding Challenges in Designing Interactions for the Age of Ambient Media

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Abstract. This work builds on the existing knowledge, experience, and practices for designing interactive systems while it tries to develop an understanding of technologies and techniques that are most suited for interacting with ambient media. There are many computing trends emerging today ranging from desktop or mainframe scenarios up to mobile solutions and ubiquitous computing preferred by on-the-run consumers. Developments in processing and communication technology have been accompanied by new interactive devices and techniques needed to provide usability and make such technology advancements available and accessible for end users. We discuss in this work current practices for interacting with ambient technology with a special focus on using mobile devices and natural gestures for interfacing public ambient displays.

Keywords: human-computer interaction, ambient media, natural interfaces, mobile devices, smart phones, public displays, ambient content, gestures, novel interactions.

1 Introduction

This work addresses the interaction aspect in the new emerging age of ambient media. Next to important issues such as *content creation* (what is the message? and who creates it?), *content presentation* (how does the message gets through? what are the technologies?), and *addressability* (to whom is the message addressed? and in what context?), *interacting with ambient media content* represents an important research challenge.

As technology develops in terms of processing power, communication, and miniaturization (towards invisible and ubiquitous), new interfaces, devices, and techniques are needed in order to truly benefit of these technological advancements. This is a particularly important issue for ambient media where content is conveyed in a large variety of forms and formats. Factors need to be addressed such as usability, intuitiveness, and ease of interaction for an increasing variety of contexts, user groups, and technologies: tabletops and horizontal surfaces, remote displays, immersive displays, personal tangibles and smart devices [8]. We therefore identify several important questions to be addressed by the research community of (semantic) ambient media:

- What interfaces should be developed for interacting with ambient content?
- How can users/customers access, create, and share content?
- Which interaction techniques are the most appropriate?
- What types of interactions are most suited (passive or implicit vs. active or explicit)?
- Could natural interaction provide an answer?
- What interaction techniques are being proposed today by the research and industry communities?
- How do general interaction principles apply to semantic ambient media?
- How does semantic content help achieving fluent, effective, and efficient interactions?

2 Designing interactions in the ambient era

The questions being raised represent a considerable challenge. It is important therefore to look at how current interactions are being designed today by both research and industry and try to understand how they apply to ambient media. We focus in the following on novel interfaces which have been designed in order to accommodate the changing needs of end users as they move towards new computing paradigms (mobile, ubiquitous, and ambiental). We specifically address the two most frequent solutions being proposed today for interacting with ambient media content: the use of mobile phones and natural (gesture-based) interaction. Figure 1 illustrates the concepts being discussed.

2.1 Mobile phones and smart devices

Mobile phones seem to hold a privileged position as physical computing devices for performing everywhere and anytime (ubiquitous) interactions. The features exposed by the various operating systems together with the hardware additions such as accelerometers, touch and multitouch screens, and video cameras have transformed mobile phones into *smart* devices. The challenge is to use all these *smart* computing capabilities in order to create intuitive and user-friendly interactions [1, 10, 25].

Different ambient media require different interaction techniques to be developed and remote displays represent a common manifestation of ambient content. Mobile devices are frequently proposed in order to control information on remote displays [2]. Vatavu [21] applied remote control of ambient displays using personal mobile devices as interfaces for controlling emotional manifestation of users with the purpose of enhancing human-human interaction.

The mobile phone needs firstly to connect to the system that employs and controls the ambient display. This is usually achieved by establishing a connection to a network through Bluetooth, IR, or wireless LAN. After the device connected successfully, a number of techniques are available for interacting with the public display: using the graphic interface of some software already existing (or downloaded and installed temporarily) on the device; sending SMS messages;

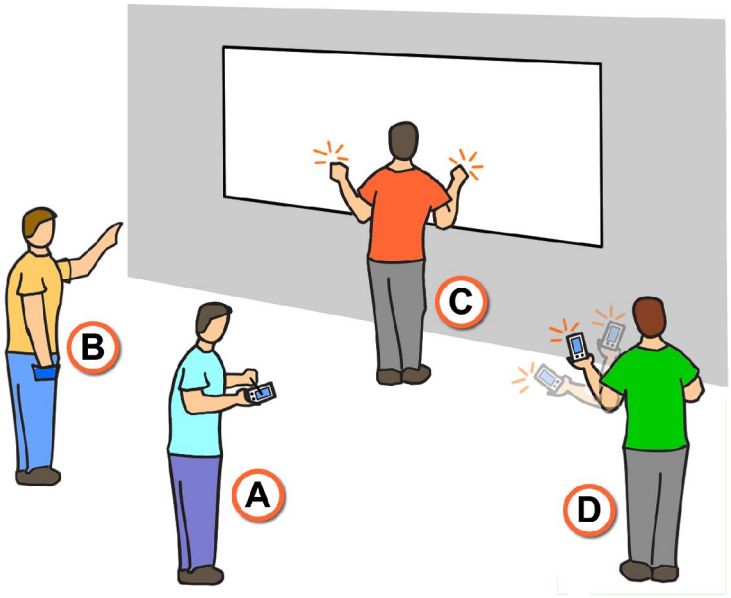

Fig. 1. Current interactions with public ambient displays: (A) using the GUI of software installed on mobile devices; (B) natural interaction via pointing and gestures; (C) touch-based interactions; (D) combining mobile phones and gesture motion commands.

or via motions and gestures captured using the sensors embedded in the device (accelerometers or the video camera) such as tilting and throwing [5].

Several studies have begun to address the social acceptability of performing gestures in public via the mobile phone [17, 18]. Rico and Brewster [18] found that the users' willingness to perform gestures is influenced by location and audience. These studies come to address the specific issues of using mobile gestures and they accompany previous research on the acceptability and perception of mobile phone use in public [3].

2.2 Pointing and gestures

Within the new paradigm of natural interaction, gestures represent the preferred way to interact with objects and to convey information, meaning, and intentions. With this respect, they are perceived as ideal interfaces by the general media due to several attributes such as familiarity, intuitiveness, and naturalness. Therefore, much research effort has been dedicated for developing acquisition technologies, recognition algorithms, and interaction techniques [7, 13, 21, 22] but also for understanding implications of gesture-based interactions.

Remote pointing and gestures have been investigated for interacting with information on large displays. Vogel and Balakrishnan [22] explored freehand pointing and clicking interaction. Also, they provided a comprehensive discussion

on the transitions between interacting with personal and public information [23]. Shoemaker et al. [19] introduced the shadow reaching technique which uses a perspective projection of the users' shadow on the remote display. The advantage is easy access over the large area of the display as well as immersive implication. Rakkolainen and Lugmayr [16] investigated interaction opportunities with novel immaterial displays. Next to remote displays, touch-enabled interactive surfaces are becoming more and more popular. A good example is Peltonen et al. [15] that describe observations from their CityWall installation with respect to parallel interaction, collaboration, management of conflict, as well as the restructuration of the public space with respect to this new interactive technology.

Wearable devices could provide an answer for future interactions with ambient media. The Sixth Sense project of Mistry, Maes, and Chang [13] lets users interact with their hands with a very large area of possible applications and scenarios (including outdoor environments). Sixth Sense is a wearable interface consisting in a video camera that detects four of the users' fingertips and recognizes their motions and actions in accordance with context. Going much further, the imaginary interfaces proposed by Gustafson et al. [7] introduce a very interesting concept. The interface exists only in the users' short memory which allows them to perform spatial interaction with empty hands and no visual feedback. The interesting aspect here is that the interface is being *imagined* hence it must be the *right* one (e.g. providing the expected functionality in accordance with context and being adapted to the user).

With respect to the industry, gesture-based interfaces are being proposed in the form of multitouch tables [4, 6, 12], free-hand gesture interfaces [6, 9], and motion sensing devices [26]. Considerable attention has been focused towards computer games in order to augment players' interactive experience [9, 26]. The Wii Remote especially has been found popular and explored for different innovatory interactions by the practitioners community [11]. Also, playful interactions have been previously proposed for ambient intelligent platforms [24].

3 Conclusions

The question of how should we interact with ambient content is still to be answered. While incredible progress is being achieved in sensing and understanding of human input, applying the current knowledge and experience in designing effective interfaces may prove a challenge for ambient media. Should the interaction be implicit, explicit, or should transitions be allowed? Which interaction techniques are the most appropriate? How does content and the interfaces to interact with content rely to each other? This position paper comes to elicit and provoke discussions on what interfaces and interaction techniques should be developed for interacting with public ambient displays and with ambient content. The community needs to address such important questions in order to assure the usability of ambient media for its customers.

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Assisted Living Solutions for the Elderly through Interactive TV

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Abstract. In this paper we are presenting application called med-reminder which will extend the functionality of existing devices providing interactive TV and help to increase the quality of life for the elderly. Med-reminder application is used for reminding people to take their medicines correctly and on time or to call a relative or medical person in an emergency situation. Since the graphical user interface was adapted for the elderly, med-reminder is easy to use without previous training. For evaluating the graphical user interface, navigation and general usability of the application, and hence identification of key aspects that increases adoption rate of assisted living applications among the target population a methodology for usability evaluation study was designed and presented in the paper.

Keywords: Interactive TV, reminder, usability evaluation, elderly

1 Introduction

Increasing life expectancy and declining fertility are the main reasons for the population ageing in most regions of the world [1]. Demographic, structural, and social trends tend towards increasing number of elderly people and single households [2]. An increasing proportion in the older ages can dramatically affect society's political, economic and social structures. Significant changes are necessary in order to remain these structures effective [3].

The use of information and communication technologies (ICT) in assisted living solutions is implementing new methods of preventive care, diagnosis and treatment [4, 5]. Conducted studies show that elderly people spent great share of their waking time watching television (TV) [6]. This is an important opportunity for the assisted living solutions which are capable of adapting interactive TV systems to the needs of an ageing population while keeping them sustainable in societies with smaller workforce [7]. In our research we have analyzed various user studies [3] and suggested how to extend the functionality of existing devices providing interactive TV with interactive applications that will increase the quality of life for the elderly and people with special needs. Proposed solutions may provide assistance and prolong the autonomy of the elderly people while increasing the overall quality of life.

Existing commercially available products for monitoring elderly people, using interactive TV already employ a broad range of modern technology [8]. However, they are mostly closed, stand-alone systems with a limited ability to describe the actual situation. Moreover they are often just too difficult for the elderly people to operate with and useless in emergencies, which results in a low adoption rate of such products by target population.

Thereupon, in our research, a prototype for an application called med-reminder that could be used in an interactive TV system was designed. The application is intended for reminding people to take their medicines on time and in a correct way. Users, elder people, are also able to call medical personnel or a relative in case of emergency, simply by clicking on a key on the remote control. The main challenge during the research was the graphical user interface (GUI) design. We dedicated our work to create a GUI that will be intuitive and easy to use even for elderly people without previous training. In order to investigate how people are using med-reminder application in real situations, we have setup methodology for usability evaluation study, which should point out the key aspects that increases adoption rate of assisted living applications among the target population.

2 Med-reminder Application Description

Commercially available Net Top Box (NTB) devices are basically developed for providing interactive TV [9]. In our research we have integrated a module for information and communication technologies (ICT module) in the NTB device and so extended its basic functionalities. The med-reminder application exploits the ICT module capabilities thus providing users with some extra services such as presence monitoring, messaging, call control, media exchange, recommendations, etc. New features were used and med-reminder application was developed.

Fig. 1. Adding reminders for taking medicine

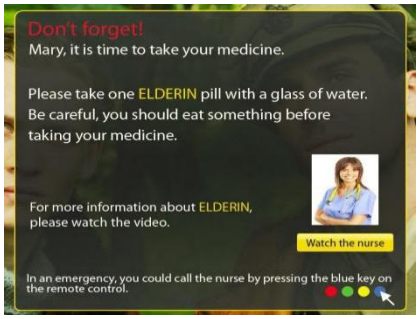

Fig. 2. Reminder for taking medicine

Upon previous analysis of the conventional diseases characteristic for elder people, the usual medications with different doses and instructions for use for these diseases were then entered in the system [11]. Furthermore, short videos with information about each medicine were recorded and also added in the system.

Users, their relatives or somebody from the home care service is able to set a reminder on the GUI as shown in Fig. 1.

Each time a patient is supposed to take the prescribed medicine, a sound signal appears from the TV set. At the same time a new window with short and clear instructions for taking the medicine in the proper way becomes visible on the TV screen as shown in Fig. 2. By clicking the "Watch the nurse" button, user is also able to watch a short video, where a speaking "nurse" explains the written instructions and offers additional information about the medicine. As a supplementary feature, in emergency cases, elder people are enabled to make a video call to a relative or a medical person just by pressing a key on the remote control.

3 Methodology for User Evaluation Study

In order to evaluate the user interface, navigation and general usability of the interactive application, usability evaluation methodology was designed [10]. Several physicians, whose patients are mostly people older than 65 years, helped this research by recruiting participants for the evaluation study. Personal physicians briefly introduced their patients, with health condition appropriate for this research, about the study. Patients were then asked if they are willing to participate in the study. Twelve patients, six male and six female, confirmed the participation. Participant's age range is between 65 and 85 years.

At the beginning, participants were asked several preliminary questions about their TV usage, general health condition and previous habits in taking medicine. The med-reminder application was then installed in the participants' homes and it is now ready for usage and evaluation. Participants are expected to use med-reminder application for three weeks and carry out four different tasks (same tasks for all participants). In task 1, participants should set a reminder for taking a medicine, which they are using in their real life. Participants are supposed to take their medicine on time, while following the instructions on the screen in task 2. Task 3 includes watching a video for gaining information about their medicine. Making a video call with a relative or medical person is the main goal in Task 4. For each task, participants are asked to rate difficulty of task completion. After three weeks of med-reminder usage, participants are invited to fill out a standard usability questionnaire system usability scale (SUS). Finally, participants are asked about their general impressions of using the application and how the system should be improved to better fit their expectations. Moreover, the participants are also asked a set of questions that would indicate their subjective perception of the main benefit of the med-reminder application (e.g. functionality, usability, accessibility, reliability, amount of information presented …). Participants are provided with a diary where they are expected to write their thoughts, emotions, possible difficulties etc, whenever they are using the med-reminder application.

The analysis of the results obtained from the usability evaluation study will determine to what extent med-reminder application assists elder people in their autonomy life and to what degree med-reminder application helps in increasing general quality of elder people lives. Possible difficulties with the med-reminder

application will be identified (for example: What happens if the TV is off or if elder person is not at home) and solutions will be suggested. We are interested in the scenarios and frequency of usage of the button for emergency call (would they in case of emergency actually use the interactive TV to make the call or would they prefer the usual telephone terminal) and the users' perception of the application benefits.

4 Conclusion

In the paper, we have presented the med-reminder application that could be used for improving the quality of elder people lives. The goal of the work was to design an application with the user interface that would overcome the usual drawbacks of applications for elderly that incorporate advanced technology achievements. Current experience shows that just applying advanced features into various solutions for elderly is far from being enough. Therefore too many advanced solutions are not being adopted by the users. The med-reminder graphical user interface was adapted specifically for the elderly, so that they would be able to use the application easily and without prior coaching and that the med-reminder application would actually became the first-choice for the elderly. First trials have shown that the med-reminder has a good potential to achieve its goal. However, thorough user testing according to the methodology for usability evaluation study defined in the paper will give the final answer.

The med-reminder application and its future extensions (reminders for visiting physician, pharmacy, season warnings and other notification of users) may have in future a significant impact on the lives of elderly. If adopted, they may contribute to preventive care improvement, diagnosis and treatment enhancements, which would consequently lead to reduced consumption of resources and materials that are part of the process of implementing health care.

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P2P TV: Evaluating Content Delivery and User Experience

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Abstract. In this paper, we present findings from empirical studies on end users' experiences of peer-to-peer (P2P) networked television services. To explore the quality of user experience and content consumption in the evolving TV system, we have developed a peer-to-peer social media service prototype, which can be used both with regular home computer networks and on mobile devices, providing users a real pervasive, ambient media experience. Our primary goal is to create an understanding of the factors that shape P2P TV experience as a basis for the future design of NextShare, a peer-to-peer social media service. Through this research, we concluded that P2P technology can provide a reliable mechanism for ingestion of time-based TV program as well as VOD content via the Internet. P2P technology is especially suitable for large media content providers. However, in order to create a real business value out of the service, new, innovative content production models and types need to be developed.

Keywords: Peer-to-Peer TV, User Experience, Content Delivery, Business models

1 Introduction

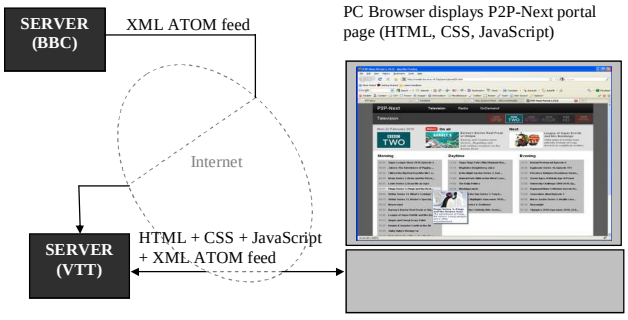
The idea behind ambient multimedia is that the user is exposed to the actual media in their natural environment rather than computer interfaces. Considering especially consumer and home entertainment services, the development of new IPTV networks provides an important case of ambient media use as it makes it possible for user to access content on-the-move and with a multitude of different devices (the mobile phones, laptops etc.). [1] However, the current infrastructure of the Internet is not suited to simultaneous transmission of live events to millions of people (i.e. broadcasting). Peer-to-Peer (P2P) based technologies can provide efficient and low-cost delivery of professional and user created content. From a technical point of view, the adoption of a P2P paradigm reduces the network costs, pushing complexity from the network to the users, while helping to relieve the bandwidth cost burden at the server. [2]
In order to produce quality services, we need to know more about the content choices and the quality of user experience related to these TV services.

Having a clear understanding of user requirements and the factors that shape the acceptance of P2P services has a lot of benefits. In principle benefits include lower developing costs, shorter developing time, lower maintenance costs, longer product life cycle, a stronger brand and more satisfied customers. [3]
In general, the quality of user experience is a huge competition factor. Ideally, when a product has been developed based on users' requirements, there is a real market for the product.
In our earlier work, we found out that the future P2P TV should combine both familiar and novel features, which support choice, control, interaction and quality of watching experience. The quality of video is one of the most important factors in the whole user experience. In P2P services the video quality is usually is better if there are more users. In addition to the better video quality, the ideal P2P service should offer users a range of varied content, both broadcast and user generated types of content and even new kinds of content genres and production types. [4]

The real significance of P2P and other interactive TV depends on understanding of the uses and problems of the services. [4] Therefore, this paper will present and discuss the findings of empirical field studies on end users' experiences the P2P TV services under development..

1.1 The P2P User Interface

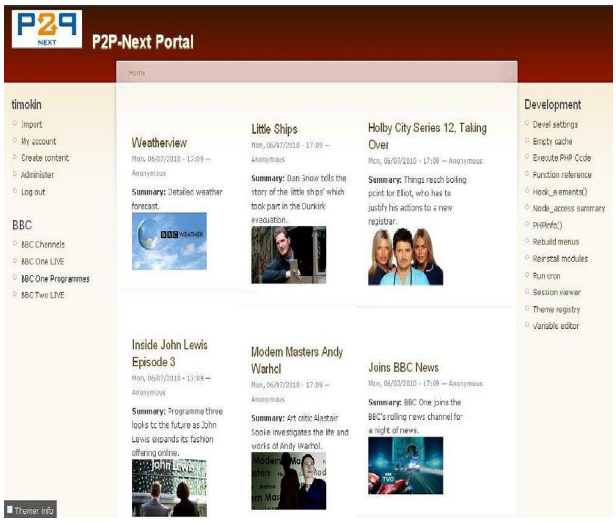
The developed P2P portal user interface is an Ajax implementation to fetch, parse and display the content of Atom feed. It is implemented with plain JavaScript, CSS and HTML, and it uses SwarmPlugin to play embedded torrent files. The original target was to support all major browsers, but eventually we had to flag Microsoft Internet Explorer out from our trial (lack of usable DOM methods when scripting the <object>-element). Following figure illustrates one example where ATOM feed comes from BBC server.



Picture 1. Opening page of P2P-Next portal.

The Ajax approach used here, is valid when users want to only view programmes. When more functionality is requested from portal, such as user accounts and publishing of users own videos in addition to professional content providers, then a real content management system must be used. We decided to use **Drupal** CMS framework to create a new portal, where users are able

to view public content without registering and also register a new account to create and administer their own content.



Picture 2. P2P portal 2010 and Drupal CMS

1.2 Content Delivery

During the test there were two types of streaming content available. There was the television channel side that was streaming the newest acquired material and then the On-demand side which had all the material archived (except for the newest material). The TV-channel side acted like live television so when the viewer opened the stream, it started showing the ongoing program from the point it currently was broadcast. On-demand streams started always from the beginning of the program.

The main TV material was shot during the "Ääni ja Vimma" festival - a band contest for 15 to 25 year-old musicians held in April 2010 in Helsinki. In total 15 band performances were shot lasting about 15 minutes each.

Other TV content used in the test was SuomiTV channel (a new TV channel focusing on family content), StadiTV (a local TV channel in Helsinki focusing on culture and events) and FabChannel (live music).

1.3 Methods for Evaluating User Experience

We collected and evaluated user feedback and the quality of user experience with different, both qualitative and quantitative methods. At first, in the NextShare adoption phase, we provided the users the opportunity to send immediate feedback and discuss the problems in our open web lab, called Owela. Owela is an online laboratory that utilizes social media features for participatory design and open innovation.

When the users tried the service first time, they were asked to fill in a questionnaire in which they can express their first impressions of the service and evaluate their user experience. The users were asked to evaluate for instance how easy it was to adopt the service, how they did experience the video quality, how logical the user interface was, how much did errors/disturbaces during the watching affect the experience, and how interesting did they find the service and content in general. This evaluation was given with a scale from 1-10. Then the users were also asked to answer to some open questions like how useful did they find this service and would they see themselves as using this kind of service in the future.

The log data collection system was also designed to follow the use of the service. The appropriate design of log functions for the evaluations is important and should be done in parallel with the technical development because it may not be easy to add the log functionality to a ready-made system. Consideration should be given to what data is needed and how the data could be automatically collected and converted into a form that is easy to analyze during the evaluation. [6]

We collected log data to reveal the time and duration of actual occurrences of P2P service use. Log data gives specific answers to questions such as: How much the user was using the service during different days of the testing period? What times of the day was she or he using the service? During which weekdays was the user using the service? How did the use change during test period? What kind of content was viewed? How long was the content viewed? The log data on the service use was collected from the P2P service prototype use and then analyzed statistically.

Altogether 91 participants used the P2P service during the test period of one month (from 15th of April to 15th of May, 2010). Their mean age was 28. Their technical expertise was high. 10 persons participated in the Owela discussion groups.

2 User Feedback

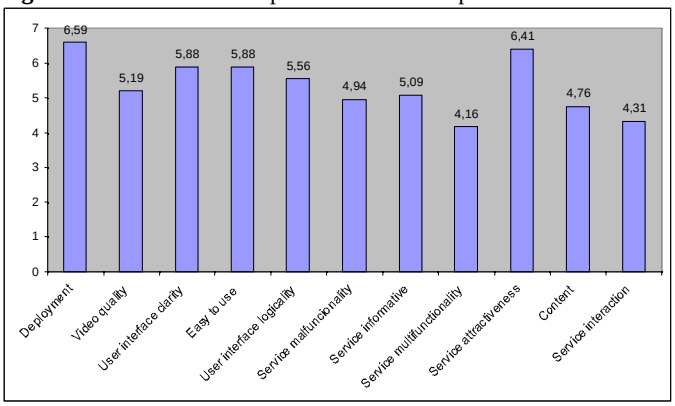
First impressions

User's thought that it was relatively easy start to use the service (Figure 1). Users rated it as 6, 6. However according to the discussions in the open web lab, Owela there were also some problems with deployment. From that reason as an overall conclusion the deployment should be made easier for the next versions.

Easiness of use to use was rated 5, 9. The clarity of the user interface was about the same. Service had some problems during the use and therefore malfunction was rated only 4.9. Service interaction functions were rated only 4.3. Overall service usability factors could be better.

Video quality was rated 5, 2. In the future as an entertainment service the video quality must be better. Clearly, the users were not satisfied with the content. Content was rated 4.8. and informativeness of the service 5,1. The whole attractiveness of the service was rated 6, 4 which is however a little bit better.

Figure 1. Different aspects of user experience of a P2P TV service prototype.



Usefulness

"The content of course determines if the service is interesting or not. It's also interesting how this kind of service would scale up for larger crowds."

According to users the service concept itself was quite useful (picture 22). 75% of the attendees thought that the service usefulness was from 7 to 10, when the scale was from 1 to 10. 15,7% of the users experienced that the usefulness was from 2 to 6.

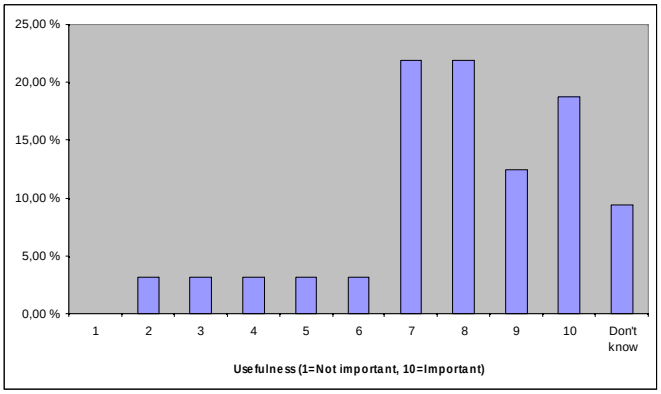


Figure 2. Evaluated usefulness of the P2P service concept.

Users expected a multitude of end devices and operating systems; ability to experience audiovisual content from PCs, laptops, media players and mobile or smart phones.
"Everything in the same place, quick search, diverse, support for local download, simple."
"Multi-platform! In addition to computers, should be viewable on various IPTV set-top-box solutions."
"I'd hope for administered entities, clear menu structures, diverse content and easiness of taking into use. A service that both young and old feel comfortable to use."

The service was most used during in the middle of week and during the weekends. (see figure 3)

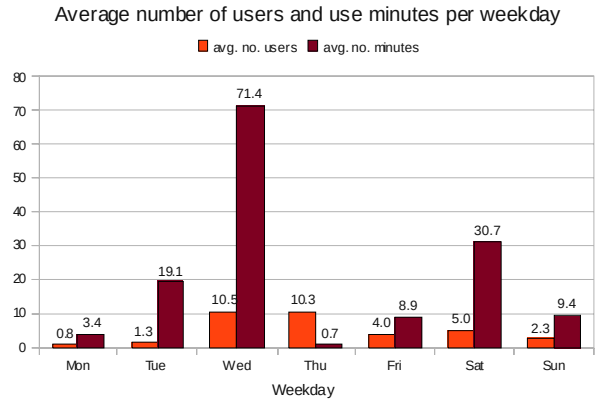


Figure 3. The average number of users and use minutes per day.

3 Payment methods

Most users were willing to pay a fixed price from this kind of peer to peer service. However, because there were many differing opinions it is important to give users options. Some people just want to subscribe to their favourite series sometimes; others may want to pay for all at once. Many were not satisfied with the current TV license system and wished for completely different kind of payment model for the whole TV.
"I don't like to finance others people's TV watching so pay per view."
"Fixed monthly or annual fee, limited access to all contents"
"Some kind of pre-paid card. It could be used to access to all channels. You could spend the saldo for the time used for watching."
"60% sponsored by commercials, 40% pay what you view."

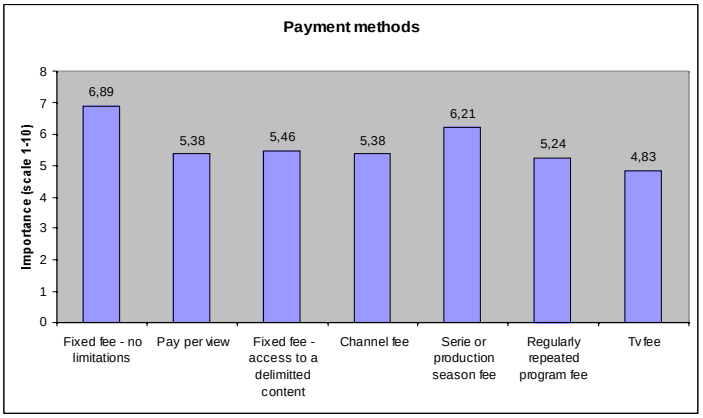


Figure 4. Preferred payment methods

3 Conclusion and Future work

The test users of saw a lot of potential in P2P type of television service. The overall rating for usefulness of the service concept was relatively high. However, there was also a critical feedback towards the user interface and its usability problems, picture quality and especially towards the chosen operating systems (by that time no open source options provided).
The test users expected P2P TV services to offer additional content delivery services to conventional TV and media portals in the Internet (such as Youtube and public/commercial broadcasters). The band contest videos were not seen as interesting enough to motivate the test users to use the system for longer time periods. Thus there is a high demand for a wide range of interesting contents for all age groups to motivate a critical amount of users to participate. With a small number of users the real benefits (i.e. better picture quality) of using P2P system cannot be gained.

There is of course a real challenge of finding a wide range of fresh, original and appealing contents for users, taking into consideration current copyright limitations. The present media environment already offers a multitude of different media contents in the Internet for free. How it is possible to develop a service that could serve users better than for instance YouTube or public and commercial broadcasters? It would be difficult to compete with the content offerings with these services, however the new P2P service could be developed for certain, smaller use segments with the possibility to new, innovative content production. Users are interested in diverse content that is not easily available under one service; for instance quality local channels, foreign channels, news, programs, movies etc. In addition, there should be programs for all age groups.

In fact, it appears that users are willing to pay for a good content service and better picture quality. The payment system should be made as easy as possible. It is important to give users different options: some people just want to subscribe to their favourite series; others pay for all at once.

In addition, copyrights restricted the implementation of the service. Content providers worried and wondered what would happen to their content once their content was ingested to the open Internet. Music video had extreme copyright problems. In our case, we had to ask permissions from all the bands and their members.

Through this trial, we concluded that P2P-next platform can provide a reliable mechanism for ingestion of time-based TV program as well as VOD content via the Internet. Peer players can constantly access to streamed torrent data. P2P-next platform is especially suitable for large content providers.

Acknowledgments. Part of this work is supported by the European Commission in the context of the P2P-Next project (contract no. 216217). Further information is available at http://www.p2p-next.eu/.The heading should be treated as a 3rd level heading and should not be assigned a number.References

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AmbiKraf: An ambient textile display

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Abstract. AmbiKraf is a novel non-emissive animated fabric technology that is fast, color changing, and robust. Here we combine thermochromic ink with semiconductor heating/cooling technologies, embedded in soft fabrics. By developing a technology that makes the fabric itself change the color we present it as a ubiquitous and ambient display technology. We present our results through a various range of animated fabric display prototypes.

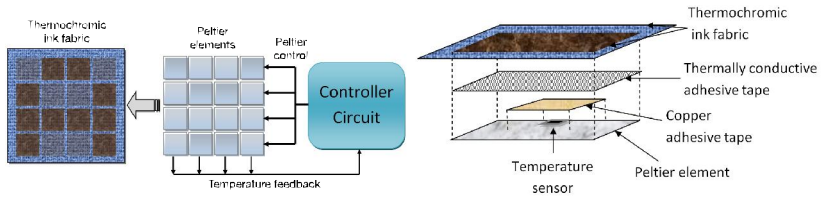
Keywords: Non-emissive, thermochromic, peltier, animation, fabric

1 Introduction

With the advancement of technology, our daily wearables are becomingmore than just a fashion statement. Introduction of new concepts and technologies, has allowed researchers to embed more and more electronics into our clothes enabling our clothes to become a medium of expression. With this development, researchers are looking into various forms of fabric displays that are mainly emissive, such as embedding LEDs [3], electroluminscent sheets and wires [2], complete LCD displays, etc. or non-emissive, such as using thermally actuated inks [4, 1]. With this paper, we present AmbiKraf, a non-emissive fast color changing fabric display. We use thermochromic inks and semiconductor Peltier elements along with a fine tuned closed loop control system to achieve this technology. The core novelty of this project lies within the implementation of the accurate, robust and fast controllability of the color of fabric. Such controllability allows dynamic patterns to be displayed on the fabric. In this paper, we discuss the technology of AmbiKraf and present an analysis of the technical results of the system. In addition, with such ubiquitous qualities of the fabric technology we envision AmbiKraf to become a platform for interaction with textiles and fabric, even possibly extending to merging with rich textile cultures and traditions.

2 System Description

The overall system is depicted in Figure 1a. The AmbiKraf system combines Peltier semiconductor modules and thermochromic leuco dye ink technologies



(a) (b)

Fig. 1: (a) Overall system (b) Integration of the system

using a closed loop control system employing a PI (proportional, integral) controller in order to accurately control color.

AmbiKraf uses thermochromic leuco dye inks as the display method due to its ease of implementation and high robustness. These inks work on the basic principle that, when their temperature is raised beyond their 'actuation temperature', the inks become colorless. When the temperature is brought below the 'actuation temperature' the ink regains its original color. The color of these inks and the actuation temperatures can be customized for any specific requirements. Currently we used inks which is of 32^0C actuation temperature and of dark brown color. These inks are then combined with textile binder and screen-printed, making the fabrics more robust for everyday use.

As thermochromic inks are thermally actuated, we chose the Peltier semiconductor modules due to its rapid thermal actuation capabilities within a wide range of temperatures. Peltier semiconductors use the thermoelectric effect, i.e. creates a temperature difference across the module when a voltage is applied. When the voltage is reversed, the heating surface becomes the cooling surface. This is a very useful feature in our work as it eliminates the requirement for bulky cooling systems as the heating and cooling occurs on the same surface of the module.

The control circuit combines these two technologies together where each Peltier module operates on a closed loop control system. Temperature sensors placed carefully on the Peltier modules feedback the temperature reading to the controller which employs a PI control algorithm with fine tuned parameters. Figure 1b depicts the integration of such a color changing pixel combining the Peltier module, the temperature sensor and the thermochromic ink fabric.

3 Results

The current implementation of the system, the system is able to increase the temperature of the fabric from 24^0C (ambient) to 33^0C in approximately 1.5s. In addition, the fall time (33^0C to 24^0C) of the system too approximates to 1.5s which is an important characteristic. This ability of the system to rapidly cooldown the fabric allows the thermochromic ink to rapidly regain the original

color hence allow subtle bidirectional animations on fabric. Hence the system is able to animate the fabric at a rate of approximately 0.7 frames-per-second. Figure 2(a) indicates the color transition and Figure 2(b) indicate the different colors at different temperatures.

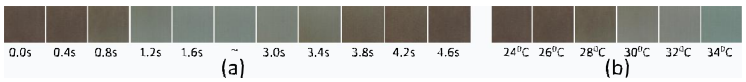


Fig. 2: (a) Color transition (b) Color at different temperatures

3.1 Prototypes

Due to the system's ability to change the color of the fabric in a very subtle manner, we tried out few prototypes that would be in the form of ambient fabric displays. As the prototypes we created a printed textile wall hanging (Figure 3) that animates a bird appearing and dissapearing on a wall painting, and a table runner (Figure 4a) which has a subtle animation of a bird flying across the table when activated and an animated byobu (Figure 4b) screen (a traditional Japanese fabric artform) which displays subtle animations of flowers as a person walks closer to the byobu screen.

Fig. 3: Animated wall hanging painting using the AmbiKraf system

By observing the resulting prototypes, it was quite clear as to how this fabric technology can ubiquitously blend with our everyday objects. The wall hanging piece and the table runner are everyday objects such as a regular wall painting or a table cloth. However, with this technology, such have become an ambient medium of display, yet subtly blending to the background. Currently even though these prototypes use fixed patterns, we are experimenting with using pixelated displays ultra miniature peltier modules. The availability of the Peltier modules of miniature scale (1mm x 1mm) is a motivation for this possibility.

In addition, with the byobu prototype, we are exploring the possibilty of integrating this technology with cultural fabrics. Room dividers or screens known as Byobu were an indispensable piece of furniture in the homes and temples of

(a) (b)

Fig. 4: (a) Animated table runner that displays a bird flying across the table (b) Interactive byobu screen that displays animated flower patterns as a person walks towards it

Japan from the 9th Century. The ubiquitous and ambient nature of the AmbiKraf allows this technology to be seamlessly integrated into such traditional fabrics. Hence, with the animation of this piece, painting of landscapes on these byobu arts can now move, change and grow to once again depicting the passage of time and temporality of nature.

4 Conclusion

Through this paper we present AmbiKraf, a non-emissive fast color changing fabric display. Few ubiquitous fabric display prototypes of the system are presented. In addition, due to the ubiquitous nature of this system, we are also exploring its feasibility into integrating this technology with the traditional and cultural fabrics. Due to the calm and subtle nature of this animated fabric display, we envision that AmbiKraf will be able to breathe life into these rich cultures and traditions of fabrics. Furthermore the ability of this technology to present subtle yet fast changing animations on fabric preserves the ubiquity of the fabric while turning it to a display medium. Hence we envision that this technology would radically challenge the boundaries of current research.

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Generalized approach to prolonging of autonomous living of elderly with semantic ambient media

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Abstract. This paper is presenting generalized approach to detection of health problems and falls of the elderly for the purpose of prolonging autonomous living of elderly using semantic ambient media. The movement of the user is captured with the motion capture system, which consists of the tags attached to the body, whose coordinates are acquired by the sensors situated in the apartment. Output time-series of coordinates are modeled with the proposed data mining approach in order to recognize the specific health problem or fall. The approach is general in a sense that it uses k-nearest neighbor algorithm and dynamic time warping with time-series of all measurable joint angles for the attributes instead of the more specific approach with medically defined attributes. It is two-step approach; in the first step it classifies person's activities into five activities including different types of falls. In the second step it classifies walking patterns into five different health states; one healthy and four unhealthy. Even though the new approach is more general and can be used to differentiate also from other types of activities or health problems, it achieves very high classification accuracies, similar to the more specific approach.

Keywords: Health problems detection, gait, machine learning, ambient media.

1 Introduction

The amount of elderly in the developed country is large and is increasing. Consequently the active population's capacity for taking care of its elderly members is decreasing [1].

We propose generalized approach to an intelligent and ubiquitous care system based on semantic ambient media for monitoring elderly in order to recognize a few of the most common and important health problems of the elderly, which can be detected by observing and analyzing the characteristics of their movement. It is two-step approach; in the first step it classifies person's activities into five activities including different types of falls. In the second step it classifies walking patterns into five different health states; one healthy and four unhealthy. The activities are: fall, unconscious fall, walking, standing/sitting, lying down/lying. Types of unhealthy walking are: hemiplegia (usually the result of stroke), Parkinson's disease, pain in the leg and pain in the back. The movement of the user is captured with the motion capture system, which consists of the tags attached to the body, whose coordinates are

acquired by the sensors situated in the apartment. Output time-series of coordinates are modeled with the proposed data mining approach in order to recognize the specific health problem.

In the related work, motion capturing is usually done with inertial sensors [2, 5], computer vision and also with specific sensor for measurement of angle of joint deflection [3] or with electromyography [4]. For our study, the (infra-red) IR camera system with tags attached to the body [8] was used.

We do not address only the recognition of activities of daily living such as walking, sitting, lying, etc. and detection of falling, which has already been addressed [6, 10], but also recognition of health problems based on motion data.

Using similar motion capture system as in our approach the automatic distinguishing between health problems such as hemiplegia and diplegia is presented [9]. However, much more common approach to recognition of health problems is capturing of movement which is later examined by medical experts by hand [3, 7, 11]. Such approach has major drawback in comparison to ours, because it needs constant observation from the medical professionals.

The study [12] recognizes between the same five health states as presented paper but it is much more specific due to usage of 13 medically defined attributes.

2 Methods and experiments

In our experimental work we focused on analyzing the classification accuracies of model, built using the k-nearest neighbor machine learning algorithm and dynamic time warping for the similarity measure. The experimental classification accuracies were obtained using leave-one-out validation.

Table 1. Confusion matrix of k-nearest neighbor classifier, where F=fall, UF=unconscious fall, W=walking, SS=standing/sitting, L=lying down/lying. Numbers denote quantity of the classified examples.

		classified as				
		F	**UF**	**W**	**SS**	**L**
true class	**F**	30	0	0	0	0
	UF	0	30	0	0	0
	W	1	0	124	0	0
	SS	0	0	0	24	1
	L	0	3	1	0	26

The 10-fold cross-validation for 5-nearest neighbor classifier resulted in classification accuracy of 97.5 % and 97.6 % for activities and health problems, respectively.

Table 1 shows the confusion matrices, i.e. how many examples of a certain true class (in rows) are classified in one of possible five classes (in columns).

Table 2. Confusion matrix of k-nearest neighbor classifier, where H=hemiplegia, L=pain in the leg, N=normal (healthy) walking, P=Parkinson's disease and B=Pain in the back. Numbers denote quantity of the classified examples.

		classified as				
		H	**L**	**N**	**P**	**B**
true class	**H**	42	2	1	0	0
	L	0	25	0	0	0
	N	1	0	24	0	0
	P	0	0	0	25	0
	B	0	0	0	0	21

For the real world cases, we can use confusion matrices for three purposes:

- We can observe how many false positives (false alarms) can be expected using these classifiers. When in real world use the system would report false alarm, e.g., normal walking is classified as some health problem, ambulance could drive to pick up the elderly which would cause unnecessary costs
- We can see how many false negatives can be expected using these classifiers. False negatives could mean potentially risky situation for the elderly, as his/her health problem would not be recognized automatically
- We can identify between which health states (classes) the errors (misclassifications) occurs. Consequently, we can add additional features to help distinguish between those particular classes. The misclassifications happened very rarely.

The results show that in the proposed approach false positives/negatives are very rare, i.e., they would not cause much unnecessary ambulance costs. Since the method accurately classified most true health problems, it represents high confidence and safety for the potential use in elderly care.

3 Conclusion

This paper presented generalized approach to detecting of health problems and falls of the elderly for the purpose of prolonging autonomous living of elderly using semantic ambient media. It is general in a sense that it does not use specific medically inspired attributes but general approach of combined k-nearest neighbor algorithm with dynamic time warping. It is two-step approach; in first step it classifies person's activities into five activities including different types of falls. In the second step it classifies walking patterns into five different health states; one healthy and four unhealthy. Even though the new approach is more general and can be used also to classify other types of activities or health problems, it still achieves high classification accuracies, similar to the more specific approach.

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Language Evolution On The Go

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Abstract. Knowing about the evolution of a term can significantly decrease time needed for searching for information. It can also aid in quickly getting a broader overview, which is essential when one is on the move. In this paper we present a solution for providing language evolution knowledge "on the go". We present a mobile interface for easy access and visualization as well as an overview of how this evolution was found.

Keywords: language evolution, mobile applications, ambient media

1 Introduction

In the age of ambient media, the user demands constant support for her needs. Mobile and smart devices provide excellent facilities for giving immersive, location based support for activities. In this paper we present a solution for providing language evolution knowledge "on the go".

Languages are evolving over time triggered by various factors including new insights, political and cultural trends, new legal requirements, and high-impact events [2]. Imagine traveling through St. Petersburg. This city exhibits a particularly interesting language development, as it was founded in 1703 as "Sankt Piter Burh" and soon after renamed to "Saint Petersburg". From 1914-1924 it was named "Petrograd" and afterwards "Leningrad". In 1991 it changed back to "Saint Petersburg" also simply referred to as "Petersburg". The typical user will not be aware of this complex development and therefore might be puzzled by observing different names when sightseeing. Using our terminology evolution application, such connections can be more easily and conveniently determined than using standard search on e.g. Google or Wikipedia.

To our knowledge only one previous work has been published in the area of terminology evolution[1]. Using language from the past, the aim here is to find good query reformulations for search engines of concurrent language. Our approach advances on this by using word senses to find similar terms rather than pure co-occurrence information. Furthermore our approach does not restrict the user to specifying a timeframe for the evolution. Due to the limited previous work no investigations on the interaction with user for this special application have been conducted.

The contribution of this paper is the development of an initial mobile interface for easy access and visualization of the language evolution we detected in a

large real-world corpus - The Times Archive[1] - for the usage on mobile devices like iPads or WebPads.

In the following we will first give some background information on the detection of language evolution. Afterwards in Section 3 we present our user interface of our language evolution application. Finally we conclude and give an outlook on future work.

2 Terminology Evolution

The challenges in language or terminology evolution are broad and cover the detection of added, removed and changed senses for a word. It also includes different terms for the same concept like in the St. Petersburg example. By comparing found word senses over time, important information can be revealed.

2.1 Finding word senses

The first step of detecting language evolution is to automatically detect word senses given a text collection. For this we use a word sense discrimination algorithm know as *curvature clustering* [3]. Following we describe the steps involved.

Natural Language Processing First the text is cleaned from strange tokens. The text is lemmatized and identified nouns and noun phrases are added to a term list which is considered to be the *dictionary* corresponding to the collection.

Co-Occurrence Graph Creation We create a *co-occurrence graph* using the dictionary. The collection is searched for lists of nouns and noun phrases. Terms from the dictionary, that are found separated by an "and", an "or" or a comma, are considered co-occurring. E.g., in "*... cities such as Paris, New York and Berlin ...*" the terms "*Paris*", "*New York*" and "*Berlin*" all co-occur in the graph. Once the entire collection is processed, all co-occurrences are filtered and low frequency co-occurrences are removed to reduce the level of noise.

Graph Clustering To cluster the graph, we use the curvature clustering algorithm which calculates the clustering coefficient [5], curvature value, of each node. After computing the curvature values, the algorithm removes nodes with a curvature value below a certain threshold. The low curvature nodes represent ambiguous nodes that are likely to connect parts of the graph that would otherwise not be connected. Once these nodes are removed, the remaining graph falls apart into connected components, from now on referred to as clusters. Clusters are considered to be candidate word senses. Finally each cluster is enriched with the nearest neighbors of its members to capture ambiguity.

[1] http://archive.timesonline.co.uk/tol/archive/

2.2 Finding word sense evolution

The second step for finding terminology evolution is to track the word senses over time. The tracking is done for each term separately. We compare the clusters where the term participates to see if there has been any evolution. Current tracking technology use Jaccard similarity to compare clusters. The similarity scores for two clusters lie between 0 and 1 where 1 indicates that two clusters are exactly the same and 0 indicates no terms in common. We consider two clusters which have a similarity higher than α to represent the same word sense. When two clusters have a similarity below β we consider the clusters to have no relation. Clusters with similarity above β but below α are candidates for evolution.

3 User Interface and implementation

In order to make the results of the language evolution process end-user accessible, we devised a mobile web service which allows for exploring the evolution of a given term. As running example we will use the term *Petersburg* present in clusters extracted from The Times Archive (1785-1985) [4]. After the user specifies the term of interest, we show all clusters containing this term over time. As representative, we chose the term with the highest clustering coefficient (on top, Figure 1). Furthermore, we give the term frequency distribution of the term over time (bottom, Figure 1).

By assessing the term frequency distribution, and possibly combined with a changing cluster representative as seen on the right side, the user can infer if a significant change of the word usage happened at a given point in time.

To get a deeper understanding of the context of a given year, the user can simply touch a cluster representative to see all cluster members along with their connection.

The terminology evolution application enables the user to get a quick look at what happens to a term over time. First of all the raw (or normalized) term frequencies over time can give an indication of an event, or evolution, for a term. When the term "Petersburg" looses in frequency from 1914 to 1915 it is worth to investigate further into that point in time. In this example it corresponds to when "St. Petersburg" changes name to "Petrograd". In addition to the term frequencies, the clusters help with understanding the term context.

The terminology evolution application saves the user time in finding and understanding the context of a term from different periods in time and shows semantic relations, which are otherwise much more complicated to obtain using standard Google, or Wikipedia searches.

4 Conclusions

In this paper, we presented a solution for providing language evolution "on the go". As a basis we used The Times Archive, a large real-world corpus, allowing us

Fig. 1. User-interface showing clusters for term *Petersburg*

to identify significant evolutions in language. We devised an application tailored for mobile devices, which allows for easy access to language evolution "on the go". Initial results suggest a significant improvement over standard knowledge accessing mechanisms. Future work is a formal user study to further improve the application.

5 Acknowledgments

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Use of Human Speech for Inclusive Games Design

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Abstract. Computer games are now a part of modern culture. However, certain groups of people are excluded from this form of entertainment and social interaction because they are unable to use the interface of the games. By using automatic speech recognition systems (ASRS), voice driven commands can be used to control the game, which can thus open up the possibility for people with disabilities and age related problem to be included in game communities for using the services.

This paper aims at find a standard way of using voice driven commands in games which uses a speech recognition system, and that can be universally applied for designing inclusive games. The standard voice driven module is based on algorithm which can be used to design plug-ins, that can be integrated with game engines; creating the possibility of voice driven universal access for controlling games.

Keywords: Design for all; inclusive design, universal design; game accessibility; game controller.

1 Introduction

As more participation in gaming is involved lately by mass amount of population around the world, it is obvious that game is not only an entertainment media for children or young people anymore but game can be used to serve several purpose for all kind of people in the society. Today's technologically inclined peoples are going to be older by age tomorrow, and they would not like to get excluded from future services for instance game, just because of the design issues associated with the game. Also, any human can suffer disabilities of some kind at any time regardless of age and it would be unfortunate to exclude them from using game. Moreover the death rate of human is decreasing while the birth rate is also falling, which results majority number of older people (disabled or not) are about to be left in the society in the near future. So the game design should be concerned with such issues, so that it can include these groups of peoples to offer them use services properly designed by the game industries.

Automatic speech recognition system is not a new concept in modern computing. However the possibility of using automatic speech recognition system to control game is one option to offer inclusiveness in game design. People with limited motor control ability can be blessed by the opportunity of using their voice to drive the commands

of game. This paper proposes such speech recognition system for game which is one of the objective in achieving universal design in computer gaming.

1.1 Why Inclusive Game

As game is becoming more popular in a different standpoint and the user of technology becoming elder, it is now time to think about what will happen in the future while the users will be technologically inclined but hemmed in to be restricted from playing game just because the game is not properly designed for him or her. Or regardless of this issue, any age group people can suffer from certain physical disability which makes them excluded from playing games- again because of the design matter. Hence the importance of designing inclusive games is going to be more and more highly valued in the future.

1.2 Speech Technology

Speech technology seems to provide new opportunities to improve the accessibility of electronic services and software applications including game, by offering compensation for the limitations of specific user group. These limitations can be quite diverse and originate from specific sensory, physical or cognitive disabilities—such as difficulties to see icons, to control a mouse or keyboard [1]. Such limitations have both functional and emotional aspects that should be addressed in the design of user interfaces [2]. Speech technology can be an 'enabler' for understanding both the content and 'tone' in user expressions, and for producing the right information with the right tone [1].

2 Proposed System

The proposed system consists of a standard automatic speech recognition system where the vocabulary array is built by fetching the commands from the most commonly used game platform. The user input is processed through the soundcard which converts the analog data to digital format and then checks with the user word model from the vocabulary register. Once the word uttered by the user matches with the word from the vocabulary list, it then sends the binary signal corresponding to that word to the process handler of the game. Users see that the action has been taken according to their given voice command, through the GUI of the game. However, it is important to utilize the user's emotion to control the character of game in different manner. So a command voiced in low pitch should result doing something different than when it is said in a higher pitch. Figure 1 shows the block diagram of the proposed system.

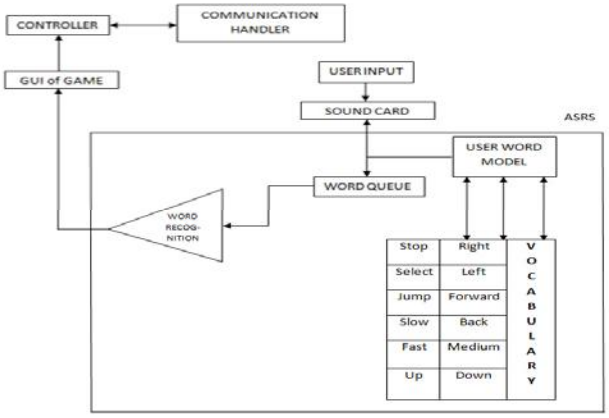

Fig. 1. Proposed ASRS model for controlling game

2.1 Method

To initiate this research computer game has been classified while thinking in mind that both old and disable people of any age-present and future can be the user of the game. The classification of computer game that was picked in this research was: action, first person shooter, strategy, board, action-adventure and sports. At least three games from each of the group of classified games were played and observed. The most frequently used commands from each game were filtered and listed. Then from each category of game, after analyzing the three different game's filtered commands, the best possible commands were picked up for each category of game. The same technique is used to filter and fetch best commands for all classified groups of game.

Two groups of users were involved in playing and observing the games and were told to write down the command they are mostly using by the input devices. They were asked which command they would like to use if the game is to be controlled by voice command. Their written commands and personal opinion of using voice commands were closely matched before creating the set of commands from different categories.

Next step was to record and monitor the frequency of each commands uttered by the users. Six users were selected in these test- three males and three females. Their voice uttering the commands were recorded and tested in two different environments. One was fairly silent environment which was assumed to be the normal settings when we usually play a game in our computer. Another was a little noisy atmosphere. The idea was to see, how the level of frequency of command varies with respect to different environment. Also each user was told to give their voice command three different times in two different environments. For this test, the audacity audio editor and recorder (available in: http://audacity.sourceforge.net/) for windows was used which is a free multilingual audio editor.

3 Results

Once the individual category's selected commands were found, a set of commands from 'all type of games' were created. If a command from one category was member of the main set, then it was picked up. This is how the best possible 15 commands were picked up from all these categories of games, considering that they are mostly used and quite obligatory at controlling any of the categorized games.

The next step was to analyze the recorded data. For doing this, each individual command from six different users were plotted in graphs to analyze the spectrum. The frequency (Hz) and intensity (dB) values were picked up from the graph and frequency domain filtering method was used to eliminate the noisy dataset. Figure 2 shows the spectrum analysis of the command 'Select' by one male and one female user.

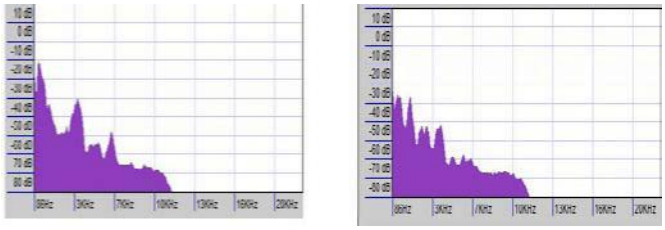

Fig. 2. Left spectrum is obtained by a male player and the right spectrum is obtained by a female player for saying same command 'Select'

Figure 3 shows how the frequency domain filtering was used to remove noise from the data obtained from the spectrum. The left most curve shows the filter function that was constructed. Then, to filter the data in the frequency domain, the Fourier transform of the data is multiplied by the frequency response of a filter and then an inverse Fourier transform was applied to return the data to the spatial domain. The third curve shows that the same filter function can also be used as a high pass filter that is, allowing only the high frequency or noise components through. MATLAB was used to generate these curves.

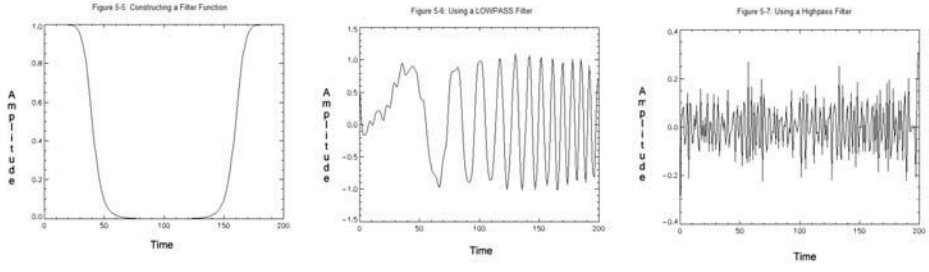

Fig. 3. Frequency domain filtering method for eliminating noise data obtained from voice spectrum

The curve in the middle shows the effect of using a low pass filter on the noisy dataset while the right curve shows the use of a high pass filter for the same function which allows only the high frequency or noise components through. The high pass and low pass filtering was simultaneously used for male and female voice data according to the number of high or low noisy level in data.

4 Algorithm

The frequency values well filtered and obtained from different commands were further analyzed to take the average, which is the mean value. The Hz and dB level was ranged based on the filtered data and was then used to construct a controller which is connected between the automatic speech recognition system and the game communication handler. The ASRS system detects and matches the stored vocabularies which in this case are the commands, while the controller checks the emotion of the uttered command (frequency and intensity) to instruct the game communication handler what to do according to the received pitch from a user. It is possible to construct a simple algorithm using the straightforward logic based loop where the purpose will be served but the run time might be quite long. Hidden Markov model (HMM) [3] is the broad-spectrum basis on modern form of speech recognition system and is a statistical model where the states are not directly visible to the user. This model can use the result of this research. The idea of using the frequency values obtained from the different users commands in HMM which combines many other algorithms for temporal pattern recognition in the game (speech in this case), can be viable. An example algorithm from this research for deciding a command between ‘Fire’ and ‘Jump’, based on statistical HMM may look like as follows:

```
    States = ('Jump', 'Fire')
Observations = ('Hz, 'dB')
start_probability = {'Fire': 0.6, 'Jump': 0.4}
 transition_probability = {
 'Fire' : {'Fire': 0.7, 'Jump': 0.3},
 'Jump' : {'Fire': 0.4, 'Jump': 0.6},
   }
 emission_probability = {
   'Fire' : {'Hz': 0.7, 'dB': 0.3},
   'Jump' : {'Hz': 0.6, 'dB': 0.4},
   }
```

From the above piece of code it can be understood that, if a user tends to use higher tone to utter a command it is possibly ‘Fire’ with higher probability assigned in the function start_ probability. The probability of the command ‘Fire’ to be ‘Fire’, when ‘Fire’ really is uttered is high when it is uttered in a high pitch otherwise it is ‘Jump’ command and this logic is assigned in the function transition_probability. The last function called emission_probability uses the frequency (Hz) and intensity (dB)

value's average (in this example) or limit and decides the uttered command received from user and sends it to the game communication handler for the execution of the command on game environment and show it on the game's GUI.

5 Implementation-Hardware and Industry Perspective

Use of PIC (Programmable Interface Controller) microcontroller, to program the logic instructions derived in this research can be a crucial initiative. For example, if a soundcard of the computer comes up with a built in chip with the certain instructions of voice command, then the soundcard can be called inclusive design supported soundcard, designed for controlling games with specific voice commands. Game designers then only need to integrate their control structure of the game with that hardware. There are two advantages of implementing the results in hardware form. First, it can be highly effective at replacing relatively complex discreet logic. Secondly, if probability based algorithm can be implemented and programmed in chip, it may replace the idea of using a speech recognition system at all; as long as we focus on certain voice input parameters. The memory type in the PIC is EPROM hence PIC can alter the data in the memory and can retain its value, even when the power is removed. The company (Microchip technology) that designed PIC provides a freeware IDE package called MPLAB that can be used to program PIC. Using 'Programmer' which is hardware to configure programmable non-volatile circuit such as EPROM, a PIC can easily be programmed with certain instructions to accomplish desired task.

It is now understood that, hardware implementation of the proposed system have several constructive issues that are going to come to pass. First, the overall system will be more compact and integrated. The command execution time will be reduced. The speech recognition system might not be required for pattern matching of word from a vocabulary array, as it can be replaced by the stylish use of algorithms to find out selected commands where the algorithm comes to a decision of the instruction based on the frequency level and intensity values from the user. This can lead to an industrial and engineering challenge. While the hardware satisfies certain voice commands in built-in format, the game industries are then going to be under press to integrate with the service from such hardware with their designed games. A universal design standard thus can be produced and games can be benchmarked in terms of their inclusivity and also can be standardized in some structure.

6 Discussion

The performance of the proposed system depends on how the algorithm is implemented. If it is a clean code based controller, the run time will be interesting to observe to evaluate the system's performance. The proposed model using the frequency level to detect and generate commands can be made more sophisticated

while issues like word error rate, single word error rate and command success rate will be verified and fine tuned. Use of Viterbi algorithm is reasonable as long as it does not increase the cost of the overall algorithm. As the system will mostly be dealing with old or disabled people, decoding the speech might be difficult sometimes, when the system is presented with a new utterance and it must then compute the most likely source word. Using Viterbi algorithm is thus prudent to find the best path which can be an added advantage in this system. Using a fuzzy logic controller between ASRS system and game controller is definitely going to make the command execution process faster.

7 Conclusion

The use of speech to control games is only one step towards inclusiveness and thereby universal design and accessibility in game. Other human modalities while combined together with speech will give more optimal performance, overcoming any drawbacks of using only speech. The result from this paper has multiple possibilities in game design and PC industry. While any existing algorithm can be altered and new algorithm can be created for detecting user emotions for executing one command in different way in game playing; which is important for elderly adult or disable people, an electronic chip can be programmed and integrated with sound card (for instance a PIC), substantiating the lasting universal design of certain standard of voice command for playing game. This enables and opens enormous opportunity both for hardware manufacturers and game industries. Voice support for game, based on this paper's idea can show the way towards finding an industry standard of universal design in computer gaming.

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Presentation of a Research Design for Evaluating the Innovativeness of Ambient Media

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Abstract. Innovations in media business have a long history, as new technologies let new forms of media emerge. Today - in the world of ubiquitous and pervasive computation - this technology lets a new form of media emerge: ambient media. One simple example are public screens where people can interact with the displayed content. The aim of this publication is to discuss ambient media as innovation driven by entrepreneurs in the world of media, the principles how they can be managed, and what is needed to make them to a success. However, at this stage solely the research design is presented within the scope of this paper, as the research work is currently in progress. As examples act entries submitted to the Nokia Ubimedia MindTrek Award by conducting interviews and analyzing the entries of the winners of the competition.

Keywords: innovations, media, ambient media, ubiquitous computation, pervasive computation, ambient intelligence.

1 Introduction

Ambient media are media that are embedded throughout the natural environment of the consumer. The idea of media becomes a matter of a media ecosystem, rather than providing the consumer with a single stream of content. As each new form of media, ambient media are based on a new technology – in the case of ambient media, the media form is based on ubiquitous and pervasive technologies, thus miniaturized computer systems distributed throughout the consumers' natural environment. One simple example are smart wallpapers, that adapt their presentation to the mood of the consumer. The technical infrastructures for presenting ambient media content currently are wide spread – they are many times developed by entrepreneurs or for specific purposes acting as enriching the main content stream. A good example are TV shows such as big brother, with an associated community of consumers following the show via mobiles or websites. However, for further reading about ambient media we would like to refer to [4] [3].

A the product ‘media’ is driven by the rapid changes of technology, the management of companies face a huge challenge to cope with the rapid development of innovations. Media can be either a single creation product, which is idea driven and unique (e.g. movie); or a continuous creation product, which is on-going and managed like a process (e.g. TV series) (see [5] [6]). In the case of ambient media the questions are manifold. Firstly – what is the actual main product – the technology? – the technology combined with the content? – the technology and content as add-on feature to other content? – what are ambient media in the context of media innovations? – what are ambient media as media product? An excellent overview of innovations in the media landscape can be found in [8].

2 Research Problem

Currently traditional media companies are learning how to cope with social media as new technology for their media products. However, ambient media based on ambient intelligent technology is the next natural technology to be considered for advanced media products. Currently ambient media are still an innovation, and solely a few products are mature. This implicates a few research questions, which are attempted to be answered within the scope of this research work:

- How do currently existing ambient media products fit into the phases of the innovation processes?
- How did the ideas for currently existing ambient media products emerge?
- How can the new products be evaluated on their innovativeness?
- What were the steps for idea implementation and how can they be commercialized?
- How could a model for innovations in ambient media look like?

To answer these questions, ambient media products submitted to the Nokia Ubimedia MindTrek Awards 2008-2010 are analyzed on their innovativeness. Winners of the competition as well as special mention were considered as cases to derive conclusions. They re-present min-cases. An overview of the competition can be found on [1].

3 Research Design

Despite the theories around the process of innovation are rather well developed, ambient media and their impact are rather new. For this purpose the research design is based on an empirical approach. This allows coping with the currently unstructured problem structure of ambient media. However, note that general theories around innovations are well developed, and provide a more structured approach. But the research design for the scope of this work shall allow the gathering of more additional observations and considerations that have not been thought about beforehand.

To cope with this fact, the approach is designed as mix between exploratory and descriptive research, with emphasize on an exploratory approach. An exploratory approach allows flexibility and as ambient media are currently newly emerging, their innovativeness and innovation character is poorly understood. This can be e.g. seen when attempting to find a coherent definition for this media form. This approach enables also to add additional observations and pieces of information while conducting a qualitative research approach to develop a more theoretical model – or a generalized theory. However, as research is rather well developed in the general theories around innovations e.g. on organizational-, macro-, micro-, and individual level, theories from this side will enrich the performed research work. Thus they will provide the general input with a-priory knowledge from general theories. However, this study excludes cause-effect research approaches, due to a lack of structure, cause-and-effect characteristics, and a difficulty to isolate specific causes (as e.g. the impact of the innovation).

The evaluation criteria are enlisted in Table 1. To answer the research questions, interviews/questionnaires with a selected set of winners and special mention of the Nokia Ubimedia MindTrek Award are selected (e.g. Donkeybedia (1st price, 2009), myGreenSpace (1st price 2010), and Point-to-Discover (1st price, 2008)).

Table 1. Evaluation criteria on the product innovativeness of ambient media services and products.

	Type	Criteria
V1	Innovation process [7]	Invention, innovation, imitation
V2	Degree of novelty [2]	Radical, adaptive, imitation
V3	Innovation form [7]	Product innovation, market innovation, process innovation, social innovation, method
V4	Innovation management [8]	Organization, efficiency, relationships, market, structure
V5	Media characteristics [5] [6]	Single creation, continuous creation, processes
V6	Impact on ambient and ubiquitous environments	low, medium, high

4 Discussion

This research work is still in progress, and shall present solely the first problem definition as well as the basic research design. The interviews will be still conducted during the year 2010, and shall allow further insight in innovation research of ambient media. The appendix section of this paper gives an overview of interview questions acting as starting point for interview preparation.

Appendix: Preliminary Interview Questions

1. Which business benefit does your product have? [free form/submission]

2. Which impact has your product on ubiquitous media environments? [free form/submission]
3. Can you formulate an elevator pitch for your entry? [free form/submission]
4. How did you have the idea for this product? [free form]
5. Is your product already a marketable product? [yes/no]
6. How long would it take to make it to a real product? [months/years]
7. How much resources in terms of mmths or funding would be required to make it to a real marketable production? [free form]
8. , or how long would it take to make it to a product? [free form]
9. How does society benefit from your product? [free form]
10. At which stage would you see your product? [it is an imitation/improvement of an existing one; it was never here before; it is an innovation]
11. Which degree of novelty do your product? [it's a radical innovation and was never here before; it imitates an existing product; it is an improvement of an existing product]
12. What does your product improve? [a consumer product; processes to create a product/used in production; it is a social innovation; it's a method contributing to the theoretical research of ambient media]
13. How do you manage your innovation inside your affiliation in terms of organization, efficiency, relationships, market structure? [free form]
14. How would you characterize your media product? [easy to replicate; it can be used only on a one-time basis; it's a process]
15. How would you see the impact on ubiquitous environments? [free form; low, medium, high]

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