# The Role of Cultural Forms in Tangible Interaction Design

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**ABSTRACT**
This paper suggests an approach to tangible interaction design that builds on the idea of *cultural forms*. Specifically, I propose that designers can shape objects and situations to *evoke* cultural forms as a means to tap into users' existing cognitive, physical, and emotional resources. The emphasis is less on improving the usability of an interface and more on improving the overall experience around an interactive artifact by cueing productive patterns of social activity. My use of the term cultural form is derived from the work of Geoffrey Saxe and his form-function shift framework. This framework describes a process through which individuals appropriate cultural forms and restructure them over time to serve new functions in light of shifting goals and expectations. I describe Saxe's framework and then illustrate the use of cultural forms in design with three examples.

**Author Keywords**
Tangible interaction, design, cultural forms

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H5.2. User Interfaces: Theory & Methods.

**INTRODUCTION**
Researchers in tangible interaction wrestle with difficult questions related to the design of interactive systems: *What aspects of design lead to "natural" and "intuitive" interaction? How can we create experiences that are meaningful, emotional, or memorable? How do we support productive collaboration among friends and colleagues or among strangers in a crowd?*

This paper considers these questions from the perspective of *cultural forms*. In particular, I propose that interaction designers can intentionally shape objects and situations to *evoke* cultural forms as a means to tap into users' existing cognitive, physical, and emotional resources. The emphasis is less on improving the usability of an interface and more on improving the overall experience around an interactive artifact by cueing productive patterns of social activity.


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My use of the term cultural form is derived from the work of Geoffrey Saxe and the *form-function shift framework* [30, 31]. This framework describes a process through which individuals appropriate cultural forms and restructure them over time to serve new functions in light of shifting goals and expectations. Cultural forms refers to social constructions or conventions that are linked to recurrent patterns of activity. Examples include things like counting systems, games, and currency systems. Cultural forms can involve physical artifacts (as in card games) or they can consist entirely of patterns of social activity (as in games like hide-and-seek). The use of cultural forms is especially relevant for tangible interaction because physcial and social embodiment [4, 11, 12] creates unique opportunities for designers to shape objects and situations to evoke existing cultural forms in highly recognizable ways. Below I describe Saxe's framework in more detail and then present three example systems that both build on cultural forms while at the same time suggesting novel functions and capabilities for which they might be used.

**A Thought Experiment**
Before getting too far into the details, a short thought experiment will help illustrate what I mean by cultural forms. To begin, imagine a small group of elementary school children in a room. Now, imagine that a researcher walks into the room, places a coil of rope on a table, and then leaves without saying anything. What happens next?

**Figure 1: A thought experiment.**

Maybe the kids play with the rope or tie it in knots. Maybe they organize a game of tug-of-war or just ignore the rope altogether. The point I want to convey is that it's not easy to predict what will happen, and it probably depends a great deal on the kids themselves and the dynamics of the group.

Now let's repeat the experiment. As before, there's a small group of children in a room. A researcher places a coil of rope on a table and then walks away. The difference is that this time there are wooden handles attached to the two ends of the rope (Figure 1). What happens now? The outcome will still vary depending on the kids themselves, but we can be a bit more confident in predicting the outcome. We might see individual kids jumping rope, or maybe two kids will swing the rope while a third tries to jump without getting tripped up. And, depending on where the kids come from, they might sing rhythmic songs in time with the rope or enact elaborate rules for taking turns.

So what changed between the two trials? One argument is that the affordances of the object changed—that the handles attached to the rope now afford grasping, swinging, and jumping. But this explanation is unsatisfactory because a rope without handles can still easily be used as a jump rope. A slightly different explanation is that the kids now *perceive* the object in a different way. In this interpretation, the rope with handles affords because it is perceived as a jumprope, whereas the rope without handles is not. While this might be an acceptable explanation, the use of the term *affordance* places an emphasis on the object itself and how the object might be used. But, what's interesting about this example is not the rope itself, or even that the kids use it to jump with. What's interesting is the complex forms of social interaction that effortlessly coalesces around the jump rope as a cultural artifact. As Norman has pointed out, the concept of affordance fails to capture the full implications of phenomena like this [27]. The explanation I propose is that the rope with handles evokes a strong and recognizable *cultural form* that, in turn, activates intricate patterns of social activity. With these patterns of activity come associated physical, cognitive, and emotional resources that individuals apply to the situation. In this paper I expand on these ideas and illustrate the use of cultural forms in tangible interaction design.

## BACKGROUND

Much of the research on "natural" and "intuitive" interaction has focused on universal (or near universal) aspects of human experience. For example, the Reality-Based Interaction (RBI) framework proposes that designers can build on users' understanding of the "natural" world at four levels: naïve physics, body awareness and skills, environment awareness and skills, and social awareness and skills [16]. Similarly, research on Natural User Interfaces (NUI) emphasizes interaction that can create "fluid, natural experiences by mimicking real-world physical interactions and augmenting them beyond what is possible in the real world" [37].

Along these lines, Hurtienne and Israel propose a continuum of pre-existing knowledge that includes innate, sensorimotor, cultural, and knowledge derived from domain expertise [14]. And, while acknowledging the role of culture, they explicitly emphasize the sensorimotor end of the continuum in an effort to be more universally applicable: "the further we rise towards the top level of the continuum, the higher the degree of specialization of knowledge and the smaller the potential number of users..." [14] (p. 128).

The work of Hurtienne & Israel has also contributed to a recent interest in the use of embodied metaphor as a foundation for intuitive tangible interaction design [1, 2, 14, 15, 19]. This area of work builds on theories of embodied cognition (e.g. [17]) that suggest that everyday sensory-motor experiences, starting in infancy, form the metaphorical foundation through which we understand a wide variety of abstract concepts. Much of the appeal of embodied metaphor comes from the idea that we can take advantage of emerging interactive technology to design more intuitive mappings between physical actions and abstract concepts. As such, this research has focused on universal aspects of human experience that cut across cultural contexts (e.g. metaphor population stereotypes [15, 19]).

### Beyond Universals

While a focus on universality might be valuable for creating broadly applicable designs, it also underplays the substantial role of cultural in shaping our engagement with world around us at a physical and social level. Within the tangible community, Hornecker has critiqued the assumption that tangibles are more natural or intuitive due to affordances rooted in physicality and our everyday experiences with the real world [13]. Along similar lines, Norman has critiqued the use of the term *natural* in reference to gestural interaction [28]: "Most gestures are neither natural nor easy to learn or remember. Few are innate or readily pre-disposed to rapid and easy learning. Even the simple headshake is puzzling when cultures intermix" [28].

Many researchers have instead argued that it is important to create systems that are responsive or sensitive to social and cultural factors (e.g. [3, 4, 8, 11, 12, 18, 20, 21, 22, 27, 34, 35]). For example, Dourish's notion of *embodied interaction* looks beyond universal aspects of human experience and attempts to capture the complex relationship between interaction, objects, and meaning as it is constructed through social and cultural practice: "The analytic exploration of embodied interaction has repeatedly uncovered the way that objects carry meaning on multiple levels: as entities in their own right, as signifiers of social meaning, as elements in systems of practice [...]" [4] (p.166).

An influential example is Mackay's study of air traffic controllers and their use of paper flight strips to coordinate work as a team [20]. She notes that "[t]he current paper-based system supports safe and effective work practices and offers a level of flexibility difficult to imagine with traditional computer-based interfaces" [20] (p. 336). A key insight is to create technology that fits within existing practices that have evolved in specific communities. Another example is Dillenbourg's concept of classroom orchestration [3]. Dillenbourg argues that technology should both work with and augment existing classroom practices in order to support usability at the level of the classrooms, not just at the level of individuals or small groups [3]. Similarly, Lee's cultural modeling design framework [18] advocates for the design of learning environments that are responsive to school students' cultural funds of knowledge [8] and socially constructed ways of knowing. She demonstrates the application of this framework in the design of a multi-media literacy environment that is responsive to the sociocul-tural resources of students in schools [18].

### Form-Function Shift Framework

The term "cultural form" is derived from the work of Geoff Saxe and his form-function shift framework [30, 31]. Saxe developed this theories through the study of diverse groups of people engaged with cultural concepts and artifacts. These groups included children selling candy on city streets in Brazil; adults engaging in economic exchanges with Western currency systems in remote areas of Papua New Guinea; and children studying fractions in elementary schools. Using these studies as a foundation, Saxe explains how individuals appropriate existing cultural forms and restructure them to serve new functions over time in light of shifting goals and expectations.

### Cultural Forms

Central to Saxe's framework is the notion of cultural forms, which he defines as historically elaborated social constructions and conventions [30]. Examples include things like counting systems, games, and monetary systems. Cultural forms can involve the use of physical artifacts (as in activities like jumping rope), or they can consist entirely of patterns of activity (as in games like hide-and-seek). Cultural forms are inherently linked to social practices. In other words, artifacts like a jigsaw puzzle or a $20 bill are nothing more than bits of paper and cardboard in the absence of recurrent, socially organized activities that give them meaning. So, when I open a jigsaw puzzle box and dump the pieces on a table, I not only have a specific goal in mind (assembling the puzzle), I also have a set of physical and cognitive skills that can be coordinated in a routine behavior to achieve that goal. And, unless I happen to be alone, dumping the puzzle pieces on the table is also a communicative act, a sort of open invitation to the people around me to partake in a shared endeavor that involves corresponding social resources as well. These resources include things like establishing common ground, negotiating goals and sub-goals, and resolving disputes.

In a way the jigsaw puzzle is just an excuse to spend time with friends and family, to talk and joke and to be physically close. The broader point is that through cultural forms, people coordinate activities and resources to accomplish goals. But, these goals are diverse, multi-layered, and constantly in flux. As Saxe puts it: "Not only do individuals shape and reshape their goals as practices take form in everyday life, but they also construct goals that vary in character as a function of the knowledge that they bring to practices" [30] (p.17).

My use of the term cultural forms implies social practices and activities that can take place at different levels of granularity. For example, Sherin proposes the term *micro-practices* to describe "stereotypical activities, varying in length from a few minutes to a few hours, in which a handful of individuals participate as the main actors." [32]. Micro-practices include things like going fishing, bowling, or playing board games. Many of the cultural forms that I use as examples in this paper involve social activities that could be described as micro-practices.

One last note on cultural forms is that they persist in societies and cultures over relatively long periods of time—at least long enough to achieve a degree of stability. Of course, as cultures and technologies change, new forms arise, old forms die off, and existing forms evolve and transform. One implication of this observation is that in order for forms to persist, they must have some built-in means of self-replication— some way in which they are passed on from person to person over time. For this to happen, the social activities implicit in cultural forms involve elaborate mechanisms for teaching and learning. There are a few excellent examples of this in the Learning Sciences literature. For example, Nasir's study of the sociocultural practices in the game of dominoes reveals subtle ways in which peers teach each other strategic approaches to play that go well beyond the rules of the game itself [24]. Likewise, Stevens' study of children playing video games in homes describes a variety of sophisticated learning arrangements in which kids teach and learn from each other through play [29, 33].

## CULTURAL FORMS IN INTERACTION DESIGN

Using Saxe's shift framework as a starting point, I propose that cultural forms provide a useful foundation for interaction design (and tangible interaction design in particular). When designers create systems that evoke cultural forms, they tap into existing resources on the part of individuals that not only increase usability, but also create meaningful experiences with other people around an interface.

This perspective diverges from notions of affordance and metaphor as they are commonly conceived in HCI research. Norman describes affordances as "the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used" [25] (p.9). His definition emphasizes the object itself and ways in which the object might be used. Of course, users must perceive the cultural form in an object or an artifact for it to be useful. If I don't recognize a piece of paper (like a $20 bill) as monetary currency, then it's just a piece of paper. That piece of paper has certain affordances: it affords writing, folding, crumpling, and so on. But as a $20 bill, the paper has meaning in terms of the cultural practices that involve the storing and exchange of currency for goods and services. More recently, Norman has proposed the term *social signifiers* to refer to physical or social indicators that cue productive social activity [27].

Of course both a rectangular piece of paper and a $20 bill can be thought of as cultural artifacts. The important point is that there are different sets of practice-linked resources associated with them. This leads to the second observation that cultural forms are culturally specific. Forms that make sense in one context are not recognized in other contexts, or are not recognized in quite the same way. Likewise, the practices surrounding the same object might be quite different in different situations. As with affordances and metaphors, cultural forms might be more or less accessible to different members of the same group depending on factors like age, gender, background, and individual experiences. For example, expertise or experience in a specific domain might change the meaning and utility of various forms [30]. In the same vein, different forms can be more or less appealing or inviting to users depending on their background, thus creating emotional responses that color their entire experience with a particular design [26].

Finally, Saxe's framework suggests that cultural forms are malleable and that people are inventive in their use of them. Forms are continually appropriated and restructured by individuals to serve new functions in light of shifting goals and expectations. This opens the possibility that interaction designers can intentionally evoke cultural forms while at the same time supporting novel capabilities. Designed forms can maintain aspects of source cultural forms to a greater or lesser extent; however, the fidelity of the designed system to the source cultural form is critical as it affects the ability of users to recognize the underlying source form. In other words, if a user does not perceive the cultural form then potentially desirable practices and resources will remain dormant.

## RELATIONSHIP TO METAPHOR

The approach I propose is similar to that of metaphor, but the emphasis is different. One typical use of metaphor in interaction design is to draw parallels between common activities in order to suggest productive actions (or suggest the significance of such actions). However, metaphors tend to break down when the familiar domain ceases to match the expressiveness and power of the target domain [4, 13].

When an interactive system evokes a cultural form, it is not a metaphor. Rather, it is an actual instantiation of the source cultural form with a certain degree of variation involved. One way to think about this is that no two jigsaw puzzles are exactly alike. They vary in terms of material properties (wood, rubber, cardboard, plastic), shape, size, number of pieces, and so on. Some jigsaw puzzles have a picture that is revealed when the pieces are assembled, and others don't. Some jigsaw puzzles aren't even *puzzles* at all. The point is that the concept of a jigsaw puzzle is rather fuzzy, and while we could argue about whether a specific instance is or is not an actual jigsaw puzzle, the underlying cultural form is recognizable in each instance to a greater or lesser extent. Now imagine an interface based on a jigsaw puzzle (e.g. [, 39]). We could say that this interface uses a jigsaw puzzle metaphor, a mapping that suggests possible operations that can be performed with objects in the system. Another way to think about it, however, is that the interface (whether physical or graphical) is, in fact, a real jigsaw puzzle, not metaphorical representation. It just varies from source cultural form to some extent, and this variation affects the legibility of the form.

## EXAMPLE 1: TANGIBLE PROGRAMMING LANGUAGES

One common application of tangible interaction is in the domain of computer programming languages, particularly for learning purposes. These languages often take the form of constructive assembly systems [36] in which users build physical algorithmic structures out of a collection of components. For example, McNerney [23] and Wyeth [38] created programming systems based on LEGO bricks, while Horn et al. [9] used blocks shaped like puzzle pieces (Figure 2). Through the use of such artifacts, all three of these systems build on existing cultural forms.

**Figure 2: The Tern tangible programming system uses puzzle pieces for the physical construction of computer programs.**

I suggest that there is more going on with these systems than simply embodying programming syntax or offering clear affordances and constraints. Because cultural forms are recognizable in these systems, users are able to apply a variety of well-established cognitive and physical resources such as the ability to correctly orient and connect building blocks and the knowledge that construction and assembly are typical goals of such systems [39]. For example, in observations of tangible programming languages, one of the first things children do is to construct the longest possible chain of blocks that they can [9]. This is a goal that is quite consistent with a jigsaw puzzle-assemble all of the pieces to see the hidden picture that results. The forms also activate social resources such as the ability to share blocks, to resolve conflicts over limited resources (e.g. there are only three forward blocks), and to negotiate shared goals.

Continuing with the tangible programming example, different cultural forms may be more or less accessible to different user groups based on background and prior experience. So, for example, it's possible to imagine a child who frequently plays with LEGOs but has never encountered a jigsaw puzzle before. For this child, the resources associated with the LEGO bricks might be more elaborate and practiced than those associated with the puzzle pieces. And, importantly, the three programming systems invoke a set of emotional resources associated with the source forms such as the enjoyment of play.

This leads to the idea that cultural forms that may be more or less inviting to users. For example, Horn et al.'s [9] study of tangible programming systems in a science museum found that the tangible system was more inviting than an equivalent graphical system that used onscreen blocks with a computer mouse. Specifically, visitors (and especially kids) were more likely to try the exhibit with the tangible blocks than with a mouse. One possible explanation is that the source cultural form was more recognizable in the tangible system than in the graphical system. Indeed, the most salient aspect of the graphical system might have been the computer mouse and monitor—an entirely different (and more polymorphic) form with different associated resources (including emotional resources). Observations of visitors interacting with the exhibit revealed differences in social activities between the two exhibits as well. The mouse-based exhibit tended to result in a more parent-driven activity, while the tangible exhibit tended to be more child-driven, meaning that children were more active in constructing various programs while parents took on more of a supporting role [9]. As Dourish explains, "a child playing with blocks engages with them in quite different ways than we could provide in a screen-based virtual equivalent; so tangible computing is exploring how to get the computer 'out of the way' and provide people with with a much more direct-tangible-experience" [4] (p.16).

## EXAMPLE 2: TABLETOP MUSEUM EXHIBIT

The second example, also from an informal learning setting, involves the use of a multi-touch tabletop in a natural history museum. The activity presented on the tabletop is a multi-level game designed to help museum visitors understand concepts of evolution and phylogenetic trees (Figure 2) [10]. Relevant to this example are micro-practices surrounding video game play. From research in the Learning Sciences there is evidence that kids engage in rich sets of social activities while playing video games together [29, 33]. These activities include a variety of self-organized learning arrangements such as mentoring, intent observation, and inner and outer circles of play [33]. Kids are also effectively able to coordinate a variety of quantitative representations common to video games to make predictions and organize their actions around those predictions [29].

Based on this research, there is reason to believe that if kids perceive the tabletop exhibit as a video game, then many of the associated resources of video game play should become accessible, even though the context is different (a natural history museum rather than a living room). Our analysis of children and families using the exhibit in a museum revealed that families employed a variety of game-like activities (such as play-by-play narration, coaching, and turn taking) to facilitate not only individual engagement, but also group engagement as well.

Notably the social resources that we observed didn't always resemble what might be thought of as "positive" collaboration. For example, two brothers resorted to physically hitting one another in a dispute over whose turn was next. Despite this conflict, both boys stayed involved in the activity, even without parental intervention or oversight. The conflict in this case might have been a well-rehearsed form of negotiation to stay involved in the activity. See [6] for another example of surprisingly useful conflict.

**Figure 3: A museum exhibit on evolution consisting of a multi-level puzzle game on an interactive tabletop surface.**

What is less conclusive from our observations is whether or not the exhibit actually helps people learn—or at least learn about evolution and phylogenetic trees. In other words, while focused engagement is probably necessary for learning, it's not necessarily sufficient in this case. And, the micro-practices of game play, while effective at helping kids learn how to play and win games, may not help them learn about the target concepts intended by the designers. In this respect the role of the parents was interesting. On the one hand, many parents and adult chaperones seemed to discourage children from interacting with the table, making statements like, "we're not here to do *that*." In these cases, they seemed to perceive the tabletop as a video game, and, as such, an inappropriate activity for a trip to the natural history museum where there are many authentic artifacts on display that can't be seen anywhere else. On the other hand, other parents seemed to perceive the activity as more of an interactive museum exhibit designed for learning rather than a video game. This often led to exchanges between parents and children in which the goals and meaning of the exhibit were negotiated over time, leading to an activity that was not quite a video game and not quite a museum exhibit either, but something that had combined aspects of both. In this case, having visitors interpret the cultural form of the exhibit installation in slightly different ways might have been valuable to the overall experience.

### EXAMPLE 3: GHOST HUNTERS

There are times when the goal of interaction design is to bring about change in culture itself. A good example of this is in the current trend to develop *eco-feedback* technology [7] to help promote sustainable behavior. The challenge is that the consumption of natural resources such as gas, electricity, and water is largely invisible due to the nature of modern infrastructures (out of sight and out of mind). As a result people have poor understandings of the magnitude and impact of their own consumption. From one perspective, the goal is to bring about behavior change through feedback and reinforcement, an approach that emphasizes change at the level of the individual. However, growing attention on the interplay between social practices and feedback technology (e.g. [34]) has enlarged the unit of analysis to consider families and communities as well as individuals.

In this vein, we developed an interactive system called Ghost Hunters designed to engage parents and children in informal learning activities in which they seek out hidden sources of energy consumption in their homes. Our system combines an electro-magnetic field (EMF) detector with a mobile tablet computer. Bringing the Ghost Hunter device within range of an electrical current activates the detector. Families can then use an app on the tablet computer to keep track of the sources of energy consumption that they have discovered so far (Figure 4). For example, bringing the device within a few inches of a microwave oven on standby will make it vibrate and beep. However, the same microwave will activate our system from several feet away while heating up food.

We deliberately created this design to evoke cultural forms of search games like hide-and-seek and I-spy-with-my-little-eye. We knew that we wanted to involve parents and children to-gether in exploring the home, and search games seemed like a good fit for the types of activities we were targeting—one in which kids search in odd places (e.g. behind couches and so on) to find hidden things. In this case the hidden things are sources of energy consumption.

However, the cultural forms in this example are different from the previous examples in two important ways. First, games like hide-and-seek don't typically involve physical artifacts. Only the players themselves (and of course places to hide) are necessary. A second related difference is that activities aren't tied to a specific location. Players are free (and even compelled) to explore their wider surroundings. Given these differences, a key question is whether or not we could create a minimal design that would nonetheless suggest particular forms of social engagement. In other words, the device itself is not particularly evocative, but we hoped that its manner of use in context would suggest familiar forms of social engagement.

An evaluation with seven families revealed a variety of ways in which parents supported their children's learning about energy consumption. This included physical support (such as lifting a child up to a light on the ceiling), offering hints and tips, and asking leading questions. These types of activities are reminiscent of search games like hide-and-seek, but more work needs to be done to fully understand whether and how the design evoked specific cultural forms. However, when we asked participants to characterize the activity after it was over, some mentioned things like "hide-and-go-electrical", "treasure hunt", and "electricity hunt". Our design seemed successful in helping families find unexpected sources of electricity use, including so-called energy vampires —devices that consume electricity on standby mode.

**Figure 4: Seeking out sources of electricity consumption using the Ghost Hunters device.**

However, our design was less effective in getting families to pay attention to relative consumption (by comparing across appliances) or in attending to the units of consumption (kilowatt hours). This might have been related to the forms that we evoked—activities that encourage discovery of hidden things but not necessarily their comparison. Future work would involve thinking about cultural forms that imply the comparison of objects or quantities and attempting to integrate those forms into the Ghost Hunter design.

## TOWARD A DESIGN PROCESS

It's clear that tangible interaction designers intuitively incorporate cultural forms into their creations all the time, even if they don't plan it that way from the outset. As a case in point, the first two examples in this paper were not created with cultural forms in mind. It was only in retrospect that the role of cultural forms in shaping the interaction around the designs became apparent. However, the inspiration for the third example (Ghost Hunters) came from deliberately thinking about the kinds of social activities that we wanted to promote. This was followed by a brainstorming session in which we considered the types of cultural forms that might or might not produce the outcomes we were looking for.

Of course, not all interactive systems can or should be designed to evoke cultural forms, but this approach can be valuable in situations where cueing certain forms social interaction is essential to the success of the design. To summarize the design approach: Start by considering the forms of social interaction that will contribute to the success of an interactive system. Who should be involved? What roles should they play? Next, think about the kinds of cultural forms that might bring about the desired patterns of social activity. How accessible and appealing are the various forms to the target audience? Formative testing that consciously samples a diverse population might be useful in answering these questions. Finally, think about the fidelity of designed forms to their corresponding source forms. Fidelity to source the form can have a large impact on the appeal of an interface to different segments of the target audience. Low fidelity forms may not be recognized as instances their source forms, thus missing out on potentially valuable practice-linked resources. In this respect, tangible systems have a clear advantage over their graphical counterparts. Through the use of physical and social embodiment tangible systems have greater flexibility to remain faithful to source forms while incorporating interactive media.

## LIMITATIONS

While the use of cultural forms can help shape social activity around an interactive system, this approach shares many of the limitations of affordance and metaphor in interaction design. While cultural forms can cue social activity, the results may or may not match desired outcomes exactly. For example, hide-and-seek games are great for uncovering hidden sources of consumption, but not so effective for getting families to compare consumption across different devices and appliances. Cultural forms are also culturally specific and open to interpretation. What works in one setting with one group of people may not be successful in a different context. Likewise, people bring into an activity their own goals and expectations that may or may not align with the designers' goals. In many cases there are no obvious or appropriate cultural forms to support the desired activity. The good news, of course, is that cultural forms are everywhere, and their use involves a wide array of activities.

## CONCLUSION

In this paper I have proposed an approach to tangible interaction design that looks beyond physical analogies and universal sensorimotor experiences. Specifically, I have argued that designers can purposefully evoke cultural forms as a means to activate existing patterns of social activity along with associated cognitive, physical, and emotional resources. This approach to design was inspired by the notion of social and cultural funds of knowledge [8, 18] and by Saxe's form-function shift framework [30, 31]. Using three examples I demonstrated what this might look like in action.


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