

> Understanding materials

Paula Alexandra Silva

Abstract

This paper describes my experience in teaching/researching HCI and Design. Additionally, it presents my beliefs as well as my concerns about teaching HCI. Specifically, I raise attention to the importance of understanding materials while designing.

Introduction

HCI is a multi interdisciplinary subject, relating computer science with many other fields of study and research, such as psychology, aesthetics, anthropology, cognitive science and design, among many others. But, in short, HCI is about the study of interaction, between people (users) and computers.

People, as well as computers, are characterised by a great level of complexity and, if the human is more stable, technology is rapidly changing. The framings of this reality constitute a challenge for us, educators, practitioners and researchers, demanding our permanent attention to: i) what is being developed or is about to be developed; ii) the methodologies we are using; or iii) the goals we are aiming at. In fact, if we do not grab this challenge with enthusiasm it can convert into a problem.

In this paper, I share my beliefs and concerns about HCI and Design, calling particular attention to the usage and understanding of materials in creative/innovation contexts.

Who am I?

I am a Phd Student at Lancaster University, working with Professor Alan Dix. I am interested in understanding how usability can be done in a way that it not only preserves creativity, but also enhances it. This has particular relevance if we consider the new paradigms of interaction design, in which innovation plays a particular role. My interests spread over three main activities: teaching, consultancy on usability evaluation, and developing research for a European project. As a teacher for 7 years, I have taught various disciplines, such as: multimedia, design, databases or informatics for management, on graduate and post-graduate courses. And this is a facet of palexa's history, a Portuguese girl that loves life...

What is my contribution?

For the CONVIVIO Faculty Forum "Teaching Design for HCI" I can only bring my recently-acquired experience, accompanied by my young questioning spirit. Therefore, I will not present a well defined design exercise or methodology, but my beliefs, based on a set of personal findings, observations and exchanged experiences. Additionally, as an enthusiastic teacher I bring my concerns on teaching design and HCI, some of which I wish to discuss during this Forum.

My contribution will focus on the several materials available to use with and in novel computer based systems and its potential uses and appliances.

Understanding Materials

New paradigms of interaction need innovation [4]. In fact, there is a full new set of applications that are currently appearing that are not merely technological and therefore require new design approaches. And, in fact, sometimes we do not need to invent new objects; what



Figure 1: Static mobile phone charger



Figure 2: Crackers features

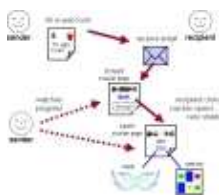


Figure 3: How virtual crackers work



Figure 4: Pin&Play materials

we do need is to look at the ones we already know and have and (re) apply them in different forms or contexts.

This sometimes requires design team members to step back and rethink their projects or even to think out of the box in order to create new ones. There are several techniques to promote these tasks, such as deBono six thinking hats [1] or BadIdeas [4]. Amongst others, these creativity techniques can be used not only to encourage critical and divergent thinking, but also to explore design in new domains in interaction. Often, this process involves two important activities that occur in subsequent phases, one divergent and another convergent¹; one of exploration of ideas and another of implementation of one selected idea.

As in the BadIdeas technique, thinking of the potential uses of materials implies a deep analysis and understanding of its properties, characteristics and affordances. This can be done by simply questioning what materials are available and are potentially usable, why, when and how or... why not, when not or how not to use them.

For instance, can we have a mini foldable map that can be stored in our pockets that shows us where the nearest ice-creams shops are as well as the quickest path to our destination? My answer is: Definitely yes and it would be really useful! We just need a bit of smart paper with a small memory chip that can be customised at home, before our trips to unknown places (like Graz, for a Portuguese ...)

But similarly, and maybe more important, that decision and creation process should be done in a free open mind, because unlike what happens with conventional software engineering, things are not well defined from the beginning and sometimes happen as insight or as a result of on going and just in time experience.

Some Examples...

In this section, I present three examples, wherein the comprehension of the materials' characteristics and properties demonstrated particular significance. Simultaneously, I perform a brief analysis of the context in which these occurred.

A low-power, one-second call-time, static mobile phone charger, with free nylon carpet for use in the wild

This example was extracted from the results of the Chindogu Scrapheap Challenge, an event that was held as part of a LeonardoNet Workshop in November 2005 [6] and that was used as an 'opportunity experiment' to study creative groups at work. During the workshop, 16 of the 20 participants were divided in three groups and given HCI themes. Within a day, they had to create a design and prototype faithful to the spirit of Scrapheap² and Chindogu³. Design solutions used materials either provided by the organising committee or found by the groups.

In the context described above, one of the groups proposed a low-power, one-second call-time, static mobile phone charger for use in the wild (see Figure 1), that unlike others does not need to be wound up. Static electricity was generated from a nylon carpet and would be enough to charge the mobile phone for one second of connectivity.

To build the low-power, one-second call-time, static mobile phone charger, the group used: empty CD boxes, kitchen foil, a campervan carpet, wires, a small battery, a mobile phone, sellotape, a capacitor and rope. The nature of the exercise did not require a fully working prototype, but the understanding of characteristics and functions of the materials used to implement the prototype is clear. For instance, in the list of used materials, there is a capacitor⁴, needed to transform the static energy in energy that can be used by the mobile phone.

This example may sound weird or/and impracticable, but it does solve a problem and creates an opportunity of development. Additionally, the "creation" process produced a great sense of achievement as well as enthusiasm and fun, as the following dialogue between group

as enthusiasm and fun, as the following dialogue between group members demonstrates:

x: "Wow... Yeah... That would be really useful... To charge up our phones... We could communicate while we are in the wild..."

p: "Wow... A phone charger on static energy from nylon carpet... It's not a bad choice!...The spot! In the wild!"

x: "So when you charge you don't get so much energy, so my guess is that it will give us a second of energy to talk..."

Virtual crackers

The virtual crackers came out of Alan's research regarding the importance of deconstruction and reconstruction as a technique for understanding interactive experience and then applying it to the redesign and recreation of experience on new media [2], [3].

The table below shows the features of both real and virtual crackers and its mapping. As we can observe, each relevant property of the experience with the real crackers has its (possible) correspondence in the virtual version.

Figure 3 illustrates with a schema how the virtual crackers work, reflecting the deconstruction of the experience of real Christmas crackers and its reconstruction in a web version. The recreation process of the crackers experience in a new medium demanded a deep understanding of the materials involved, in both reference and virtual world.

Pin&play

Pin&Play [7] was a one year project (2002-2003) sponsored by the IST-FET programme of the European Commission, based at Lancaster University. It consists of a new approach of ad-hoc networking among objects that people can attach to large surfaces, such as walls and notice boards. Those augmented surfaces are implemented with low-cost conductive material, creating smart surfaces that can be used as communication medium. The objects are attached to such surfaces by means of simple pin connectors, to provide users with a familiar mechanism for adding objects to the network.

Besides the inherent usefulness of such smart surfaces the aspect I would like to detach here is the way the idea emerged and was implemented, especially into what respect to the materials used.

The idea of Pin&Play came out at a coffee break, while some of the members of the UbiComp group were talking about using pins as connectors. This theme led to the idea of combining pins with textiles that can conduct electricity. The result was a novel technology that actually has sensible applications.

Concerning the implementation and the material used, we noticed that most of them were definitely not originally from a computer science domain, but, as we can observe in Figure 3, from textile, medical and playing domains.

From my point-of-view, it was the ability of the researchers to understand the materials and its properties, apart from its original domain, that made this project possible.

Discussion

The examples provided demonstrate the importance of comprehending materials in its diverse perspectives in order to make the best use of it. In the first example, materials appear as constraints that, in a second stage, work as prompts for new designs. In the second example, the material properties and its conditions/environment have to be understood in order to be recreated in the virtual context. Finally, in the third example, materials appear as inspiration, prompting new ideas by re-applying existent materials in completely different domains.

Conclusions

In this position paper, I reflected about the importance of understanding materials and their various appliances for design. Additionally, I provided three distinct examples of design situations in which the understanding of materials played a significant importance.

Finally, and getting back to the challenge I refer to in the introduction of this document, I would like to try to approach the challenge (before it converts into a problem), saying that:

As practitioners and researchers, we should permanently feed our questioning minds and spirits, to make them fitted and ready to accept and evolve along with the present changing environment.

As educators, besides following the example of practitioners and researchers, we are also responsible to promote, even provoke, exciting, engaging and vivid experiences in our students. By doing this, we will be fostering the creative and innovative minds they have (whether they discovered it already or not).

Acknowledgments

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¹ See also [5].

² *The Scrapheap Challenge is an engineering game show produced by RDF Media and broadcasted on Channel 4 in the UK. In the show, teams of contestants have 10 hours to build a working machine to perform a specific task, using materials available in a scrapheap.*

³ *Chindogu is the Japanese 'art' of inventing ingenious everyday gadgets. These gadgets appear to be clever solutions to a particular problem, however, anyone actually attempting to use a Chindogu invention would find that it causes so many new problems or such significant social embarrassment, that effectively it has no utility. Thus, Chindogu are sometimes described as 'unuseless' i.e.: they cannot be regarded as 'useless' in an absolute sense, since they do actually solve a problem, however, in practical terms, they cannot*

positively be called "user". (See website.iineone.net/~sobriety for details and examples)

⁴ A capacitor is an electrical device that can store energy in the electric field between a pair of closely spaced conductors (called 'plates'). When voltage is applied to the capacitor, electric charges of equal magnitude, but opposite polarity, build up on each plate. In this case the capacitor was formed by the aluminum foil wrapping CD cases.