
Designing for Reflection in the Context of Sustainable Interaction Design

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Abstract

Both sustainability and critical reflection have emerged as key areas of interest for interaction design and HCI. This paper reports on two ongoing projects that use reflective designs to promote more conscious consumption of energy and materials. This paper concludes with thoughts on the role of reflection in sustainable interaction design.

Keywords

Sustainability, Reflection, Design

ACM Classification Keywords

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

Introduction

Sustainability and critical reflection have both emerged as key areas of interest for interaction design and HCI. Sengers et. al describe reflective designs as those that bring "*unconscious aspects of experience to conscious awareness, thereby making them available for conscious choice*" [9]:50. Such designs offer strong potential to encourage more sustainable consumption of energy [7, 8], as well as address the rapid replacement and disposal of technology products

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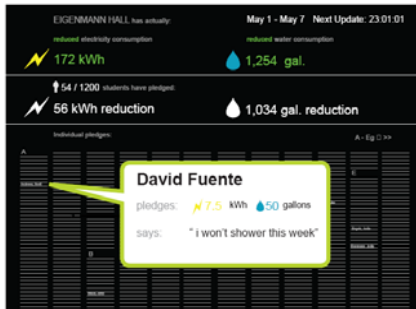


Figure 1. The student pledge wall publicly displays the names of students who make conservation pledges.

themselves, an issue which has been discussed in the context of HCI and interaction design by [3, 5].

Readings of the literature related to reflective approaches to design—which includes reflective design [9], critical design [1], ludic design [2], and technology as experience [6]—suggest three general ways of interpreting designs that provoke reflection. We can view reflective designs as (i) **practical designs**—which satisfy relatively well-established needs or desires and, consequently, may be more readily adopted and accepted into everyday routines, (ii) **critiques**—which serve as a critical discourse for designers, scholars, industry or the general public, or (iii) **probes**—which are used as a tools to provoke thoughtful responses from users, which may inspire, support or otherwise inform future design work. A reflective design may fit within more than one of these characterizations and they are presented here primarily to help frame the discussions in this paper. In what immediately follows, I report on two ongoing projects that use reflection to promote more conscious consumption of energy and materials. I conclude with some general thoughts on the role of reflection in sustainable interaction design.

Energy awareness: The IU Energy Challenge

Previously, I have worked with researchers David Roedel and William Odom on the design and implementation of an eco-visualization (EV) for the *Energy Challenge 2008*, a student competition to conserve water and electricity in the dormitories at the Indiana University Bloomington (IUB) campus. We have elsewhere described EVs as “any kind of interactive device targeted at revealing energy use in order to promote more sustainable behaviors or foster positive attitudes towards sustainable practices” [7], a notion which owes

strongly to artist and designer Tiffany Holmes [4]. A simple EV was used to communicate dorm consumption and competition standings for the Energy Challenge (<http://energychallenge.indiana.edu/>). The competition resulted in an estimated combined savings of 33,008 kWh of electricity and 724,322 gallons of water compared to baseline consumption of the previous three years.

Currently, I am working with the IUB Sustainability Task Force and IUB Utilities Group to design and implement new concepts for the upcoming *Energy Challenge 2009*. Several of these concepts are EVs especially concerned with using reflective design as practical design to encourage conservation. One of these concepts is the *student pledge wall*. The student pledge wall is a web application publicly displayed via an interactive kiosk in the lobby of each dormitory. The pledge wall (figure 1) contains a blank space for every student residing in the dormitory. Students may add their names to their spaces on the pledge wall by using the pledge form (figure 2) to pledge specific conservation actions (e.g. turn of the lights when not in use this month). Selecting a name on the pledge wall displays that student's pledge, including any comments she or he has made using the pledge form. The pledge wall also compares the estimated *expected reduction* resulting from student pledges with the *actual reduction* as compared to a benchmark goal.

The pledge wall serves as a persistent reminder to students to keep their pledges. The pledge wall also provides a mechanism for students to be acknowledged for their commitments. By visually displaying pledges publicly, rather than simply asking students to make pledges or educating them on how to best conserve

Figure 2. The student pledge form allows students to pledge specific conservation actions and calculate the estimated savings associated with each pledge action.

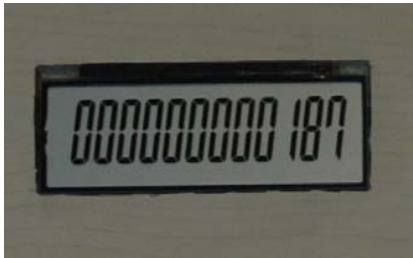


Figure 3. *Table that Counts* displays the total number of heavy objects that have been placed on it during its lifetime.

resources, the hope is that students will reflect more thoughtfully on the relationships between individual and collective actions. The lack of accurate and detailed data related to individual consumption is normally considered a barrier to the design of EVs that inform and persuade dwellers to consume less. In contrast, the pledge wall EV exploits the lack of personal consumption data as an opportunity for encouraging students to pledge and reflect on personal and collective commitments to reduce consumption.

Material awareness: Objects that Count

How can designers encourage more enduring and sustainable relationships with the unique and particular material objects that populate everyday life? How might these objects draw attention to themselves—and our experiences *with them*—in engaging and provocative ways? In order to investigate these questions, I am developing a series of familiar domestic products augmented with small numerical displays—or *counters*—and various sensors that record and display simple histories of use. These *Objects that Count* are designed primarily to be used as probes to elicit thoughtful responses from users, which may inform the design of enduring artifice that people may more readily adopt and integrate into their daily routines. I discuss several of these designs here.

The *Table that Counts* (figure 3) 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 the table's surface causes the 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.

Placing a new object on the table restores the numbers to the normal brightness level. Will the table encourage people to engage with it or treat it with care? Will its owner think twice about replacing the table when she or he reflects on the number on the counter?

The *Lamp that Counts* (figure 4) 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. Will the user think more consciously about her or his use of the lamp when she or he observes the rapidly increasing counter? Will its owner think twice about discarding the lamp when she or he reflects on precisely how long it has been used?

The simple and direct communication of previously inaccessible—and not obviously useful—information (e.g. the number of times an object has been placed on a table) is intended to provoke reflection from users on the possible intentions of these products and encourage exploration into possible uses and meanings. In particular, the unnecessarily high degrees of precision (e.g. milliseconds) and unrealistically large capacities (e.g. thousands of years) used for recording and displaying simple histories of use are intended to encourage reflection on the relationship between short and long term experience with the objects. The objects are critical of dominant approaches to design, which seek to create objects that are "invisible" and treat these objects as disposable.

I am also exploring more practical reflective designs that display histories of use. One of these directions is the design of *digital-material patinas*, aesthetic data-



Figure 4. *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).

visualizations or emerging visual patterns that communicate the age of an object and ways and extent to which it has been used. Digital-material patinas can potentially be used to design objects whose aesthetic and symbolic qualities gradually improve over time, thus encouraging attachment to these objects. This work is inspired in part by a recent study I have conducted with William Odom and Eli Blevis, which investigated the particular design qualities contributing to the endurance of everyday objects in people's homes.

Conclusions

Designing cleaner and more efficient products is important, as is making sustainable choices more useful and convenient. However, designs that bring issues of sustainability to conscious awareness are also of critical importance and interaction design is uniquely situated to contribute to such design. Everyday products, services and systems can be designed to bring issues of sustainability to conscious awareness in engaging, aesthetic and provocative ways. In doing so, design may better satisfy both our immediate and personal desires related to pleasure and meaning, as well as our long term and collective needs related to social and environmental sustainability.

In this workshop, I hope to contribute reflections on my experience working on diverse projects in sustainable interaction design, including ongoing work described in this paper, which emphasizes reflection as a strategy to promote more conscious consumption of energy and materials. I hope to engage with others working in diverse areas at the intersection of sustainability and HCI to further develop and refine the role of HCI in facilitating more sustainable ways of being.

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