Slow Technology – Designing For Reflection

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Slow Technology – Designing for Reflection

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Abstract: As computers are increasingly woven into the fabric of everyday life, interaction design may have to change – from creating only fast and efficient tools to be used during a limited time in specific situations, to creating technology that surrounds us and therefore is a part of our activities for long periods of time. We present *slow technology*: a design agenda for technology aimed at reflection and moments of mental rest rather than efficiency in performance. The aim of this paper is to develop a design philosophy for slow technology, to discuss general design principles and to revisit some basic issues in interaction design from a more philosophical point of view. We discuss examples of *soniture* and *informative art* as instances of slow technology and as examples of how the design principles can be applied in practice.

Keywords: Design; Human-computer interaction; Informative art; Slow technology; Soniture; Ubiquitous computing

1. Introduction

As the use of a certain kind of object changes, there is often a need to reconsider the principles behind its design. Often, this leads to an extensive pluralism in terms of design principles and goals as the many situations and user groups have incompatible demands and expectations. Until recently, the main purpose of information technology has been to make people more efficient when carrying out certain tasks. This is, given the background of computers in office automation and efficient scientific calculations, a highly reasonable design agenda. However, as information technology now is being used far outside its origin in the office environment and scientific computation centres, and no longer by a selected group of business professionals and scientists, new demands on the design of such technology arise.

Computers have, for instance, been used in entertainment for a long time. Computer games are now one of the driving forces in hardware development. Artists and composers frequently use computers as medium of expression, creating genres such as interactive art and electro-acoustic music (cf. [1,2]). These areas of use have posed special demands on the technology, leading to the development of special interface components such as joysticks, drawing tablets and MIDI keyboards. Development of specialised interface components is now an important part of HCI research (cf. [3]). Still, much development has been concentrated on the computer as a tool to be used in specific situations to accomplish a certain task.

When computers become increasingly ubiquitous, some of them will turn from being tools explicitly used in specific situations to being more or less continuously present as a part of a designed environment. One of the aspects of this transition is that the time perspective changes from simply encompassing the moment of explicit use to the longer periods of time associated with dwelling. We can compare this with the use of a chair: designing only for the situation when a person is actually sitting down is quite different from designing for the long periods of time during which people only sometimes sit down in the chair, when the chair is used as a part of the environment. The second case implies that not only the affordance of being able to sit upon is of relevance, but also the aesthetics of its design, its integration with the rest of the environment, etc.

Researchers have worked on a variety of aspects of the integration of computing technology and the physical environment (cf. [4]). *Ubiquitous computing* is concerned with how to support people with the relevant computational resources wherever they are [5]. Work on *augmented reality* has been exploring how digital information can be superimposed on, and integrated with, real-world objects and environments (e.g. [6,7]). Examples of *calm technology* [8] and *ambient media* [9] have been designed to

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Fig. 1. Three pieces of informative art.

allow for a smooth integration of digital information and physical space, taking advantage of human peripheral attention. For instance, a number of novel information displays that aim to reduce cognitive load and give users more background access to information have been developed [10–12].

Calm technology and ambient displays are designed to reside in the periphery of our attention, continuously providing us with contextual information without demanding a conscious effort on our behalf. However, we believe that we do not only need to create calm technology, we also need actively to promote moments of reflection and mental rest in a more and more rapidly changing environment. There is clearly a challenge for new technology to answer this call.

2. A Design Philosophy for Slow Technology

Design-by-drawing, the traditional design method, depends almost completely upon accurate modelling of dimension in space. The time dimension, if we may call it that, is left to take care of itself. As the scale of designing is increased (from the designing of objects to the designing of systems, programs, flows, communications, communities, and the like) the way things are used, their life-cycles, become as much designed as do their shapes. At this point designers need to acknowledge their relative ignorance of ''temporal design'' and can perhaps learn from the ''time arts'' (music, dance, theatre, film, novel, poetry, etc) how to compose-in-time with some sense of beauty. To design in time is, more so than when designing objects, to design life itself, the very form of existence, and surely calls for a gentler touch than can be felt in the insensitive forms of our production-systems, legal-systems, time-tables, schedules, distribution-systems, etc.

J.C Jones [13, p. xxxii]

Interaction in environmental design has a natural foundation in how we understand and relate to the environment. We continuously change our behaviours in response to the environment, thereby in turn also changing the environment. Architects, interior designers, artists and others have long been working on how technology and design can initiate such changes in various ways, but it is not until recently that issues in environmental design have gained interest in the HCI community (cf. [14,15]). What are the characteristics of information and computing technology that initiate changes towards a more reflective environment? One partial answer to this question is that such technology is *slow* in nature.

Imagine an electronic doorbell that plays short fragments of a very long melody each time we press the doorbell button. To fully grasp the doorbell through its behaviour, we have to stop and reflect for a moment each time it rings and only over time can we grasp the whole melody. It is technology that claims time. Is this "slow" doorbell a better doorbell than the ordinary one

playing the same two or three tones over and over again? The difference in aesthetics between the two doorbells is a difference in philosophy of design; the "slow" doorbell is not designed to be "just" an efficient signalling mechanism for non-reflective use, but rather an artefact that through its *expression* and slow appearance puts reflective "use" in focus. It is a doorbell designed for reflection in a world of expressions using time and presence as key parameters.

We can compare the two doorbells with, say, the distinction between fast-food such as ready-made hamburgers and a gourmet meal. In both cases it is food to eat, but there is a fundamental difference in appearance. While the readymade hamburger is all about fast, efficient uniformity – the mechanisation of eating – gourmet cuisine is slow food, in terms of both preparation and eating, which invites us to reflect on the art of cooking as well as the art of eating. It is in a certain sense a question about functionality versus aesthetics.

There is an analogous distinction between fast technology and slow technology. Good design of tools used for certain specific purposes may be characterised in terms of ease of use, fast learning, efficiency, immediate "visible" results, etc (cf. [16]). This is *fast* technology: efficiency in functionality with respect to a well-defined task. With fast technology we aim to *take away* time. We aim to take away time both in terms of making the user more efficient when working (the task taking less time) and making the artefact as such as fast and easy to use as possible; we ask ourselves questions such as how long it takes the average user to perform a certain action or to learn how to use the given technology. For instance, the time needed for a long journey abroad to meet somebody can be taken away by a single phone call; the time for reflecting on the syntax of language may disappear through a single mouse click in a word processor. Now, technology can also be *slow* in various ways as it takes time to:

i) learn how it works
ii) understand why it works the way it works
iii) apply it
iv) see what it is
v) find out the consequences of using it.

The reason for this slowness might be bad design or complexity of tasks. Such unintentional slowness often results in frustration on behalf of the user. But i–v could also be a description of the basic and intentional slowness in learning/understanding (i and ii) and in presence (iii, iv and v) of a work of art, a piece of music or any other object designed for reflection. All design with deep roots in art is concerned with amplifying the presence of things to make them into something more than efficient tools for specific, well-defined tasks [17,18]. The expression of design then invites reflection, but it is slow technology only with respect to true use of a certain thing; time and/or reflective presence are not necessarily key design notions.

Slow technology is technology that is slow in various degrees in respect to i–v. What is important to note here is that the distinction between fast and slow technology is not a distinction in terms of time perception; it is a metaphorical distinction that has to do with time presence. When we use a thing as an efficient tool, time disappears, i.e. we get things done. Accepting an invitation for reflection inherent in the design means on the other hand that time will appear, i.e. we open up for time presence.

A key issue in slow technology, as a design philosophy, is that we should use slowness in learning, understanding and presence to give people time to think and reflect. Using such an object should not be time consuming but time productive; we should get time for new reflective activities. It is not technology for compressing time to do given tasks, but technology supplying time for doing new things. It is technology that is useless for fast and impressive demos; to see what it is takes time.

Slow technology *can* be technology where the aesthetics of functionality, i.e. the expression of functionality as such rather than its objectives, are in focus. It is design concerned with how we relate to the expression of technology itself as we use it to do certain things. The functionality of a doorbell is concerned with telling us that someone is at the door and wants us to open it. Our "slow" doorbell is designed with a focus on how we relate to the possible expressions of this doorbell-functionality. Here, slow technology design is applied aesthetics, the aesthetics of presence, inner design logic, use, basic technology, reflective content, etc. Slowness then comes as a consequence of a techno-aesthetical design philosophy that focuses on reflective and conscious use of the technology as such. Slow

technology *can also* be technology where slowness of appearance and presence simply is inherent in the design for various reasons beyond pure aesthetics of functionality, design where time is a central and explicit notion. This is technology with focus on time presence.

If slowness comes as a result of the concentration on aesthetics, it might well be that the given thing at the same time is an effective tool, i.e. slowness comes from reflection on aesthetical aspects and changing perspective but we use the same thing to accomplish a given task efficiently. The delicate handicraft and design of a mechanical watch invites us to reflect on technology making it slow in appearance, but we also use the watch for fast access to time. We collect such watches as a pure act of reflection on technology. In a certain sense we "use" things in different modes as we switch back and forth between a slow and a fast perspective. There is nothing strange with this as we design things that somehow have a definition in terms of functionality.

Slow technology shares the interest in a tight integration between computational media and the rest of the designed physical environment with approaches such as calm technology and ambient media. However, slow technology differs in that it is *not* supposed to reduce cognitive load or make digital information and computational resources more readily available. Slow technology is not about making technology invisible, but about exposing technology in a way that encourages people to reflect and think about it. This design challenge is, among other things, a call for more conscious aesthetics in technology [3,19,20], i.e. technology is not just solutions to specific technical problems, but also provides things with specific expressions situated in our living environments.

3. Examples and Projects

Typical examples of artefacts made to encourage reflection are art and music, especially as found at art exhibitions and in concert halls. In slow technology, however, the use of nearly ubiquitous information technology in everyday life is in focus. Transitions, back and forth, from these traditional places designated for reflection and meditation to everyday-life environments are often present in environmental design. A house is built as part of our everyday-life environment, but at the same time its architecture, interior design, etc. can be conceived as works of art. We can change our perspective by looking at the house as an art object and not just as a building in which our office is situated. Then, the house is no longer "just" a heated place that keeps the rain out, where we can sit down and do our work, but is also a complex unity of interesting expressions of which many have their roots in the reflective environments of artistic work. In these transitions from the "art-world" to the "everyday-life-world" we bring certain aspects of the expression of things as art objects to the design of everyday things. In the design programme of slow technology we have in mind, we have distinguished three such aspects – *reflective technology*, *time technology* and *amplified environments* – each making up a specific design theme in the programme.

3.1. Reflective technology

This theme concerns the design of technology that both invites reflection and at the same time is reflective in its expression. The basic challenge is to design technology that in its elementary expression opens up for reflection and asks questions about its being as a piece of technology. It is technology that could be awkward if it is used without reflection, i.e. if we just try to take it for granted as a "simple" tool.

Technology in its early development often has a functionality expression that reminds us of its own being as a specific piece of technology. The technology is "new", thus still an event and not yet perfect in functionality and slim design – just take the very first computer technology as a typical example. In these early stages of development awareness of the elementary expression of given technology is still present. Later on, this is something that often seems to be lost in the expressions of fast and efficient technology. Here, the call for slow technology is to use slow design expression as an instrument to make room for and invite reflection; to use a slow presence of elementary technology as a tool for making reflection inherent in design expression.

3.2. Time technology

This theme concerns the design of technology that through its expression amplifies the presence – not the absence – of time. The basic challenge is to design technology that somehow seems to

give us time for doing certain things. It should not be technology that is tiresome and time consuming, but technology that stretches time and slow things down. A good music instrument is typical example of such technology. If you master the art of playing the violin, a good violin is a piece of technology that through its expression in use, for example in playing a partita by Bach, certainly amplifies the presence of time. In these themes, the call for slow technology is to design technology that in true use reveals a slow expression of present time.

3.3. Amplified environments

This theme concerns the design of technological settings for the enlargement and *amplification* of given environments. With *amplified reality* [21] we mean the use of computers and other technologies to enhance the *expressions* and functionality of existing artefacts (or kinds of artefacts). A typical example is electronic audio technology such as the combination of microphones, amplifiers and loudspeakers that enables musicians to perform in ways that are not possible with non-amplified acoustical instruments. The basic challenge is to design settings that amplify the expressions of a given environment in such a way that it in practice is enlarged in space or time. The call for slow technology is to use slow design expression to amplify given environments in time.

Below, we present some examples of slow technology. The examples fall into two categories, *sonitures* and *informative art*.

4. Soniture

With *soniture*, we mean the more or less movable things in a room that give the room its sounds, the sounds that equip it for living and makes it into the particular room it is. (Compare with furniture: the movable things in a room that equip it for living, such as chairs, beds, etc.)

Sound is always the sound *of* something, or sounds *from* something. Something starts the patterns of air pressure oscillations that reach us as sounds. Some of these sounds and their sources define an environment; they constitute the sonitures of the given environment. Soniture can, for instance, be an old clock ticking and ringing, a refrigerator, a blender or a door where the hinges needs oiling. Soniture is, however, not only furniture, or the walls and the floor of a room – it can also be sound installations, people moving around and so on.

The absence of sound is a property of furniture and other environmental things as fast practical tools. Using the sound as a central property of material amplifies the presence of things and makes learning and understanding slower. Consider the "nightingale floor" of Japanese Shogun castles, a singing floor that was built to warn against intruders, or a rocking chair with a complex sounding behaviour. In these cases, the fact that using furniture, living in a house, walking on the floor, etc. all are a form of interaction with the environment is made more explicit through the use of sound.

If we think of the floor as a piece of soniture we view it as an instrument in the orchestra of a given room, the orchestra that plays all the familiar songs connected with the room; we focus on a certain elementary property of the floor as it continuously helps to build the room. Soniture is, just like furniture, an aspect of the presence and expression of things – thus soniture is not a name for "sonic furniture" [22]. Modern computer and audio technology has vastly increased the possibilities for the design of soniture. However, there are still many challenges when it comes to designing old-fashioned furniture with focus on the sound of material.

Designing soniture as slow technology can be a matter of using sound as one central property of material for building furniture or it can be a matter of using modern audio technology in combination with computing technology to amplify and redefine given environments (cf. "multimodal environments" [23]). Below we present some examples of soniture. In many cases the differences between creating a piece of music, an installation (e.g. [24]), creating a certain soundscape [25], or building a piece of soniture are a matter of degrees. However, the intersections between these areas of use also point to slow technology as an attempt to join ideas from art, environment and interior design, and the development of information technology.

4.1. SoundMirrors

In "Flashbacks", several microphones are used to record sound fragments in a corridor at an office. These fragments are then played back through loudspeakers in the same corridor with varying time delays – the recorded sound fragments are

Fig. 2. A SoundMirror.

not saved, creating something similar to a "slow mirror" (Fig. 2). The time series of fragments and delays have a certain structure that is possible to understand through careful reflection on what happens over a long period of time. Thus it is possible to predict when this audio mirror reflects the present sounds or when it does not. At first all we notice is that sounds are played back, then we recognise that these sounds come from earlier sound events in the very same corridor. Later we can recognise a certain well-defined structure in time, a class of patterns that makes the capture-playback series into an understandable soniture.

There are several questions about technology that the SoundMirror is aimed to expose. The basic design question asked in the SoundMirror experiment is: how does this mixture of very simple audio technology with a more sophisticated time composition function as a basis for a reflective audio environmental design? It is also designed to make people reflect on how soniture can be used to amplify the notion of a corridor as a public place.

In order to obtain a structure sufficiently rich and complex to gain interest over a long period of time we used multiple layers of capture and playback. Studio monitors with much the same audio level as the level of ordinary conversation in the corridor were used in order to obtain a "close" sound that worked well as a part of the given environment. Further, the placement of microphones and loudspeakers is critical. In our experiment we did not attempt to hide them, making them act as visual markers of the fact that a recording was taking place. However, one might want to hide all microphones and loudspeakers ensuring that the SoundMirror becomes a soniture that is more integrated with the given environment. One could also imagine rooms and corridors that are designed with sonitures, such as the SoundMirror, already integrated in the interiors of the building.

4.2. SoundLamps – the art of concentration.

Consider these two equations:

light = sound
dark = silence

We can think of a lamp as something that brings light into darkness. Thus, a sound-lamp is something that brings sound into where silence resides. In terms of being a piece of soniture, a sound-lamp is based on sounds that emerge whenever it is completely "dark", i.e. completely silent with respect to the background noise in the room. As with ordinary lamps, you can turn it on whenever you want, but you will only see, or in this case hear, it when it is dark or silent enough. Thus to "see" the light from the lamp you have to concentrate on being silent, an act of intensive reflection on the sounds made by you and others in the room. Compare this with music for meditation and concentration, such as Stockhausen's "Aus den Sieben Tagen" [26].

SoundLamps can be implemented in various ways. One can use a low-level sound that is difficult to hear, ensuring that one has to be almost completely silent in order to hear the sound. Further, we can use headphones for the sounds we want to hear, we can use extremely directed speakers, or we can engage in building complex acoustic models of the given room trying to isolate the sound of the lamp from all background "noise".

4.3. Furniture and soniture – the sound of presence

The issue here is to use computer technology in combination with sensor and audio technology to build floors, walls and other things as resonance resources amplifying the sound presence of people in a room. One could, for instance, use sensor technology to implement an "active" floor (cf. [27]) that can inform us about the history of presence in the room; am I walking on a part of the floor where many people have walked recently? We could implement sonitures representing aspects like "clean", "dusty", "dirty"

or "worn". These aspects all have to do with changes over time. The audio expression of the floor is slow, just like an old fashioned floor it gradually changes its expression as time and people go by.

Build a rocking chair with focus on the sound of material in shaping the chair. The objective should be to look for rich, distinct, controlled and unique sounds that define sitting in this particular chair. The chair will not just be something practical, something to sit on, but a chair where distinct presence and "personality" is amplified through the sounds that comes with it. As a piece of soniture with a rich expression the chair becomes a "slow" chair where the aesthetics of sitting are in focus. This is closely related to the sonic furniture of AudioLives [22], which gives an example of how we can build a sort of soniture for social interactions in the workplace, using modern computing technology.

5. Informative Art

Posters, pictures, paintings, etc. are often used to furnish the walls of our homes, offices and other places. Partly they are employed for their aesthetical properties, but perhaps even more because their function as decorative objects helps to create a certain ambience. A certain picture or poster might also serve as a kind of statement that enables visitors to get a clue of what the place and the people living or working there might be like. With *informative art* [28], we have tried to "amplify" an art object's capability to present information about its location (Fig. 3). This can be achived by mapping information to changes in the structure of the composition, colour scheme, etc.

In more traditional forms of information visualisation, the design problem is how to create a structure that represents the information as efficiently and readable as possible. In informative art, these structures are often more or less given by the conventions of what posters and pictures might be like in order to fit into the desired environment, or by some other set of aesthetical preferences. The main problem is how to make these structures carry the desired set of information. It should also be noted that the issue in informative art is not to create art *per se* (cf. [1,2]), but to explore the design space of information presentation from a different point of view (cf. [30]).

5.1. Abstract information displays

We have experimented with displaying time structures in terms of various "clocks", for example a clock inspired by Klein's mono-chromes, where colours and time structures interpret certain properties of given information and a clock slowly displays time in terms of small changes in colour of a simple geometrical

Fig. 3. Three pieces of informative art. From left to right: WebAware [29], and two abstract clocks [28].

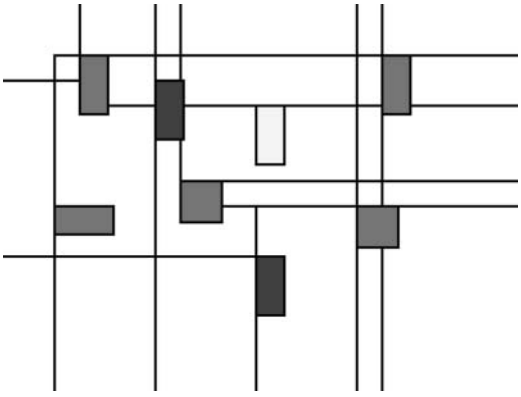

Fig. 4. A Mondrian-like visualisation.

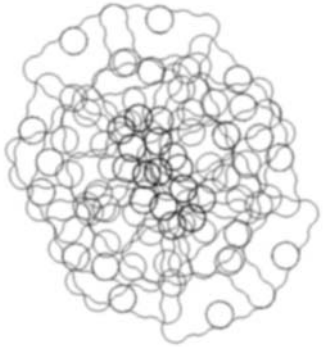

Fig. 5. A visualisation based on a Lindenmayer system.

structure [28]. Inspired by the paintings of Mondrian (Fig. 4), we have experimented with mapping the dynamics of information structures onto the geometrics of Mondrian-like displays [28]. We have also used techniques such as generative grammars and Lindenmayer systems (e.g. [31] and Fig. 5) to be able to map information to the complexity of a pattern or composition [28].

5.2. The ChatterBox

We have also created informative art that uses slightly more complex sources of information, like the ChatterBox [32] (Fig. 6). The ChatterBox continuously "listens" for the emails and electronic documents that are sent around an office, for example (privacy issues naturally restricting the extent and nature of this "overhearing"). It then analyses the material and stores the sentences and information about syntax in a database. In parallel, the ChatterBox

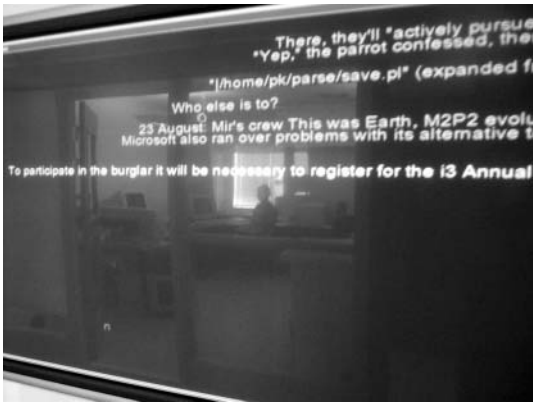

Fig. 6. The ChatterBox.

continuously "talks" by generating novel sentences based on the material in the database. It does so by recombining material by swapping words between sentences. Finally, the sentences are visualised in the corridor, the dining room or another public place so that people can take a quick glance at it while passing by. We have experimented with different kinds of visualisation, including appearances based on how credits are displayed after a movie, and visualisations based on a "falling autumn leaves" metaphor, in which letters, words and sentences fall from the top of the screen at various speeds and then whirl around at the bottom.

The basic idea with the ChatterBox was to provide entertaining and inspiring variations of the material produced at an office. However, it also serves as a very slow tool for workplace awareness in the sense that each time one takes a look at it, a small and distorted fragment of the original material will be presented. At first, the appearance of the ChatterBox will seem as a rather ordinary random text-generator but, over time, one will be able to recognise parts of sentences, words and sentence structures. Over time, one will slowly form an understanding of the underlying material and finally even an understanding of the rules according to which the sentences are generated. Even visitors who are not very familiar with the original material submitted to the ChatterBox will, over time, be able to form some kind of understanding of what is going on at the office, in as much as these activities are reflected in the material the ChatterBox is working on. The ChatterBox serves as an example of slow technology in terms of both its visual appearance and how we come to perceive and understand it over time.

6. Form and Function

A basic principle of slow technology is to *amplify the presence* of things to make them into something more than just a silent tool for fast access to something else. This amplification is not just a matter of aesthetical surface, but concerns the whole thing as it is used. We do not talk about functionality *and* design, but about the complete expression of a thing as it appears in the given context.

In the case of a word processor it is easy to point out its function; it is a tool that supports its user when writing and otherwise constructing documents. So when designing things that should invite and make room for reflection it seems obvious that function is all about supporting reflection on some given issue. So, why not simply put up a sign saying "PLEASE REFLECT ON X"? One basic reason is that the sign through its message – its expression – does not give any precise meaning to the intended act of reflecting. Assume the function of a painting hanging on the wall in my room, as it seems to be used, is to make me happy, or at least to put me into the mood to smile. Why is it not enough to have a reminder sign on the wall saying in capital letters "SMILE" or "THINK OF YOUR FAVOURITE PAINTING BY MATISSE", etc? A key reason why this substitution is pointless is that the reminder sign is very imprecise in telling me what my favourite painting by Matisse is or why I should smile. It is the expression of the Matisse painting itself – or probably a reproduction – hanging on the wall that is important. The function of a thing designed to invite and make room for reflection is inherent in the precise meaning of reflecting that is given by the total expression of the given thing; function is inherent in design expression.

In slow technology as an environmental interaction design this interplay between form and function is clear; form is the process to learn and realise function, the structure of building a living environment. We may think of form as that structure that presents the design expression, i.e. the structure of appearance and presence. Thus in slow technology form brings forth function. But in the present context form is not necessarily a consequence of the primary functionality of an object. Take for instance a slow mirror, an object that only very gradually turns into a mirror and only gradually deletes the mirrored image. It functions as a mirror, but this "mirror" appears in a form that to some extent hides the basic functionality of a mirror. This is similar to how a puzzle, due to its form as a puzzle, hides a picture. In this case, form covers the primary functionality of an object as a bearer of slowness.

7. Evaluating Slow Technology

One of the implications of designing for "presence" instead of "use" is that evaluations will have to change as well. When evaluating a certain design given the objectives specific to slow technology, what are the relevant questions to ask? The need to build prototypes and expose them to real-world settings is likely to be as important to slow technology as it is to any other practical study of how to develop principles for interaction design.

In the present context the question about good design is intimately interwoven with questions concerning what a given designed thing really is. In the case of "tools" it can be argued that the basic of a tool is understanding how it is used – a tool is always something that is used *for* something. In the case of other artefacts, such as works of art, this basic understanding has to be something else. One cannot explain what a symphony by Beethoven is, as a piece of art, by empirical studies of a collection of concert visitors. To answer this question is more like formulating the theory, or model, of its inner logic, aesthetics, etc. on which a sensible empirical study can rest.

The examples of slow technology presented here are neither works of art nor tools. However, they share properties with both extremes. We have argued that good design of slow technology is primarily about inner logic and aesthetics, since these seem to be key factors in creating something that can serve as an incitement for reflection. Given these objectives design will have to be evaluated by investigating the design, perhaps in a way similar to the methods developed in art critique: cultivating evaluation as the art of explanation and understanding.

Evaluations of slow technology will, however, also share characteristics with more typical interaction design methodologies since we aim to create building blocks that people can use to furnish their environments. The empirical evaluations we have carried out clearly showed that slow technology has to be carefully framed and

introduced in order not to be perceived merely as some poorly designed and, as a result, useless tool. Part of the problem is how to introduce a kind of technology that behaves in a way which we normally would expect to find at an art exhibition or when using a musical instrument, in the context of information technology in everyday life. For instance, we have tried the ChatterBox in a range of different settings with differing results [32]. When used at offices, many people perceived it as inefficient and the transformation of information as more of degradation than as inspiration. The very same prototype used at a reception party made people think about, laugh at and talk about its texts.

8. Developing Guidelines for Slow Technology

One of the basic ideas behind the examples of slow technology is to use simplicity in material in combination with complexity of form. Much design, especially of digital media, is about creating something that is immediately appealing and impressive. This is not the case with slow technology. Taking the ChatterBox as an example, the purpose is not to create an exciting visual presentation. Neither is it to create an innovative text generator or natural language parser. Although these are important parts of the system, the main purpose is to present the material submitted to ChatterBox in a special way, namely as recombinations and transformations of partly familiar fragments of texts. This makes the ChatterBox less impressive from a technological point of view, and many "users" started out with the question "So what?". This is nevertheless a starting point for reflecting upon it: What does it do? Where does this and that sentence come from? and so on. Similar questions can be asked about the other examples.

Simplicity in material invites people to reflect when there is an obvious complexity in form. The modest appearance of the ChatterBox or the SoundMirror does not stand in the way when one wants to find out more about their inner workings – their appearance even indicates that there must be something more to them than this appearance. The combination of a modest and a slow appearance is also what makes slow technology interesting in the case of environmental design – when trying to make technology interesting and stimulating when present over long periods of time. Given the experiences presented here, we propose two basic guidelines for slow technology:

- focus on slowness of appearance (materialisation, manifestation) and presence – the slow materialisation and design presence of form (F)
- focus on aesthetics of material and use simple basic tools of modern technology – the clear and simple design presence of matetial (M).

The design should give time for reflection through its slow form-presence and invite us to reflect through its clear, distinct and simple material-expression. It is a combination of simplicity in material with a subtle complexity in form focusing on time as a basic element of composition. Technology should bring forth the material, not hide it.

9. Concluding Remarks

Interaction design in the area of HCI mainly concerns itself with tools and work methods for certain specific tasks. But in a more general sense interaction design can also be concerned with the design of an environment in which these tasks occur. This is interaction design in the sense that we design structures within which we express presence and build our "work-worlds" and "life-worlds" through interaction with the environment. The notion of slow technology is, just like calm technology, a kind of leitmotif for this type of interaction design. It brings a uniform approach to basic notions like appearance, presence, expression, environmental interaction, etc. as well as to the inherent relation between form and function in environmental design. Slowness is a key factor that could bring forth, and make room for, reflection. The idea with a design leitmotif is to conceptualise the design style, the form of expression.

It is clear that there is a point of convergence of technology, design and art in a design philosophy like slow technology (cf. [33–35]). In practice, such a convergence can take on many different routes, ranging from examples such as Bauhaus to more modest forms of collaboration as in various artist-in-residence programs [19]. Slow technology should not be seen just as a call for more creativity or artistic expression in a world of information technology, but as an attempt to revisit some basic problems in interface design from a perspective that bears

on ideas about environmental design derived from several different disciplines. It is also an attempt to discuss the foundations for design as such in information technology (cf. [36,37]).

The importance of aesthetics in slow technology is a consequence of the design objective, as is the focus on the inner logic of the design. It might be easy to confuse any study of technology with the design objective of functioning as incitements for reflection, with art. This might be because of the predominance of the study and development of tools. However, if we instead turn to architecture or interior design, where the environment as a whole is in focus, the combination of aesthetics and more technological issues is central. As computers increasingly become a part of our everyday lives, such a combination of interests is likely to be of great importance to interaction design.

We believe that the transition from, or rather complement to, the perspective on technology as "tool" to a perspective on information technology as being a part of a complex designed and inhabited environment will be important to future design methodologies [38]. Not only does this imply that we have to engage in a range of issues concerning the role and effects of new technology, it also opens up many interesting new possibilities. One such possibility is a technology, such as slow technology, that is not "used" at all but nevertheless is a part of the environment, adding to its ambience and supporting various activities taking place in it.

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