

From Use to Presence: On the Expressions and Aesthetics of Everyday Computational Things

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The coming ubiquity of computational things urges us to consider what it means for something to be present in someone's life, in contrast to being just used for something. "Use" and "presence" represent two perspectives on what a thing is. While "use" refers to a general description of a thing in terms of what it is used for, "presence" refers to existential definitions of a thing based on how we invite and accept it as a part of our *lifeworld*. Searching for a basis on which these existential definitions are formed, we argue that the *expressions* of things are central for accepting them as present in our lives. We introduce the notion of an *expressional*, referring to a thing designed to be the bearer of certain expressions, just as an appliance is designed to be the bearer of a certain functionality. Aesthetics, as a logic of expressions, can provide a proper foundation for design for presence. We discuss the expressiveness of computational things as depending both on time structures and space structures. An aesthetical leitmotif for the design of computational things—a leitmotif that may be used to guide a normative design philosophy, or a design style—is described. Finally, we describe a practical example of what designing a mobile phone as an "expressional" might be like.

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1. INTRODUCTION

Over the next twenty years computers will inhabit the most trivial things: clotheslabels (to track washing), coffee cups (to alert cleaning staff to moldy cups), lightswitches (to save energy if no one is in the room), and pencils (to digitize everything we draw). In such a world, we must dwell with computers, not just interact with them. (Weiser [1996], p. 3)

The aesthetic potential of the narrative space centred on the consumer product has received surprisingly little attention from artists and writers and even less from designers. Few films or stories acknowledge how our lives and

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identities are intertwined with machines and artifacts, particularly everyday electronic products. Though we inhabit an environment of electronic gadgets and gizmos, little effort is turned towards exploring what this means. (Dunne [1999], p. 62)

Information technology is changing from only being tools for the researcher or the business professional to becoming part of our everyday lives. Part of this change is due to the rapid development of inexpensive embedded, wearable, and mobile computing systems and the continuous miniaturization of components that allow us to create a range of novel computational artifacts at a reasonable cost. This technological development and its implications for how we both think about and design human-computer interaction have been the starting point for several lines of research in recent years such as *ubiquitous computing* [Want et al. 1995; Weiser 1991], *tangible media* [Ishii and Ullmer 1997], and *augmented reality* [Wellner et al. 1993].

Here, we will take a step back and discuss some of the implications of this development. Our discussion will be centered on a perspective of increasing importance in technology development, namely *phenomenology* (cf. Svanæs [1999]; Winograd and Flores [1986]). We argue that the coming ubiquity of computational artifacts drives a shift from efficient *use* to meaningful *presence* of information technology. Our interpretation of this shift from use to presence comes mainly from working with various forms of novel human-computer interfaces (cf. Hallnäs et al. [2001]; Hallnäs and Redström [2001]). Having encountered problems such as how to evaluate a certain design and how to describe what constitutes good design in these areas, we came to question the relevance of some of the basic assumptions in human-computer interaction. In what follows, we will try to discuss some of the problems that, to us, suggested that we might have to change perspectives when designing and evaluating everyday computational things.

The design and evaluation of an artifact are always done in relation to a definition of what the artifact is—of what it is that we aim to design. In human-computer interaction, we usually think of the computer as a tool for achieving certain ends, such as creating a document or searching for information. We thus evaluate the usability of computational artifacts in relation to criteria such as efficiency, simplicity of use, and ease of learning, based on relatively precise descriptions of what they are used for. We may call descriptions of things along these lines *functional* descriptions based on a general notion of *use*. This is what we do when we ask what a house, or a hammer, is and answer with a description telling what houses and hammers in general are used for. These are descriptions of types, or kinds, of artifacts focused on the general objectives of use without any reference to a specific person that uses them in some specific situation.

We can also answer the question of what a thing is in a different way, as when we ask a friend about a certain piece of furniture in her home and she answers that it is the table she got from her late grandfather. Clearly, it would be inappropriate to answer such a question with “it is a piece of furniture on which you can put this or that kind of object provided it does not weigh more than X kg.” When we ask questions about this particular table, we do not ask

for its general use, but about its existence in our friend's life, for example, its role or place. When we learn what it is, we get an *existential* description of what this particular table is to our friend, a description based on the table's *presence* in her life. Unlike a description based on a general notion of use, this definition in terms of presence is related to a particular meaning given to a specific unique thing.

The notion of presence that concerns us here is not the mere physical existence of things in someone's surroundings, but rather the existence of things in our everyday life based on an act of acceptance; we give things a place in our lives as we turn to them and let them enter our life (cf. Csikszentmihalyi [1995]). The presence of a certain phone means that it exists as someone's phone or the phone at someone's office or home, with a specific meaning as such. Presence, as conceived here, is therefore not just present here-and-now: the particular sofa in my living room is present in my life even if I do not look at or even think about it. Even the old bike I have at our summerhouse and only use once a year certainly has a place—and presence—in my life although I rarely even think about it. Thus, to be present in my life, a thing does not have to physically present to me at all at the moment. Of course, things present themselves to us in various acts of perception and action, but when we think about presence in terms of places in our lives, this is not primarily a matter of perception. Here, presence concerns the existence of things on the level of lifeworlds—it is a matter of existence of things based on an existential definition of what they are.

Currently, human-computer interaction is dominated by references to functional descriptions of artifacts based on general notions of use, while references to existential descriptions based on presence are almost completely neglected. However, the increased physical presence of computers in various environments, frequently governed by the notion of the invisible or disappearing computer, is gaining a growing interest in subfields of human-computer interaction such as ubiquitous computing.

Frequently, computers becoming an integrated part of everyday life is taken to be something equal to embedding computational technology in various artifacts or in the walls of a building. Clearly, this is not what was referred to as being “present” in someone's life as described above. Even if we expand our notion of use and usability in interaction design to include new forms of interaction such as the automatic sensing of user activities and context-aware applications, this is still a matter of “use” in the sense described above. If we want to understand what it means for an artifact to be part of someone's everyday life—and eventually to design for this—we have to consider its presence beyond just being physically there.

The two different perspectives on artifacts here represented by the notions of use and presence have very different implications when it comes to the design and evaluation of artifacts. When computer systems change from being tools for specific use to everyday things present in our lives, we have to change focus from design for *efficient* use to design for *meaningful* presence. What does this shift of focus really mean? What is the meaning of “usability” with respect to this change? What could constitute a proper foundation for the design and evaluation of computational things with respect to presence? In what sense

does the meaning of interaction design change as we shift our focus from use to presence?

2. PRESENCE

Information technology in the form of devices such as mobile phones, personal digital assistants (PDAs), personal computers, and information appliances is increasingly used in everyday life. As information technology pervades everyday life, computational artifacts also become a part of our lives: we can say that we let some of these artifacts enter our *lifeworld*. As we take them for granted in our lifeworlds, they often become something more than just tools to be used to accomplish given tasks.

Consider for instance the following observation made by the designers of Nokia phones:

... the mobile phone was first considered to be a serious tool for certain occupations, especially the military, and then an item for business purposes. After a while—around the early 1990s—it became a consumer product in countries like Finland, Sweden, and the UK. In this adaptation to consumers' lifestyles, the personalization of the mobile phone may play an important role: In constant use the mobile handset becomes a very personal object that intensifies the user's feeling of being inseparable from it. (Vänänen-Vaino-Mattila and Ruuska [2000], p. 173).

That a phone becomes a personal object and not just a tool for communication suggests that this phone has become a part of someone's life; my phone will not just be any phone, but a unique thing that belongs to my lifeworld, just as my house is not just any house but this particular house of mine.

To say that a thing is part of our life is to say that there is a proper place for it in our lifeworld; it becomes a part of our life through a process where we find or define a place for it. Many kinds of artifacts have well-defined places, or categories of places, that they are more or less designed to fit. We can also design with such places in mind, as when we create furniture for a kitchen or a livingroom. While kitchens and livingrooms are physical places, furniture designed for these places also indicates ways for these things to enter into our everyday life.

Personal computers were designed to fit into an office environment and the activities taking place there. They were designed to be efficient tools in the hands of the professional—a role we are beginning to understand as our knowledge about usability and user interface design matures. Thus, our present practice of interaction design is directed to this setting. Obviously, everyday life is quite different from office work, and therefore other “places,” interfaces, and appearances have to be explored in order to find a broader repertoire of strategies for creating human-centered technology.

The perhaps most influential example of an alternative scenario for human-computer interaction is *ubiquitous computing*, as described by Weiser and his colleagues at Xerox PARC some ten years ago [Weiser 1991]. Their main intention was to replace the personal computer and move the interaction with digital information out into the rich physical space we inhabit. Other approaches that address similar issues on how to integrate computational resources with

the physical world and make the combination something meaningful, usable, and enjoyable to live with, work with, and play in, include *augmented reality* [Wellner et al. 1993], *tangible user interfaces* [Ishii and Ullmer 1997], and *ambient media* [Wisneski et al. 1998].

Originally, the ubiquitous computing experiment used computer displays, in the sizes of boards, pads, and tabs [Want et al. 1995]. These displays all used graphical user interfaces and were quite similar to ordinary computer displays. Later in the development of ubiquitous computing, however, more radically different forms of information displays and interfaces were introduced. One new approach was the notion of *calm technology* [Weiser and Seely Brown 1996]. Calm technology can, for instance, be technology that continuously presents information to us in the same nonobtrusive way as, for instance, an inner office window is a way of offering us information about the activities outside. A central idea is the notion of an interface that moves between the foreground and the background of our attention [Weiser and Seely Brown 1996]. This has also been one of the main ideas behind the design of ambient information displays [Wisneski 1998]. Clearly, many of these new experiments are not concerned with new functionality; rather they are explorations of new forms of appearances of computers.

Often, the goal of these experiments is to make the computer “disappear.” While making the computer literally invisible might be a step in the right direction, disappearance in the phenomenological sense is more complex. Invisible things are the ones taken for granted: we do not focus our attention on the hammer itself when we use it—we just use it. The hammer is not invisible, but it “disappears” as it is just a natural part of us, something that we do not attend to or reflect upon, as we nail something. Similarly, I do not consciously use my feet to walk—I just walk. In fact, most things present we take for granted as natural parts of our life. If the door to my house suddenly is gone as I am about to leave for work in the morning, the absence of the door in a very explicit manner forces me to reflect upon something that I have taken for granted. When I install a new door, I will gradually accept this new thing as the door to my house, and after a while this thing too will become a natural part of my life that I do not attend to or reflect upon.

In this manner, things appear and disappear as parts of our everyday lives. Most of the time the things present in our lives will just be there without us attending to their presence. But this presence presupposes a process of acceptance. Things appear and we open, or close, the door to our lifeworld for them. To build a sound foundation for design, we have to understand these acts of acceptance with respect to some reasonable, and clear enough, understanding of the notion of what everyday computational things are.

3. DESIGN FOR PRESENCE

Design is in a certain sense a question of instantiation: to design is always to design something that is given, for example, a “chair,” a “mobile phone,” etc. Correspondingly, we evaluate the result according to a description or a definition of what that something given is. When we design for use, this means, for

example, that the design and evaluation of a thing is done on the basis of some definition of what such a thing is and what it is used for. If we instead want to design and evaluate a design with regard to presence of designed things in our everyday life, we are faced with the problem of relating design and evaluation to existential definitions of things, that is, to their particular existence in someone's lifeworld. What does this mean in practice?

The intended object of a design act determines a collection of design variables describing what we intend to design and also roughly how. The design process is in an abstract sense the process of making these variables explicit and forming concrete instances of them. An abstract form is implicitly given by the choice of variables, and the instantiations of these variables carry with them the specific material form. If it is about designing a chair, we may think of variables like the legs, the arms, the back, and the seat of a chair. Now, forming a concrete instance of the back of a chair of course also involves design. Thus, it is again a matter of making design variables explicit, etc.

At certain moments in the design process, it seems as if this regression stops and we just form a concrete instance of a variable without making explicit what it is, that is, there are no explicit variables describing what this something is, it is a pure atomic design form. The design process in this sense involves a series of choices: we choose variables for composite design forms; we choose the atomic design form, etc. Reflecting on the resulting thing, it is natural to ask where these choices come from and what they are based on, if it is a good design or if a different series of choices could have resulted in something better. As we reflect on these matters, we, at least implicitly, form a picture of a collection of design variables and a series of choices that builds the thing, that is, we describe *a* design of the thing.

In interaction design for computer systems, use is traditionally in focus when determining design variables and their instantiation. We seek a solution that satisfies the basic criteria for usability such as efficiency in use, low error rate, and support for recovery from error, based on a general knowledge about what to do and what not to do to meet such criteria (cf. Hackos and Redish [1998]; Nielsen [1993]). We aim to achieve maximum usability with respect to a general, precise notion of use, and our design is motivated by this ambition. Thus it is reasonable to think that we can set up user tests in order to evaluate the usability of the design. Such a test does not necessarily examine the strength of the inner design-logic that builds the thing, and perhaps a different explication of what its use is would result in a better evaluation. But still, given a well-defined notion of intended use, the user test will relate design choices to usability. For instance, we can perform usability studies based on methods from experimental psychology to assess to what extent the different criteria are fulfilled in comparison to some other design. This enables us to discuss and compare different designs with respect to a general functional definition of the designed things.

If we instead turn to artifacts as they are defined in terms of their place and role in everyday life—an existential definition—the situation is quite different. There is no longer a well-defined general notion of use that will cover all these different definitions in sufficiently many nontrivial cases, and so the notion

of a user is consequently somewhat blurred. Given the difficulty of providing a proper definition of use in this context, it is even hard to say what a user test would be here. The notion of a user is in general a difficult notion (cf. Grudin [1993]), but here it is as if the user disappears into thin air leaving the artifact and its expression behind, open to be used in various ways. Consider, for instance, evaluating a doorknob (cf. Norman [1988]): some doorknobs are certainly things that are present in my life with expressions that cannot be captured in any nontrivial way by a general notion of doorknob usability.

When thinking about the presence of things, we seem to face a situation where we cannot relate general design and general evaluation to the existential definition of a specific thing. An existential definition is based on an act of acceptance, that is, we turn to a thing and give it a place in our lives. Behind the various manners in which things present themselves to us there is something that remains invariant with respect to all the different possible existential definitions. When we design for presence, we have to relate design and evaluation to some picture of this invariant “thing” that in some sense builds the things we define as we accept them to be present in our lives. Although this is a rather unfamiliar situation in human-computer interaction research, it is perhaps the basic perspective in art and design. In these areas, it is clear that we relate both design and evaluation to existential definitions of designed things. This is what we do when we picture what to design as we work on the design of a floor lamp. We clearly have a picture of something general that may build meaningful things in several of our rooms and that cannot in a simple fashion be reduced to something described in terms of the general use of a floor lamp. This is also what we do when we, as a basis for a richer experience, try to understand the inner logic of a painting or a musical composition. Here, the expressions of things become central.

3.1 Expressions

Our primary interest here is how computational things enter into our lifeworld. To some extent this is something we actively do: we choose to have certain objects, such as a particular piece of furniture, a painting, or a mobile phone, around us. By giving things a place in our home, we “invite” them into our lifeworld. But we do not actively decide to take them for granted as a part of our life: this is something that happens (or does not happen) over time. When we buy a new sofa, it is clearly visible to us, and we note its presence, hopefully feeling happy about our new sofa. Over time, however, the sofa will gradually disappear to us as we increasingly take it for granted. Eventually, there are objects in our near surroundings that we do not “see” until they are gone or until we suddenly discover that something has changed. While this gradual disappearance is characteristic of presence, what is central here are the first encounters with an object, that is, we focus on what happens when it is introduced to us and an act of acceptance can begin.

This first invitation clearly has something to do with appearance: what an object is like as it makes its appearance in our life, when it presents itself to us. A thing always presents itself through its expressions. The expressions

of a thing are its pure appearances as we disregard—or “bracket”—functional and existential definitions. It is what defines the thing as an abstract *expressional*, a bearer of the properties of expressions that are invariant across the many different existential definitions, that is, an *expression-identity*. Similarly to how we may think of a thing as an *appliance*—a thing designed to perform certain functions—we may think of the bearer of this expression-identity as an “expressional”—a thing that is designed to be the bearer of a certain expression.¹

Appliances and expressionals refer to two different perspectives on what it is that we design. When we design everyday things such as wristwatches, cars, and furniture, we in general consider both. As we consider the expression-identity of things—the expressionals—we, phenomenologically speaking, put the general notion of well-defined explicit use and of a well-defined user within brackets. Consider, for instance, the expression-identity of a chair: we use the chair to sit down and rest, to sit down and watch a movie, to sit down and work, etc. That people sit down in the chair belongs to the expression of the chair, but the users disappear as we refrain from referring to why they sit down and what they are doing sitting in the chair. If we think of a bicycle and what characterizes its expression, we do not think of it in terms that it is used by Mary to go to the beach, or by a child that is learning how to ride a bike. Despite the fact that it takes a person to ride the bike, we just focus on the bicycle itself when we think of it. We may also think of a phone not in terms of an interaction model based on the notion of phoning, but instead in terms of an artifact with certain expressions, made from a certain kind of (technical) material, that people use to build their everyday lives. If we think about a phone in this way, we disregard, or “bracket,” the user and instead turn to the expressions as a foundation for existential definitions.

When we let things into our lifeworld and they receive a place in our life, they become meaningful to us. We can say that this act of acceptance is in a certain sense a matter of relating expression to meaning, or of giving meaning to expressions.² Sometimes this is an explicit act, as in gift-giving and rituals (consider, for instance, how the wedding ring is given its place in the ceremony), but more often this process of becoming meaningful happens gradually over time. However, in both cases the result is that a thing becomes the bearer of meaningfulness through its expressiveness. It is this expressiveness and meaningfulness that is basic to design for presence.

We can also think of expressions as something characteristic to a thing, as it has entered into our lifeworld. For instance, when we look into the home of

¹We use the construction “expressional” along the same lines as the established word “confessional”—“a small enclosed stall in which a priest hears confessions”, that is, as a thing designed to be a room for confessions.

²The notion that there is an immediate connection between the expressions of a thing and various concrete forms of using it is related to the concept of *affordances* (cf. Gaver [1991]; Gibson [1979]). Affordances also describe the meaningfulness of objects in relation to an agent, but an important difference is that while the existential definitions of objects discussed here are made in terms of being present in someone’s lifeworld, affordances are defined from an ecological point of view and concern the perception of things.

another person, the things we find tell us something about this person beyond the functionality of these artifacts. In many cases, the precise meanings of a particular object to this person are not clear to us, but the object still expresses something and, as we see this, we can ask for what the particular thing is in terms of its presence. For instance, we might find an object of seemingly little value placed in a way that suggests it is very precious to its owner, and we may therefore ask for what it is (cf. Csikszentmihalyi [1995]). Correspondingly, the owner of a home expresses herself with such things. Consider a musical instrument as an example: when we first see it, we might reflect upon its construction, its shape and proportions, whether it is new or old, made by a craftsperson or a machine, etc. Then we might perceive it in its context: this musician's instrument does not just lie there as one of many examples of what a music instrument is, it tells us something about the musician and the instrument's place in her life. If I play the violin, it helps me express the meaning of music in my life to myself and other people. It is this type of musical expressiveness and meaningfulness that is in focus when designing a violin and not usability in a more narrow sense. The notions of musical expressiveness and meaningfulness guide the design; they are the basic leitmotifs for the design process.

When I ask for what a thing is and what it expresses, I ask for the place it has in my life. This new usability or usefulness is not about instrumental functionality, but about the design and construction of things that can become meaningful parts of the environment and of our lives. Thus, we have to design these computational everyday things in ways that makes it possible for people to give them meaning, to give them a place in their lives, in various ways. This is quite different from creating technology that is just easy to use; it might even be the case that the artifacts that become most meaningful are not at all the ones that are easy to use.

We can relate this to Borgmann's notion of focal things as it is used in design practice: "Focal things . . . are things that ask for attention and involvement: they desire a practice that cannot be characterized by consumption but by engagement" (Verbeek and Kockelkoren [1998], p. 41; (cf. also Borgman [1992; 1995]). Focal things are not designed to disappear; rather, they act as engaging centers in human practices. A violin, as a musical instrument in the hands of a musician, is a focal thing, while a Stradivarius placed in a museum is not [Borgman 1992].

There is a basic difference between describing the presence of a thing and describing what we in general can use it for. When we think of the expressions of, for example, a mobile phone in elementary phoning-acts such as listening, talking, waiting, dialing, etc., these are clearly related to some basic form of mobile phone use. However, thinking about the thing in terms of how it forms its presence by means of its expressions in such acts is different from thinking about its functionality, for example, how it enables people to talk to each other despite not being co-located. When we think about what forms the presence of a thing, we try to understand what it means to be there for us as a part of our lifeworld whether we will actually use it to do something or not. This is not to say that a given thing has both functions and expressions that can be treated separately, but that these two correspond to two different perspectives

addressing two quite different questions: the existence versus the functionality of an artifact.

Further, there is a basic difference between the expressions of an artifact and what it expresses in terms of being a part of someone's life. The expressions of a thing form the basis for its presence, and in the sense that a thing has to be there for us in order to be used for something, these expressions can be said to form the basis for its use as well. However, a given thing can be used not only for doing certain things, it can be used also to express various things, such as our lifestyle, the values we believe in, the (sub)cultures we belong to, etc. When we think about the expressions of a thing in terms of how it presents itself, we do not think about *what* it expresses, just as we do not think about *what* it can be used for. Of course, both the use of the thing and what it might be expressing when present in someone's life are aspects that frame and to some extent govern how we study the expressions of the thing, but here we are trying to bracket all these aspects as we concentrate on how computational things form their presence by means of expressions.

The concept of an expressional can be used as a basis for the design and evaluation of computational things in regard to presence, and also serve as a complement to use as a basis for interaction design. Thus, we design bearers of expressions as we design for presence, expressions that invite to acts of acceptance. However, we also need methods for comparing different designs with respect to a given type of expressionals, methods for the systematic reflection and critique of expression-designs of computational things. This is where aesthetics becomes central.

3.2 Aesthetics

A narrow definition of use can give us external criteria for empirical user tests. Evaluations of the expression-logic of artifacts forces us to focus on the internal structure that builds the expression. When evaluating design with a focus on existential definitions, we can look for what is invariant in regard to the expressions of the artifact, that is, the identity of the object. We are not evaluating the thing as it is defined in an existential definition, but its expression-identity as a foundation for such definitions.

To try to understand and explain the logic of this expression-identity seems to be a reasonable basis for evaluation. It is a possible foundation for an abstract critical evaluation of the design of artifacts. Evaluation then turns into aesthetics: to understand the logic of an expression on the basis of understanding the material that builds the expression.

We may think of an expression as the presentation of a structure in a given space of design variables. The design itself can be seen as an act or a process that defines the expression. To understand and describe such phenomena is in a certain sense a matter of logic. Logic in a broad sense deals with formal matters, the general forms of certain specific things such as the forms of correct arguments. Form can be seen as the way in which matter builds a thing. Aesthetics, as we understand it, is concerned with how material builds expressive things, that is, it is a logic of expressionals.

It follows that good design from an aesthetical point of view basically is a logical question, not primarily a question of psychology, ethnography, sociology, etc. It is a basic axiom here that it is through the force of its inner logic, its consistent appearance, that a thing receives depth in its expression and thus its strength to act as a placeholder for meaning. Behind each expressive thing present in our lives there is an expressional with a strong form. From an aesthetical point of view, this is also the foundation for the character we ascribe to things (cf. Janlert and Stolterman [1997]) for a discussion of the character of computational things).

To design with aesthetics in focus means to concentrate on appearance as constituting the essence of things—how a thing manifests itself in a world of expressions (cf. Zaccai [1995]). This is much easier to acknowledge in the areas of art and music critique. Consider for instance a valuation of the second Brandenburg Concerto by Bach: what is it that such a valuation would refer to? Probably not the precise notational text of the Bärenreiter edition No. X, nor to a particular performance by Concentus Musicus. It would be something much more abstract, a specific expression that is invariant with respect to all various performances—that is, the musical idea as it is expressed through the notational text. In the same manner, we have to trace the idea of computational things as we try to understand the logic of their expression-identities.

Consider a typical graphical user interface (GUI) on a desktop computer. Components of the interface can be seen both as constituents of an interaction model and as constituents of an expression structure. It is the expressions of these components that convey the meanings they have in the interaction model and it is also the expressions that talk to me as I form an existential definition of the GUI in my daily work with the machine. To make sense of the interface structure means in a certain sense to describe and evaluate its expressiveness. This is comparable to analyzing the logical form of an argument and evaluating its logical correctness.

We have yet no stable tradition of aesthetics within the domain of human-computer interaction that, in a systematic way, will help us reflect upon the expressions of computational things in this manner. However, as computational artifacts become more and more important in our lives, their importance as existentially defined objects will increase. This, in turn, will force us to begin to reflect on the aesthetics of computational artifacts. As a basis, we can use critical design, experimental design, and similar approaches (cf. Dunne [1999]; Gaver and Dunne [1999]; Gaver and Martin [2000]; Harris [1999]). Over time, these reflections will help the human-computer interaction research community form a tradition of aesthetics to complement the experimental tradition of usability studies.

4. THE EXPRESSION-IDENTITY OF COMPUTATIONAL THINGS

To understand the expressions of computational things, we have to search for intrinsic properties of their expression-identities, that is, basic properties of computational expressionals. In, for instance, graphical design and many areas of industrial design, form giving often means to design the exterior of an object.

This is reasonable when the object is sufficiently static and when its internal workings do not contribute to the overall expression. If we think about the material that forms the expressions of computational things, it is clear that it is a combination of computations and interaction surfaces. Clearly, “aesthetical design” of computational things is not to give a computer a new and more colorful shell (cf. Djajadiningrat et al. [2000]).

We may say that the expression-identity of computational artifacts is based on a combination of time structures (computation) and space structures (manipulation and display of results). Computational expressions have many similarities with musical expressions, as both concern temporal rather than spatial structures. Therefore, a proper aesthetics of computational things concerns “time gestalt.” However, interaction design also depends on spatial manifestations of the results of computations for various forms of input. We use displays, keyboards and other instruments to control computational processes and to see the results. Therefore, the expression-identity of a computational thing is based on both temporal structures and spatial manifestations.

Design for presence also requires a different perspective on what time-spans we are designing for. The processes we design for in human-computer interaction often take place over hours, minutes, or even seconds. However, when thinking about the interaction with computers in terms of dwelling, the time-spans in focus are much longer, for example, days, weeks, or even years. Of course, these long time-spans are considered in present interaction design as well as in many systems because those systems are going to be used for quite a long time in an organization, but the issue here is what we focus on when designing (cf. Jones [1992], p. xxxii). Considering the point made by Weiser [1996] quoted in the introduction, we might say that while interaction is supposed to be fast, dwelling is not.

To design computational expressionals, we can use design *leitmotifs* that support reflection upon the interplay between temporal and spatial structures. One such leitmotif is to think of the computational artifact as a display.

4.1 An Aesthetical Leitmotif: Computational Artifacts as Displays

As a basis for the design of an artifact, we always have some picture or idea of what kind of thing it is. Such a picture leads our thoughts in certain directions and can thus function as a key notion in a normative design philosophy; the picture helps us focus on certain aspects of the given class of things even if it, as a description, is highly incomplete. We have argued that a focus on the expression-identity of things seems to be reasonable when designing for presence, that is, to acknowledge aesthetics as a basis for design. What sort of pictures could help us to focus on the expression-identity of computational everyday artifacts?

One such approach could be to consider the computational artifact as a thing displaying the execution of programs. A computational thing in this sense is not necessarily an electronic device; clocks, mechanical pianos, etc., are also examples of such computational things. The expression of a computational thing depends on the execution of programs. Interacting with computational things means that we give values to program variables and initiate execution

of programs in various manners. Time is a central form element for a computational thing in the same sense as time is a central form element in music. The picture of a computational thing as something displaying the execution of programs leads us to focus on expressiveness where time is a central form element. To open up for existential definitions of a computational thing, we can ask questions such as the following:

- (i) In what way and in what sense does it express the execution of a program?
- (ii) What determines what is to be displayed?
- (iii) What initiates the execution of programs?
- (iv) What defines the given programs?

As we acknowledge a computational thing to be present in our daily life, we of course use it to do various things: we phone our friends, we remind ourselves of things to do, we listen to music, etc. To focus on expressiveness in design does not mean that we forget all about the use of computational things—it means that usability becomes subordinated to expressiveness when designing according to this leitmotif. A computational thing is a thing displaying the execution of programs: an expressional more than an appliance. We can use it to do different things, but its general definition is not given in terms of use.

Consider asking these questions about a phone in order to get a new “picture” of what a phone is. Is not the old picture very much a matter of how a phone looks as it is used, that is, a matter of expression, as when we mimic using a phone by pointing our thumb to our ear and our little finger to our mouth? To take the traditional stationary phone as a starting point, limits the design space rather than opens it up for new perspectives. Instead, we could try to consider different types of display expressions by setting up collections of design variables as answers to questions (i) to (iv). In this way, we define what a phone could be as a computational thing. The better we resist retreating to the old notion of a phone, the better chance we have of finding a new and useful design space. The notion of a computational thing as a thing displaying the execution of programs could help us here to focus on the phone as a more general class of expressions where time is a central parameter.

Assume that we will design a digital doorbell. A doorbell is something we use to attract the attention of people inside as we stand outside a door, to notify them that someone is at the door. There is nothing in this description that refers to the expression of a doorbell. We can also describe a computational doorbell as a thing that displays the execution of a certain program everywhere inside of a compartment or a house as it is initiated outside a given door. This is a distinction between describing the notion of a doorbell in terms of use and describing what thing a computational doorbell is in terms of its expression. In the first case, we will probably consider what it means to attract the attention of people. In the second case, we will consider what it could mean to display the execution of a program everywhere in a house.

In contrast to the expressions of an artifact, its usability concerns the more abstract notion of use, that is, the use of that artifact. It is at this point that

the definition of what a thing is enters the scene. We could design our doorbell on the basis of a rather precise definition of use, but such a definition would restrict the design space concerning the expressions of doorbells and it would rest on several assumptions concerning the forms of the existential definitions we implicitly, or explicitly, make as we acknowledge the presence of the doorbell in our daily life. If we, on the other hand, start with a general description of what thing a computational doorbell is in terms of its expression, we may open up the design space and also make fewer assumptions about the forms of existential definitions to come.

5. EXAMPLE: MOBILE PHONES AS APPLIANCES AND EXPRESSIONALS

When we consider the mobile phone as an information appliance, we think of it as a thing designed to perform certain functions, to be the bearer of a certain functionality. Any given information appliance is a concrete thing, and thus it will always have certain expressions in the uses associated with it. Consider, for instance, the use of mobile phones with hands-free sets: suddenly we find people talking aloud to themselves in parks, restaurants, etc.

There are several design choices taken here that seem to be mere unintentional consequences of functionality rather than taken as the explicit aesthetic choices they are. That the expressions of everyday things, such as the ones of mobile phones with hands-free sets, are unintentional is problematic, since it is the expressions of things that form the basis for their presence in everyday life. This urges us to consider the question of how to design the mobile phone as an expressional more carefully.

To design a mobile phone as an expressional means designing it on the basis of a collection of generic expressions, that is, the expressions associated with phones and phoning. To do this, we typically bracket functionality and focus on the expressions of a mobile phone in use: How does it feel? How does it look? How does it shape a gestalt of movements, speech, and gestures? How does it transform and present my voice? How does it express time? Again, the expressions of a mobile phone in use are different from what the phone expresses in terms of being a part of my life, and here our focus is on the expressions of the phone in use as we try to understand these expressions as a foundation for its presence in everyday life.

As an expressional, the mobile phone with a hands-free set is simply, among other things, a “talking-loudly-to-yourself”-device. Being a “talking-loudly-to-yourself-device” is just one out of many things a mobile phone can become as it is adopted as part of someone’s everyday life. For instance, it might turn into a “flirting-device” that is used to initiate and ground a conversation (cf. Weilenmann and Larsson [2001]), a “check-that-nothing-has-happened-device” that is brought along just to see that no one has called, a “walking-companion” that is brought when going for a walk to ensure company for conversation, etc. The existential definitions of a “flirting-device” and a “talking-loudly-to-yourself-device” are clearly different although the basic functionality of the phones in those two cases might be identical. Searching for a foundation on which all these different existential definitions of a mobile phone

can rest, we turn to its characteristics as an expressional. To do this, we consider its expressions in various elementary acts of phoning, such as the following:

- writing,
- listening,
- talking,
- sending,
- being open for communication,
- being connected,
- waiting,
- communicating, etc.

The phone itself can then be seen as being designed to be a bearer of certain types of expressions associated with these phoning-acts. These acts are all related to some general use of a mobile phone, but there is a basic difference between a focus on its expressions in such acts and its functionality. The use of the thing might restrict or govern what acts we consider as elementary in the sense that we would choose differently in case we were to design a football or a mobile phone. However, thinking about how a mobile phone expresses itself in acts of waiting, listening, talking, etc., is clearly different from thinking about what we use it for.

To explore and expose expressions associated with these acts, we can use experimental or conceptual design. Consider, for instance, the following conceptual “phone”: the phone looks like a long tube, for example, of length 1.5 m and diameter 5 cm. The tube has sensors indicating its position in space; it is also touch sensitive. Inside the tube there is a microphone at one end and a loudspeaker at the other. The microphone and other sensors are connected to a signal processing system. We can then list some expressions of elementary phoning-acts that this “phone” is a bearer of:

- By covering both ends of the tube, the pattern “written” by touching the tube at different places is recorded.
- Patterns are sent by blowing into the tube.
- The tube is open for communication when one end is open—to do this, one might balance the tube in the palm of one’s hand.
- The tube is connected when both ends are open—to do this, one might balance the tube on the tip of one of one’s fingers.
- The tube is waiting for information as long as a marble is moving inside the tube—to do this, one has to ensure that the marble is in continuous motion by carefully balancing the tube.
- The signal processing system is programmed to transform one’s voice with respect to movements of the tube.
- One communicates by talking into the tube and by listening to sounds coming from the other end of the tube.

Sketching a phone as an expressional in this manner can be seen as a methodological exercise as we try to reflect in a systematic way on the elementary expressions of its use. The main point here is that we are trying to expose basic aesthetical choices involved in designing for presence. What does, for instance, “waiting” mean in the design of a phone? How waiting expresses itself is surely important if we are going to live with these things. Balancing a marble in constant motion inside the tube turns waiting into an act of intense concentration. This might not be the optimal solution in all cases, but the point being made here is that waiting is an elementary act of phone-use and that we should carefully consider its expression in designing a phone. The same holds for being open for communication, being connected, communicating when in motion, listening, etc.

The idea is that the expressions of these elementary acts of use are of basic importance when designing a phone as an everyday thing to be present in people’s life. These expressions are inherent in the use of existing phones as well (as we wait for phone calls, we send messages, etc). But in designing a phone explicitly as an expressional, we try to expose all these more or less hidden aesthetical choices.

6. CONCLUDING REMARKS

We have argued that the use of new computational things in everyday life implies a shift from efficient use to meaningful presence. Many of these new computational artifacts will be defined by their intended use, for example, the way information appliances are defined by the tasks or situations they are supposed to be used in [Mohageg and Wagner 2000; Norman 1998]. However, some of them will also be a part of someone’s life in a more profound sense than as tools to bring forth when needed; the artifacts that surround us are more than components of a continuously available toolbox—they are present in our lifeworld as part of who we are, how we live, and how we express ourselves.

Presence, as we understand it here, concerns the existence of things on the basis of an act of invitation and acceptance. We have described the presence of an artifact in terms of how it expresses itself as we encounter it in our everyday life. Then we can think of artifacts as expressionals, artifacts as bearers of expressions rather than functions.

The perspective on artifacts as expressing something, rather than as being specifically used for something, places aesthetics at the center of design. Aesthetics is not about the creative or artistic surface of these everyday computational artifacts, but about how their expressions form an identity that can make them meaningful building blocks in someone’s lifeworld. Then aesthetics, as a logic of expressionals, gives a methodological context for the expressional foundations of existential definitions of computational things.

When focusing on aesthetics, we can get the feeling that we completely leave issues of truth and falsity, of good and bad, aside. This is not at all the case. Aesthetics in focus means that we focus on expressions as a leitmotif for our road to understanding, not that we focus on the expressions of things as static isolated items. Note the close connections between aesthetics on the one hand

and epistemology and ethics on the other. Beauty and simplicity are often used as strong criteria for the correct path to deep theorems and good theories in areas such as mathematics and physics (cf. Simon [1996]). If I design a glass bottle, I ought to know that if partly broken it can be used as a weapon in a fight and that this is part of the expression of a glass bottle. An existential definition of a thing means that I take care of how I concretely use the thing; I declare a position with respect to the expression of the given thing. When I place a stone in my garden as a decoration, I implicitly declare that this is not a stone to crash windows with; when some younger person perhaps uses it to do just this, then this might be a reaction to my definition of what the stone is. All this leaves the designer in a classical existential situation with respect to her/his responsibility.

The two ways of describing and defining an artifact—in terms of use or presence—are complementary perspectives. Consider how we evaluate a piece of furniture both in regard to functionality and expressions: when we buy a sofa, we not only consider whether it is in principle comfortable to sit on, we also ask ourselves whether its materials, design, etc., will fit into the rest of the environment in the way we want. We consider both its practical functionality as a sofa and its prospective expressions as a sofa placed there in our living-room. This is also acknowledged in many forms of design for everyday life, such as in architecture, interior design, and furniture and clothing design (cf. Monö [1997]; Paulsson and Paulsson [1957]). In the case of interaction design of computational artifacts, things seem to be different. Certainly, there is a very strong tradition of experimental psychology, but there is no corresponding tradition of aesthetics in relation to the existential definitions of a thing in human-computer interaction design (cf. Dunne [1999]).

Thinking in terms of presence opens up new design spaces. It has been argued that mature technology becomes transparent to its users. The ideas presented here point to a situation where the computer loses its unique position, and computational technology simply becomes one out of the many different materials we use to build everyday life. Of course, it will be a material with special properties, such as having form based on both temporal and spatial structures, but from an existential point of view, we will think of it as just another material: everyday computational things will be as familiar as everyday wooden things, everyday plastic things, etc. Eventually, they will be just “things” present in our lives, made out of materials we do not necessarily think about. Then, the computer will have disappeared.

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