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# Material Awareness: Promoting Reflection on Everyday Materiality

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**Abstract**

Drawing on existing design approaches, this paper argues for the experiential desirability and critical importance—in terms of environmental sustainability—of designing for reflection on everyday material things themselves. This paper motivates and proposes a *material awareness* design approach, further drawing on developments from philosophy of technology and design theory. A series of conceptual designs are presented to help illustrate this approach.

**Keywords**

Sustainability, reflection, design, material awareness

**ACM Classification Keywords**

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

**Introduction**

Designed things are all around us. They mediate the ways we work, play, learn, design, dream, and otherwise relate to others, the world, and ourselves. Yet, we typically take these things for granted—constantly acquiring the new and discarding the old without thought. There are exceptions. Some things develop an enduring presence in our lives: an heirloom chair, a love letter, a favorite T-shirt. However, by and large we acquire, use, discard, and replace material things frequently and without significant consideration or appreciation for material things themselves, the

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roles they play in our lives, or the material effects this cycle has on others and our natural environment.

In this paper, I argue for the experiential desirability and critical importance—in terms of environmental sustainability—of designing for reflection on everyday material things themselves. Two trends in HCI and design motivate and inform this position. The first originates within the context of sustainable industrial design and is concerned with designing products in ways that promote longevity of use. The second trend originates within interaction design and HCI and is concerned with the design of technology that promotes reflection on experience as well as values unconsciously embedded in technology itself. Building on previous theoretical work, I propose a *material awareness* approach to the design of more engaging, more meaningful, and ultimately more enduring everyday interactive products. Broadly, the material awareness approach is concerned with designing everyday useful products that occasionally present themselves to us in ways that encourage us to consider them more thoughtfully. In what immediately follows, I (i) briefly review relevant literature; (ii) define material awareness, further drawing on design theory and philosophy of technology; and (iii) illustrate the material awareness approach through a series of conceptual design prototypes.

### **Sustainable Design and Product Durability**

Sustainability has emerged as a key area of interest for the fields of HCI and design. The importance of design approaches that address the rapid replacement and disposal of technology has been discussed within the context of HCI and interaction design by Huang & Truong [6], Odom et al. [9], and others. Designing

products in ways that promote durability and longevity of use has been proposed by Verbeek [11] and others in the context of industrial design, and has recently been discussed in the context of HCI and interaction design by Blevins and Stolterman [2] and most recently by Odom et al. [9].

### **Critical Reflective Approaches to Design**

Recent work in HCI and interaction design has emphasized designing for critical reflection on technology itself and the values unconsciously embedded in its design. Dunne and Raby introduce *critical design*, a design approach that "*rejects how things are now as being the only possibility*" and instead provides "*a critique of the prevailing situation through designs that embody alternative social, cultural, technical or economic values.*" [4]:58. As an example of critical design, consider Dunne and Raby's Nipple Chair that vibrates when it detects electromagnetic radiation, prompting reflection on the presence of previously undetectable effects of pervasive everyday electronic technologies. A related, yet potentially more accessible, approach is *ludic design*, or design that encourages and supports "*activities motivated by curiosity, exploration, and reflection rather than externally defined tasks*", which has been proposed by Gaver et al. [5]:885. *Reflective design*, an approach proposed by Sengers et al., explicitly integrates critical design, ludic design, and other reflective perspectives, broadly proposing a focus on design that brings "*unconscious aspects of experience to conscious awareness, thereby making them available for conscious choice.*" [10]:50. Backlund et al. draw on critical design approaches to redesign everyday domestic products that promote reflection on energy consumption [1]. As an example of this work, the

Element radiator uses 35 60-watt incandescent light bulbs as a heat source, prompting reflection on the hidden nature of everyday energy consumption through the unexpected appropriation of the familiar.

### **Material Awareness**

Motivated by work in reflective design and sustainable design, I propose a *material awareness* design approach to more sustainable material consumption. The *material awareness* approach is concerned with designing for reflection on material things—and our everyday experiences with unique and particular things themselves—in aesthetic, engaging, and provocative ways, thereby encouraging more enduring and sustainable relationships with particular things or discouraging thoughtless consumption of things in general. This approach draws on critical reflective approaches discussed previously, which illustrate ways of stimulating reflection on and integrating reflection into everyday life by revealing that which was previously hidden, e.g., energy, electromagnetic radiation. However, the material awareness approach is specifically concerned with revealing the materiality of the everyday itself, what Lefebvre suggests is at once both "*the most obvious and the best hidden.*" [8]:8. The material awareness approach further emphasizes designing to promote reflection on what Nelson and Stolterman refer to as the *ultimate particular* [10], e.g., *this* particular chair, as opposed to chairs in general.

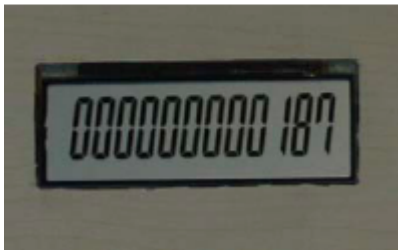
This paper is specifically concerned with the utilization of digital technology to enable and encourage material awareness in everyday life. Whereas traditional design materials are relatively static and spatially restricted, computational material is dynamic and temporal in nature, as discussed by Mazé & Redström [8].

Conceptualizing computation as a material in this way allows us to "*investigate what it means to design a relationship with a computational thing that will last and develop over time - in effect, an object who's form is fundamentally constituted by its temporal manifestation.*" [8]:11. HCI and interaction design are thus uniquely situated to concretely explore the design of interactions leading to relationships with technology that grow and improve with time. In order to develop a deeper, more nuanced understanding of the relationships that may exist between people and artifacts, I now turn to phenomenological understandings of the ways in which artifacts may be present in our lives.

### **Technological Presence**

Heidegger's phenomenological concepts of *readiness-to-hand* and *presence-at-hand* have been brought to attention within the HCI literature by Winograd and Flores [12] and more recently by Dourish [3]. These concepts allow us to, in simplified terms, distinguish between things that are consciously experienced versus things that, as we use them for some purpose, perceptually fade into the background. As a refinement of Heidegger's distinction, Ihde proposes three human-technology relations, namely *embodiment relations*, *hermeneutic relations*, and *alterity relations* [7], which have been discussed also by Verbeek [11]. I briefly discuss each relation in turn.

*Embodiment relations* are human-technology relations where technology becomes "*perceptually transparent*" through the "*partial symbiosis of [an individual] and [an artifact].*" [7]:86. As an example, consider a chef's use of a familiar cooking knife, where the knife functions fluidly as a natural extension of the chef's



**Figure 1.** The Table that Counts displays the total number of heavy objects that have been placed on it during its lifetime.

hand. Ihde formally represents embodiment relations as follows:

$$(I\text{-technology}) \rightarrow \text{world}$$

*Hermeneutic relations* are human-technology relations where the artifact provides a representation of the world that we may “read” and interpret and, consequently, come to new understandings of the world. As an example, consider a person’s “reading” of the patina that develops on a well-loved piece of furniture, where particular markings refer to particular events in the person’s experience using the object. Ihde formally represents hermeneutic relations as follows:

$$I \rightarrow (\text{technology-world})$$

*Alterity relations* are characterized by “relations to or with *technology*.” Via alterity relations, technology is experienced as a *quasi-other*, something present to us in ways similar to yet not truly human [7]:98. As an example, consider the relationship an individual has to a well-loved automobile, which the individual consciously cares for and relates to as a material entity. Ihde formally represents alterity relations as follows:

$$I \rightarrow \text{technology}(-\text{world})$$

We may interpret these human-technology relations of embodiment, hermeneutic, and alterity as respectively occupying spaces along a continuum from readiness-to-hand to presence-at-hand. This continuum serves as a useful framework when considering how to approach the design of everyday objects that occasionally present themselves to us in engaging and provocative

ways, i.e., designing for material awareness. Technology, and in particular computing technology, is typically designed to perceptually disappear from conscious experience as we use it. When technology does *breakdown* in Heidegger’s terms and present itself to us—becoming present-at-hand—this is typically considered either a failing of the design or a means to some purely functional end such as customization or repair. This need not be the case. Instead, we may consider intentionally designing breakdowns that lead to experiences with technology that may grow and improve over time. In what follows, I more concretely explore designing for such interactions and experiences with technology. I present conceptual prototypes employing two primary strategies, namely (i) amplifying the histories of things and (ii) amplifying the agency of things. The former emphasizes designing for enduring hermeneutic relations, while the latter emphasizes designing for enduring alterity relations.

### Amplifying the Histories of Things

How can digital technology amplify perceptions of the unique histories of particular objects—and our experiential histories with them—over time, encouraging attachment to these objects? How can a thing reveal to us over time, via hermeneutic relations, meaningful representations, prompting varying degrees of reflection on the presence of a thing in our life? Consider a series of domestic products augmented with small numerical displays—or *counters*—and various sensors that record and display simple histories of use. The *Table that Counts* (Figure 1) has a counter embedded in its face displaying the total number of times a heavy object has been placed on the table during its lifetime. Dropping an object on the table or otherwise causing shock to its surface causes the



**Figure 2.** The Lamp that Counts displays the total number of years, days, hours, minutes, seconds and milliseconds the lamp has been lit during its lifetime (milliseconds not shown in this prototype).

counter to become erratic, gradually returning to its correct count. The numbers on the counter begin to gradually dim if no new objects are placed on the table; eventually, the numbers fade out completely. Placing a new object on the table restores the numbers to the normal brightness level. The *Lamp that Counts* (Figure 2) has a counter embedded in the lampshade displaying the total number of years, days, hours, minutes, seconds, and milliseconds the lamp has been lit during its lifetime. Turning the lamp on starts the timer; turning off the lamp stops the timer.

The simple and direct communication of mundane use-histories is intended to invite reflection on the relationship between short- and long-term experiences with the objects. These *Objects that Count* invite an individual to reflect on her or his history of experience and existence with everyday useful things—things typically designed and used purely as means towards functional ends. Amplifying the histories of things involves designing emergent and evolving representations that reflect aspects of a person's experience with a particular thing, in turn, altering the way a person engages with and experiences that thing. This material-hermeneutic cycle, prompted by the physically evolving representation, may encourage meaningful human-artifact relationships that develop and endure with time.

### **Amplifying the Agency of Things**

How can everyday things amplify our perceptions of them as possessing agency—possibly even human-like thoughts or behaviors—in order to increase our attachment to these things? How can a thing reveal to us over time, via alterity relations, meaningful presentations of itself, prompting varying degrees of

reflection on the presence of a thing in our life?

Consider a series of domestic products that have been redesigned to (mis)use their functionality to help them express their needs and desires. The *Animate Lamp* tires and begins to dim its light bulb after it has been left on for a while. Jostling its shade causes it to startle and brighten. Gently rocking the lamp's shade comforts the lamp and causes lights woven within the shade itself to glow in aesthetic patterns. After a while, the lampshade lights gradually begin to dim unless the shade is again gently rocked. The *Animate Clock* (Figure 3) occasionally grows bored with showing the correct time and deviates by displaying an incorrect time. This deviation typically lasts only briefly and the clock returns to the correct time, briefly flashing a message—"HA HA"—to indicate it was only joking.

These *Animate Objects* invite use of their functionality by means tangential to their core functionality and inhibit use of their functionality by subverting their core functionality. In doing so, individuals are invited to interpret and reflect on these objects as possessing human-like needs and desires rather than treating them as purely functional. Amplifying the agency of things involves designing everyday products to present themselves as a quasi-other—an 'other' that may be related to on a deeper experiential and material level than is typical of mundane functional products.

### **Discussion of 'Prototypes' and Future Work**

The conceptual prototypes presented here are unlikely candidates for commercially viable products that an average person may readily adopt and integrate into her or his life—although it is not difficult to imagine variations of these designs that *do* meet such criteria. The role of these prototypes is different and twofold.



**Figure 3.** The Animate Clock occasionally grows bored with displaying the correct time and deviates by displaying an incorrect time.

First, the prototypes serve as concrete embodiments of abstract theoretical concepts and speculative strategies, and they provide a more tangible basis for ongoing discussion. Second, these prototypes may serve as probes that can elicit thoughtful responses from users, which may inform and inspire future design. In the future, I intend to use these types of prototypes in this way to empirically investigate the potential for material awareness in everyday life.

### Conclusion

In this paper I have proposed a *material awareness* approach to design, which emphasizes designing everyday products to occasionally draw attention to themselves, encouraging us to consider them more thoughtfully. Drawing from philosophy of technology and design theory, I have presented design strategies and concepts suggesting directions for future interaction design and HCI research aimed at promoting more enduring and sustainable relationships with technology. A goal of this work is to propose conceptual tools for generating and evaluating designs that may ultimately facilitate more meaningful and sustainable ways of being in our world with the things we create.

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