Augmenting Fun and Beauty: A Pamphlet

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ABSTRACT

In this article we describe how the augmented reality and product design communities, which share the common interest of combining the real and the virtual, might learn from each other. From our side, we would like to share with you some of our ideas about product design which we consider highly relevant for the augmented reality community. In a pamphlet we list 10 sloganesque points for action which challenge the status quo in product design. Finally, we present some projects which show how these points could be implemented. We hope this approach will inspire those involved in augmented reality design and help them to avoid the pitfalls that the product design community is now trying to crawl out of.

Keywords

augmented reality, usability, perceptual-motor, emotion, aesthetics.

INTRODUCTION

Augmented reality bridges the physical and virtual worlds. While for people with an HCI background, the physical aspect is often new ground, the physical has of course always formed an essential part of product design. Virtual aspects are gaining foothold in product design, as more and more electronics are embedded into products and the distinction between products and computers becomes blurred. So product designers too are trying to cope with unifying the real and the virtual, they only approach the matter from a different background. These days product design is said to take man, not technology, as its starting point. The talk is all about user-centred design. But what does this mean? We think that user-centred design should be interpreted as showing respect for man as a whole. For the sake of analysis, man's skills, which are used when interacting with products, may be considered on three levels: cognitive skills, perceptual-motor skills and emotional skills. In other words, knowing, doing and feeling. Research on human-product interaction, however, has shifted to cognitive skills. This shift is easily understood, as there is no electronic counterpart for the mechanical world-view that still dominates Western thinking. We understand the world of moving machines, since we consider, to a certain extent, our

bodies to be mechanical machines. The electronic world is more opaque to us. What happens inside electronic products is intangible: it neither fits the mechanics of our body nor the mechanical view of the world. In contrast with mechanical components, electronic components do not impose specific forms or interactions for a design. Products have become 'intelligent', and intelligence has no form. Design research, quite naturally, turned to the intelligent part of humans and thus to the science of cognition to find answers. This has resulted in interface design placing a heavy burden on human intellect. For example, designers start grouping and colour coding related functions, adding displays with an abundance of text and icons, and writing logically structured manuals. In our opinion the design of electronic products has got stuck as a result of this cognitive approach, which neglects the user physically and emotionally. We think that such an approach, which mainly addresses the rational and quantifiable human skills, simply does not cut it. Augmented reality could play a role in restoring the balance in addressing all of man's skills.

AUGMENTED REALITY THROUGH A DESIGNER'S EYES

In the world of software, augmented reality is often presented as a way of introducing real, tangible objects in an otherwise virtual world. The introduction of tangible components allows HCI designers to address perceptual-motor skills which are neglected in a purely virtual environment. From a product design perspective, however, tangibility is not the most challenging concept within augmented reality. Clearly, unlike software, electronic consumer products are tangible to start with. What is new is not so much the tangibility of the interaction as the *richness* of the interaction. Regardless of function, controls of current electronic products not only look the same, they also require the same actions (Figure 1). Rows of identical looking buttons, all require pushing. Similar looking sliders all require sliding. Users are very capable of distinguishing between the functionalities of everyday objects on the basis of differences in appearance and interaction, but when these differences are eliminated and everything looks and behaves the same, things become difficult. This is exactly what happens in electronic products and is a major factor in today's usability problems. Augmented reality offers designers of electronic products the powerful notion that we can interact with electronics through everyday, real objects, with their inherent richness of interaction. For example, while product designers are often pre-occupied with creating a single, integrated product, the tagging developments in augmented reality show the new

possibilities offered by products that consist of multiple, communicating units.

Figure 1   (Left) Controls of current electronic products not only look the same, they also require the same actions.
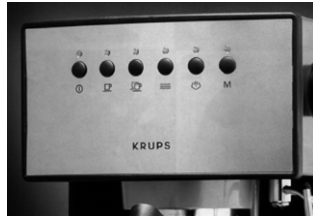
Figure 2   (Right) The current aesthetic sacrifices expressiveness to achieve a unified and aesthetically pleasing whole.

CHALLENGING THE STATUS QUO

So how do these ideas relate to the status quo in product design? Here we present a pamphlet for action.

1. Don't think products, think experiences.

Users are not interested in products, they are in search of challenging experiences. Therefore the designer needs to create a context for experience, rather than just a product [8]. He needs to offer the user a context in which he may enjoy a film, dinner, cleaning, playing, working with all his senses. We talk of creating a context for experience rather than just an experience, because we cannot impose a particular experience on a user, who is bound to explore the design in his own manner [10]. A design should offer the user the freedom for building his or her own experiences.

2. Don't think beauty in appearance, think beauty in interaction.

Usability is generally treated separately from aesthetics. Aesthetics in product design appears to be restricted to making products beautiful in appearance. As the ease of use strategies do not appear to pay off, this has left us in the curious situation that we have products which look good at first sight, but frustrate us as soon as we start interacting with them. We think that the emphasis should shift from a beautiful appearance to beautiful interaction, of which beautiful appearance is a part. Dunne [4] too talks of 'an aesthetics of use': an aesthetics which, through the interactivity made possible by computing, seeks a developing and more nuanced cooperation with the object - a cooperation which, it is hoped, might enhance social contact and everyday experience.

3. Don't think ease of use, think enjoyment of the experience.

Current efforts on improving usability focus on making things easier. However, there is more to usability than ease of use. A user may choose to work with a product despite it being difficult to use, because it is challenging, seductive, playful, surprising, memorable or rewarding, resulting in enjoyment of the experience. No musician learnt to play the violin because it was easy. Bringing together 'contexts for experience' and 'aesthetics of interaction' means that we do not strive for making a function as easy to access as possible, but for making the unlocking of the functionality contribute to the overall experience.

4. Don't think buttons, think rich actions.

The controls of the current generation of electronic products, whether physical or screen-based, require the same actions. By increasing the richness of actions, controls cannot only be perceptually differentiated, but also motorically. Here again the goal is not differentiation for differentiation's sake, but the design of actions which are in accordance with the purpose of a control.

5. Don't think labels, think expressiveness and identity.

Not only do current electronic products themselves look highly similar, their controls, whether physical or screen-based, also are often hard to tell apart. This has made it necessary for controls to be labelled with explanatory texts and icons, which are either illegible or unintelligible, regardless of whether they are physical or screen-based. We think that instead designers should differentiate between controls to make them look, sound and feel different. More importantly though, this differentiation should not be arbitrary. The formgiving should express what purpose a product or control serves. This would require a replacement for the current aesthetic with rows of identical controls which so heavily relies on repetition as a means to a achieve a unified and aesthetically pleasing whole [2], for which the expression of the individual controls are sacrificed (Figure 2).

6. Metaphor sucks

The use of metaphor has become common place in both HCI and product design. 'We could use a such and such metaphor' is an often heard statement. We think the usefulness of metaphor is overrated. When trying to describe a design in absence of the thing itself it maybe necessary to rely on metaphor. But this does not necessarily mean that whilst interacting with the product the user understands the design through one single, consistent metaphor. Gentner and Nielsen [7] and Gaver [6] also point out the limits of perfect fitting metaphors. The challenge here is to avoid the temptation of relying on metaphor and to create products which have an identity of their own.

7. Don't hide, don't represent. Show.

Current product design has a tendency to hide the physical components, even those which are highly informative to a product's operation. A choice is made in favour of an alternative representations rather than physical manifestation. For example, a video tape becomes completely hidden inside a video recorder when inserted and is then represented on a display (Figure 3). In photocopiers paper is put inside drawers so that we need sophisticated displays to tell us which paper format lives where. It is the designer's task to make these last remaining physical hold-ons visible and make optimal use of them in the interaction process.

8. Don't think affordances, think irresistibles.

Both the HCI and product design communities have borrowed the term affordances from perception-psychology and have hooked onto mainly its structural aspects whilst neglecting the affective aspects. We lament this clinical
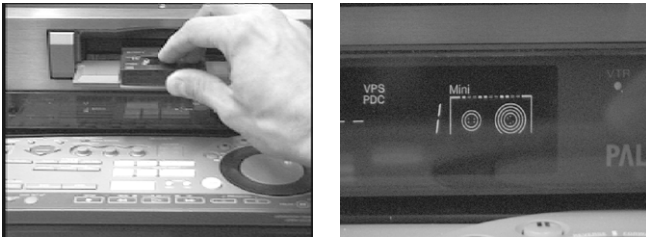
Figure 3 First the tape is hidden completely inside the machine, to be then represented on a display.

interpretation of affordance. People are not invited to act only because a design fits their physical measurements. They can also be attracted to act, even irresistibly so, through the expectation of beauty of interaction.

9. Hit me, touch me, and I know how you feel.

We may slam doors in anger, chew a pen or write with it frantically, sip our coffee or gulp it down in haste. If we design products which invite rich actions, we can get an idea about the user's emotions by looking at these actions [11]. Triggered by the work of Damasio [1] designers are becoming aware that emotions are not a luxury, but a necessity in rational decision making. Often this is translated into a need for sensors for physiological measurements, such as heart rate, blood pressure and skin conductivity [9]. We think the interaction with physical objects opens up other ways of detecting the emotional state of the user. Our interaction with the real world expresses our emotions.

10. Don't think thinking, just do doing

HCI methodologies often separate the cognitive, verbal, diagrammatic and abstract 'thinking' design phase from the visual, concrete, 'doing' phase, and emphasize the former. In product design, 'doing' is seen as equally valid as thinking and as beneficial to the design process even in the very early stages. Handling physical objects and manipulating materials can allow one to be creative in ways that flow diagrams cannot. In the design of the physical, knowledge cannot replace skills. You can think and talk all you want, but in the end, the creation of contexts for experience, the enjoyment and the expressiveness require hands-on skills.

PROJECTS

In this section we illustrate the previous points through the work of PhD and masters students in Industrial Design Engineering. Of course, none of the examples illustrate all of the points equally well, some even fail miserably in some respects. Still, we think that on one or more points they all have something valuable to offer.

Appointment manager

Figure 4 shows an electronic appointment manager, a masters project by J.W. Frens [5]. It was designed for a hedonistic, polyandrous twenty year old woman, who tries to juggle relationships with multiple boyfriends who may not learn of each other's existence. Picturing this extreme character has enabled Frens to let go of the stereotypical PDA aesthetic which is tied to office work and business people, and has led to a product which aims for a completely different

experience. Multiple folding screens invite playing and the interface is completely pictorially oriented, using pictures for defining persons, events and locations. Frens aimed to design a device which supports the woman in her polyandrous behaviour. This is done by means of a public mode (all screens folded in, only the top screen visible) and a private mode (all screens folded out and visible), which allow her to shield appointments as appropriate. To be able to manage the woman's appointments, the device needs to have some knowledge of her feelings about an appointment. Through the playful positioning of the screens, the woman can rate and compare her boyfriends on a fun-profile with issues such as dining, shopping, partying, sex etc. Frens has adopted a model for navigating time which uses a coupling between the rotary dial and the circular flow of characters over the screen. This makes for a beautiful aesthetic of interaction, a pleasurable act in itself.
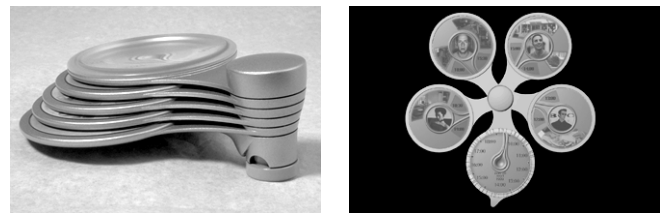

Figure 4 Appointment manager.

Videodeck

In this design for a videodeck, Djajadiningrat [3] keeps the cassette visible instead of hiding it and explores the consequences for the interface. Figure 5 shows a small selection of functions which can suddenly be related to the tape, instead of being activated through meaningless buttons.
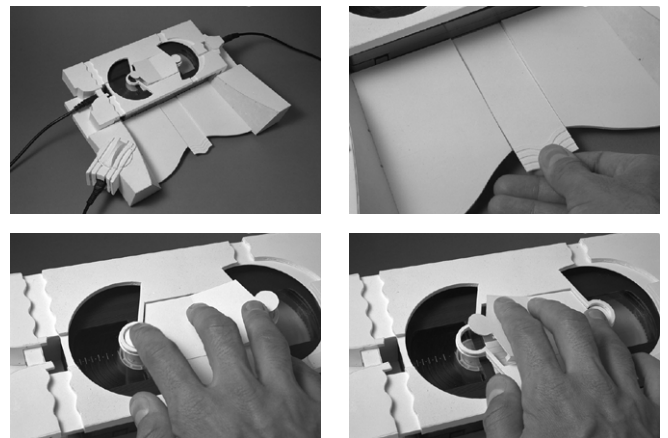

Figure 5 Starting top-left clockwise: the cassette remains visible whilst in the machine, pulling a ribbon triggers eject, and fast-forward/reverse becomes intuitively clear through a toggle placed between the tape reels (The design was entered by J.P. Djajadiningrat for a design competition organized by the Sekisui Design Corporation (Japan) in October 1997).

Cubby

Most 3D systems tease the user by showing highly lifelike virtual objects locked away behind a monitor screen where he cannot reach them. The virtual objects may not be locked out

of sight as in the video example, they are locked out of direct interaction, again forcing upon the user an awkward substitute for what should be everyday skills. Cubby, a desktop VR system, unifies the display and manipulation spaces, effectively overlaying the real and virtual worlds [3]. Virtual objects can be manipulated at the place where they appear by means of an augmented instrument, which features a physical barrel and a virtual tip (Figure 6).

Figure 6   In Cubby the user can manipulate virtual objects at the place where they appear by means of an augmented instrument.

Alarm clocks

During the last run of the practical Form Theory 1, 2nd year students were asked to design an alarm clock. Current alarm clocks wake the user in the same way, regardless of the situation. Whether the user needs to catch a flight early in the morning or wishes to wake up for a relaxed sunday morning, he or she is always woken with the same sound. In this practical we asked students to design an alarm clock which adapts the waking experience to the situation. Figure 7 shows an alarm clock designed by K. Geers and P. Wirtz of which one hand is detachable. In the morning the user can detach the hand and wear it as a pendant which acts as a small sound-recording device. During the day she may record an appropriate sound which reflects her mood. In the evening, the hand can be re-attached and the next morning the alarm clock will wake the user with the stored sound. The design does not work with pre-recorded waking sounds which are imposed on the user, but allows her—at least to a certain extent—to create her own experience. Figure 7 also shows a design by H.C. Van Es and M.G. Hillen which plays with the notion of rich expressiveness. It features five settings for waking up sounds. Instead of meaningless controls, the designers have opted for five objects which differ in their expression. Varying from a very soft and fluffy texture to a spiky, aggressive texture these spheres try to express the associated sound while simultaneously offering a new and playful aesthetic.
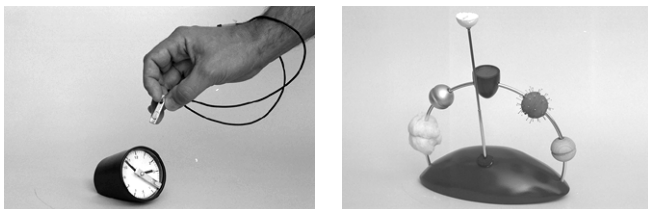

Figure 7   The audio-storage hand (K. Geers and P. Wirtz) and the design with the expressive forms (H.C. Van Es and M.G. Hillen)

While the previous examples are all appearance models, we are currently researching the detection of emotional behaviour through a alarm clock test rig [11]. From the way the user presses the snooze button, the alarm clock draws conclusions about the emotional state of the user so that it can adapt its behaviour

CONCLUSIONS

We hope that the augmented reality community will avoid the pitfalls that product design is now crawling its way out of. We watch some developments with unease though. For example, often the tagged objects in augmented reality systems all look identical. This is very similar to the rows and rows of identical buttons problem in design. If designs are to be truly user-centred then they need to show respect for man as a whole, including his perceptual-motor and emotional skills. In accordance with this viewpoint, we think design should not be led by technology, but by ideas which show respect for all of man's skills. We strongly feel that the augmented reality community should embrace industrial designers and allow them to play a leading role in the idea phase, instead of looking upon industrial design as an afterthought.

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