Tattle Tail: Social Interfaces Using Simple Anthropomorphic Cues

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Abstract
Tattle Tail is a tangible interface exploring the addition of intentionally abstract social cues to everyday objects. We introduce an analog alarm clock that we have augmented with a physical tail to expand its output vocabulary. The tail demonstrates excitement when the alarm is ringing, disappointment and anger when snoozed, and contentment after the user wakes up. We discuss the general design space explored by the Tattle Tail prototype, including other objects that might benefit from tail augmentation or other anthropomorphic elements.

Figure 1. The Tattle Tail prototype connected to an alarm clock that conveys its emotions via wagging gestures.

Keywords
Social Interfaces, Tangible Interfaces, Emotional Design

ACM Classification Keywords
H5.2 User Interfaces: Interaction Styles

Introduction

Social and relational design are firmly grounded in a vision of making interaction with technology close to, and hopefully indistinguishable from, interaction with other humans. In search of this vision, research and industry have developed a wide range of social technologies, from animated agents [4] and social robots [1] to speech and natural language interfaces. As these interfaces become more and more human-like, however, small design missteps become more and more detrimental to the qualitative experience of the interaction -- a situation termed the *uncanny valley* [5] (Figure 2). Rather than focus on this 'long tail' of social nuances, the Tattle Tail project positions itself on the near side of the valley: granting limited, but high-payoff, social affordances to interactive designs.

Tattle Tail is a physical interface augmenting everyday objects with emotional states via an actuated tail (Figure 1). By using simple social cues, interfaces such as Tattle Tail can convey representative emotional states of everyday objects to inform the user of how it feels. These objects have a relatively straightforward vocabulary of emotions -- for example excitement, anger, and contentment -- that can be represented abstractly so as to avoid falling into the uncanny valley. This type of physical anthropomorphic interface is both ambient and tangible, showing the user information at a glance while also being actuated in the real world where other objects and people can be affected.

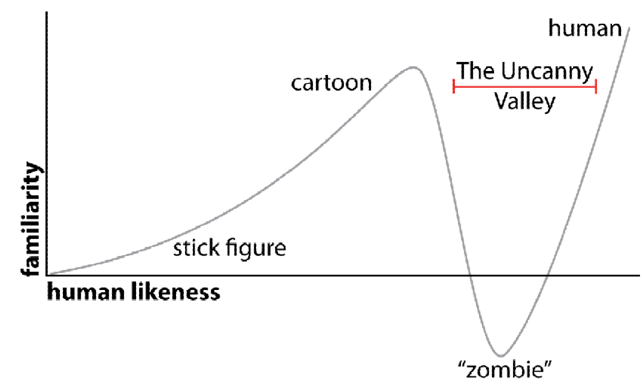

Figure 2. The Uncanny Valley, adapted from [5].

To follow, we place Tattle Tail in context of related work and describe its current instantiation as an augmentation to an everyday alarm clock, its general implementation, and our vision for how the Tattle Tail concept might be extended.

Related Work

Reeves and Nass were the first to convincingly demonstrate the power of media to parade as a social actor [8]. To strengthen their arguments, the authors used as minimal an experimental manipulation as they could; Tattle Tail aims to translate their minimalist experimental manipulations into design criteria. Our designs are intended to be processed at what Norman calls the *visceral level* of cognition [6], creating instinctual reactions that occur before conscious thought.

Tattle Tail builds on a variety of tangible and robotic social computing projects. Interface agents [4] have tended to use anthromorphic design elements to communicate state and intention to the user. Social robots such as Kismet [1] have incorporated the basic facial movements identified in psychology literature to guide emotive output. Interfaces have explored the use of facial expression [7] for emotive feedback, as well as posture, gesture, and others [2].

Tattle Tail

Tattle Tail is envisioned as an output modality for everyday objects. At its essence, Tattle Tail is an actuated tail attached to items such as clocks, chairs, laptops, or coffee mugs. The tail communicates via a combination of gesture and posture, for example drooping or wagging. It can be used in a variety of ways (Figure 3), including notification, information display, and communication.

In our prototype, the tail is integrated into an analog alarm clock (Figure 1). In its resting state, the tail of the alarm clock is mostly idle, occasionally making slow and subtle wagging motions to convey peace and contentment. When the alarm sounds, the tail perks up and begins shivering excitedly, jittering as if startled. If the user turns off the alarm and signals that she is awake, the alarm clock begins a broad wagging motion to express happiness at the user waking. If the alarm is snoozed, the clock goes back to its resting state for a set period of time. If the user chooses to snooze the alarm several times in succession, the tail will slam up and down in a thumping fashion to express annoyance.

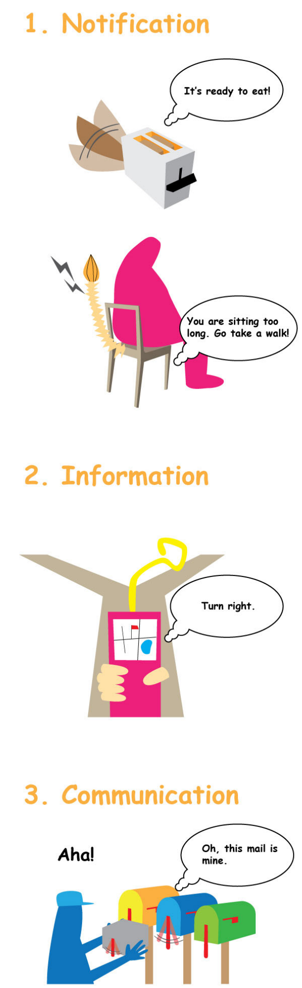

Figure 3. Tails used for notification, information display, and communication.

Implementation

Tattle Tail uses a spine robot topology [3] to allow for two degrees of freedom (curve up/down and curve left/right) and is cable driven via two servos in the tail's base. The tail is made from a series of aluminum universal joints connected together by lightweight carbon fiber tubing, as shown in Figure 4. The control cables are arranged in antagonistic pairs allowing for force to be applied in both directions. The tail is covered in fabric to hide the details of its construction from the user and to take on a more natural tail-like appearance.

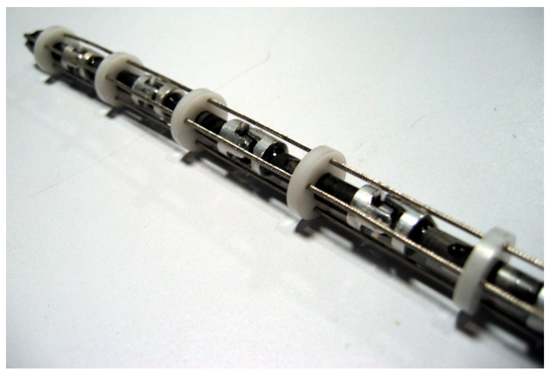

Figure 4. Mechanical structure within the tail's soft fabric exterior.

Sitting atop the tail is an analog wind-up alarm clock specifically chosen for its simplicity and low-tech charm. A few modifications allow for user interaction and control. Sensing of the clock's alarm status (i.e., a mechanical lever that pops when the alarm sounds) is achieved by placing a wire that makes electrical contact when certain internal gears and levers move. A momentary push-button is placed on the top of the clock to enable snooze functionality which temporarily disables the alarm for a set period of time. A servo, in addition to the two used for moving the tail, is also used to mechanically stop the alarm bell from ringing after the user presses the snooze button.

The microcontroller controlling the hardware speaks via serial/USB to a host computer responsible for actuating the servos. This host computer sends messages back to the microcontroller announcing the alarm clock's state and the tail's position. Tail animations are represented in the computer as a series of X/Y coordinates and wait time parameters that are sent to the tail as a representation of various emotional states.

Design Feedback

We presented our work for a design review to a class of artists, engineers, architects and designers. Feedback to the clock seemed qualitatively different than that given to a typical timepiece, especially emotional feedback (e.g., verbal "awww"s and facial expressions). Reviewers immediately understood most of the clock's emotional cues and were able to cite reasons why the clock might be feeling each particular emotion. Angry thumping upon repeated snoozing was an exception, as the animation executed too slowly to be understood as frustration. This feedback underscored the importance of tuning the tail animations carefully.

Some viewers questioned the ability of a tail to change their interactions with an alarm clock. Without an extensive user study it is difficult to know the effects of tail-like additions to everyday objects, but we believe that small social cues such as gesture, posture, and form could play a large role in better understanding devices' emotional states and building closer relationships with physical objects in our environment.

Another provocative comment suggested the addition of interaction patterns that mimic the way a human interacts with an emotional animal, as one might pet a cat to calm it down after it has become upset. While this may seem natural, petting upset objects could quickly lead to an irritatingly high-maintenance environment and move closer to the disturbing false-reality of the *uncanny valley*. Instead, we believe that common object interaction is more appropriate and allows the user to directly alter the conditions that are causing the object to be emotional. For example, a sad tail on a potted plant would suggest the need for watering or sunlight, not petting it or taking it for a walk to make the plant happy.

Discussion and Future Work

Most animals' tails are direct signals of emotional states such as anger and fear, and we leverage this fact in our design. Rather than display abstract data, our designs for Tattle Tail involve translating data to holistic emotional levels first. So, while mapping the tail's X/Y coordinates to temperature and humidity respectively would likely result in a non-intuitive display, translating the weather instead to an emotion (for example, sailing weather means a happy tail, while a storm instills fear) more directly leverages the tail's intuitive emotive output. There is also a design space for abstract output (as in Figure 3), where the tail might be used to represent an icon such as an arrow or a question mark, but our work has not yet explored this space.

Though we integrated Tattle Tail into an alarm clock, we believe the idea is not limited only to clocks. Other possibilities include objects such as book bags, cellular phones, coffee mugs, and laptops. In addition, objects with tail-like physical forms could offer similar interactions without adding a tail to the interface (Figure 5): for example, computer mouse cords, grandfather clock pendulums, or vacuum cleaners.

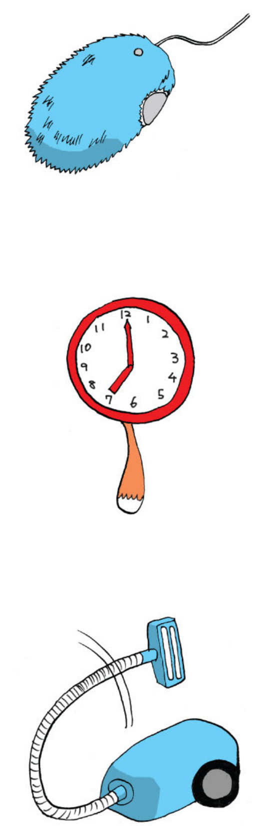

Figure 5. Examples of other everyday objects that are straightforward to augment with tails or tail-like behavior.

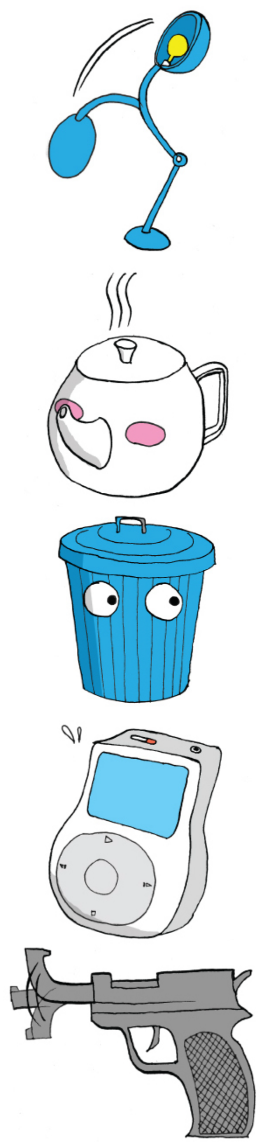

Figure 6. Examples of posture, gesture, facial expression, and form used as simple social cues to physical interfaces.

Broadening our scope, we are interested in bringing other kinds of simple social cues to physical and tangible interfaces (Figure 6). These cues include:

- Posture and Gesture: a lamp that gestures or waves at the user to attract attention
- Facial expression: a teapot that blushes when the water is hot, or a trash can that winces when it needs to be taken out
- Form: a digital music player that grows bloated when near capacity, or a gun that becomes limp if not in the owner's hands

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