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Seeing the self in the washing machine: the Deep Affordance of 2.0 philosophy in the household appliance domain

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ABSTRACT

The acceleration of rhythm of everyday life requires efficiency and flexibility in daily routines. The real expectations and needs of people concerning intelligent home devices should be carefully researched. The project Moon 2.0 by Indesit Company presents alternative ways of producing household appliance services developing a 2.0 HMI and programs setting unit for washing machines, totally manageable by smart phones or iPhones. Users can't explicitly control washing machines when they would like to use a features combination that hasn't application in a current washing programs. The application of the Web 2.0 philosophy to the washing machine let the user the possibility to directly control all the existing features of the washing programs and to decide time by time how many programs their machine should have, with regards to the transparency and interactivity concepts of the ambient intelligence. Moon 2.0 should not be confused with an hand held personal home assistant capable of controlling a wide range of electronic home devices. The smart phone behaves the intelligence of the washing machine and offers the user endless customisation possibilities. The mobile enable the user also to share his/her experience joining the web community in the Washipedia.

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Performance, Design, Human Factors

Keywords

Ambient Intelligence, Continuity Affordance, Deep Affordance, Household Appliance, Human Machine Interface, philosophy 2.0, iPhone, Ubiquitous Computing, Washing Machine

1 INTRODUCTION

New technologies have changed our life in the last decades. They improve our life, making everyday tasks easier and faster; providing enjoyment, playfulness, fun and aesthetics;

Practical use or improved productivity are the main selling argument concerning new innovative domestic technology [1]. Household appliances are quite expensive, have long lives and once bought they are no more customizable and upgradable. Trends in appliance design are towards more sophisticated control and networking capabilities [2]. Nowadays washing machines are equipped with a quite complex software, that doesn't let the user to create, modify or extend the software scope and capability.

The real expectations and needs of people concerning intelligent home devices are multifaceted and should be carefully researched. Household appliance are for Humans, whose quality of life, and the perception of it, is expected to improve via technology and ambient intelligence.

This paper reports on the development of customisable HMI and programs setting unit for washing machines, totally manageable by smart phones or iPhones. The project Moon 2.0 by Indesit Company studies alternative ways of producing services that have traditionally been taken care of by households, starting from existing products. In the next paragraph we propose the theoretical and technical framework our project arise from. Paragraph 3 depicts and overview on the Moon 2.0 project, encompassing software artefact, system architecture and HMI. At the end, conclusions are presented.

2 BACKGROUND

As we know, Bluetooth is widespread low cost wireless technology. Bluetooth can connect home appliances with mobile devices without wire and it is becoming a *de facto* standard. Bluetooth communication functionality avoid to buy new home appliances for adding communication functionality. Furthermore the mobile devices and smart phones can be used with short start-up time and their ability to access Internet can provide useful functionalities and services [3]. In the household appliance domain Bluetooth effectively support the coming of a user-centred ambient intelligence.

This article touches upon of ambient intelligence, ubiquitous computing, disappearing technologies, natural user experiences and their social implications. Visions of highly automatised homes with futuristic technologies have been developed for decades. During the last few years the scientific literature concerning the topic of domotics has diversified. The term "intelligent" has become obsolete, being replaced by new approaches such as "aware house", "integrated environments" or "alive and interactive environments". Studies about interactions between home and inhabitants increased. This change appears analogous to the shift of emphasis from techno-centred artificial intelligence

towards human-centred ambient intelligence [1]. The most complicated and full of functions artefacts turned out static and inflexible, unable to adapt to the changeable user needs. The most intelligent artefacts disclosed a bare and plain absence of functions, along to the possibility to be reinvented and the functions redesigned every time the user desires. It is a shift of intelligence from the static artefact, too complex to be modified, to another artefact, easy to update. The Moon 2.0 washing machine is an example of this concept: the washing machine has no user commands and controls. We can say that it is like a *tabula rasa*. The full intelligence, customisation and adaptation is devolved to the connected smart phone, that gives the user the power to mould number, type and features of washing programming, transferring them on the washing machine at a later stage. Exactly as depicted in the disappearing technology vision, in this way the home of tomorrow will look more like the home of yesterday than the home of today. Devices that are seemingly poor of functions have fade into the background, embedded their intelligence into other common devices, as the mobile or smart phone [4]. Over time, devices like the washing machine changed people expectations about what things would be done, how often and by whom. Today, they already contain microprocessors and a variety of programmes. Thanks to disappearing technologies and natural user interfaces the machines themselves could conclude from the degree of dirtiness the need for a certain programme, and can update always newer and more effective washing programs. The idea of a future home equipped with technical devices that make life easier is an old one. What is new with disappearing technologies is the added value of transparency and interactivity [1]. Solutions similar to the ones developed for cars, mobile phones or MP3 readers can be applied to housing.

3 MOON 2.0 PROJECT

Washing machines have sophisticated electronic programmes, but users can't explicitly control them. Often people use a narrow subset of the available washing programs, or they would like to use a features combination that hasn't application in a current washing programs and they wonder how to do or whether they can combine features in an approximate way respect their desires. In order to give the user the possibility to directly control all the existing features of the washing programs and to decide time by time how many programs their machine should have, we designed a washing machine taking inspiration from the Web 2.0 philosophy. The term "Web 2.0" is commonly associated with web applications that facilitate interactive information sharing, interoperability, user-centred design, and collaboration on the World Wide Web. Examples of Web 2.0 [5]. We transferred this concept on the washing machine, making it evolving into a more interactive, multi-media driven technological *space*. The Moon 2.0 washing machine has the four essential elements typical of Library 2.0 [6]

1. **It is user-centered:** users participate in the creation of the content and services meant as washing programs and concerning features. The consumption and creation of content is dynamic.
2. **It provides a multi-media experience:** the adaptive and plenipotentiary interface is a smart phone application. The user can select the washing programs features (i.e. temperature, material, drying cycle, delay time) and number of programs to have on the machine.
3. **It is socially rich:** All the washing programs created by the users will be stored on a DB. The user can vote the efficiency of the washing process: programs and their votes are published on the on-line Washipedia. The programs' web-presence includes users' presences.

4. **It is communally innovative** The Washipedia is on of the single most important aspect of Moon 2.0. It rests on the foundation of washing programs DB as a community service, allowing users at effectively utilizing information. If you want to find the best washing program for a special type of material, you can download on your mobile the program with the highest rank on the Washipedia, and then update the washing machine.

3.1 The human-understandable artifact

Ubiquitous computing is concerned with bringing the same degree of naturalness of interaction to the computers and devices that are currently proliferating our environments. Hence, ubiquitous computing systems allow people at focusing on what is really important, for example their actual tasks, rather than concentrating on the time-consuming steps of operating the system to perform these tasks [7]. The 2.0 washing machine concept should not be confused with an hand held personal home assistant capable of controlling a wide range of electronic home devices. The smart phone behaves the intelligence of the washing machine and offers the user endless customisation possibilities for the machine. But the user owns both authority and autonomy on the overall systems, avoiding in this way the automation drawbacks [8].

3.2 Architecture overview

The architecture of Moon 2.0 prototype we realized is composed by:

- Washing machine without any commands or controls
- PC
- iPhone

The connection between the machine and the iPhone was assured by a Wifi network towards the pc. Then the Pc communicates directly with the washing machine through an hardware Bluetooth key. The reason behind this architecture is that when the prototype was realized, the iPhone model we had, had only the Wifi connection and not the Bluetooth one.



Figure 1 On the left the Moon 2.0 washing machine with no user controls. On the right the Moon 2.0 totally customizable user interface implemented in a real iPhone

3.3 Continuity and deep affordances

The literature explains how affordances derived from well-known and widely used technology encourage a more proactive use of new technology. In this case affordance stands for the elements mainly embodied in the user interfaces which suggest how a technology may be interacted with [9][10]. Moreover, the *Continuity Affordances* (CA) stand for old elements that could be introduced into new technologies user interfaces with the aim of improving the recognition of the new functions and functionalities and reducing the barriers in the new technology access, mainly for non-expert users [11]. In the case of Moon 2.0 the concept of CA has been partially reviewed: the old and strengthened

elements of the washing machine HMI have been transferred into a new device, the iPhone, but the difference is the final aim, that is to improve the efficacy of use of the older device (washing machine) instead of the newer one (iPhone). In this way the older technology affordances have been empowered by the affordance of the newer technology, partially reversing the CA. This step beyond continuity affordance lead towards the new concept of *deep affordance*.

3.3.1 Back to a new HMI concept

The washing machine of tomorrow will look more like the washing machine of yesterday. The absence of controls on directly on the machine brings back to a new HMI concept, where customisations, adaptability and endless updating are the *leitmotiv*. The HMI implemented in the iPhone allows at choosing among four different type of washing machine:

1. **Current Moon** (Moon attuale): the user can choose among a restricted set (four) of the most used washing programs with predetermined features (i.e. strong wash, soft wash, ecc.)
2. **Moon +**: this is a standard machine with a wide set of programs. The user can modify the program features (temperature, drying cycle, delay, ecc), stop the wash and monitor the residual time. In fact Moon +, compared to standard machines, adds the watch function, that is managed as an MP3 file. The stop and delay functions are performed dragging the time bar.

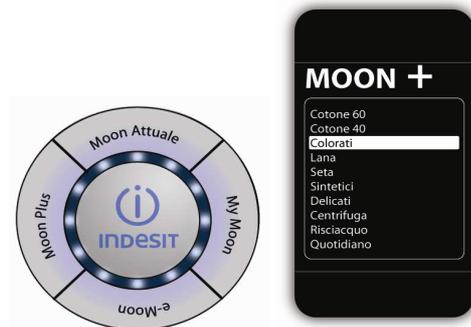


Figure 2 Current Moon and Moon + user interfaces

3. **e-Moon**: among all the available washing programs features, the user can choose which ones he wants to set for each wash, exactly like the interaction with a tool bar. For example the user can decide for each wash to set only the temperature and not the drying cycle, using for this features the standard parameter. At the end of the wash the user can vote the wash and send it to the Washipedia, thanks the Internet connection of the iPhone.
4. **My Moon**: it is the answer for the user that doesn't know how to precede or what programs features set to do his/her washing. S/he can search the answer in the Washipedia and download the washing program with the highest rank, with a Google-like interaction.



Figure 3 e-Moon and My Moon user interfaces. In the figure on the right the MP3-like stop and delay function is visible

4 CONCLUSIONS

The acceleration of rhythm of everyday life calls for growing demands of efficiency and flexibility in daily routines; increasing also the search for experiences and meanings. The project Moon 2.0 by Indesit Company presents alternative ways of producing household appliance services developing a 2.0 HMI and programs setting unit for washing machines, totally manageable by smart phones or iPhones.

Since a computer technology plays the role of a social actor, also a washing machine connected to the World Wide Web can improving the quality of our life making a deep-specialised and precious know-how freely available to all. In this way we can consider the Washipedia as an example of Positive Technology [12].

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