“Give me five minutes!” Feeling Time Slip By

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Abstract
Time perception is the result of the physical progression of events and the way we experience them. For centuries the way we experience time has heavily relied on visual and auditory senses; little has been done with the experience of time and haptics. As technology is increasingly embedded in our everyday life, and wearables are becoming increasingly popular, we explore the concept of ‘feeling’ time. In this paper we present initial work into users’ interactions with, and appropriation of, a simple wearable device that vibrates every five minutes. We discuss how lightweight interactions with such a device can increase our awareness of time in a peripheral way through the sense of touch, by presenting initial findings from two in-the-wild autoethnographies.

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Introduction
Time, as an element of physics, proceeds at a constant speed yet individuals may experience the same amount of time very differently, particularly if deeply engaged in a task [3]. Ancient Greeks distinguished the perceived experience and the actual concept of time with the two terms: *Kairos* and *Chronos*. While the latter refers to the chronological sequence of time, *Kairos* refers more to the qualitative experience of being in an opportune moment. Time perception has been of great interest in many disciplines, including philosophy and psychology, and more recently by technologists when considering time management tools (e.g. calendars). In our contemporary lives, busy schedules, flexible working and constant distractions make it easier than ever before to lose track of time.

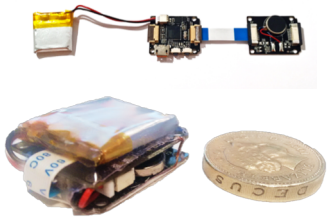

Figure 1.
Prototype with a £1 coin for scale.

As technology is increasingly integrated into our everyday environment, providing access to information anytime and anywhere, researchers [e.g. 6] have suggested the need to rethink our relationship with technology. For example, Bakker [1] discusses extensively how ubiquitous technology can also be perceived in the periphery of our attention. To address this, we discuss use of technology in the periphery of our attention as a way of self-enhancement. We present initial work on a prototype heavily inspired by a commercial device, *Durr*, intended to enhance our perception of time. We then discuss initial findings from an in-the-wild deployment through two autoethnographies and lay out our future steps.

Motivation: *Durr*

In late 2013 *Skrekkøgle* launched *Durr* (http://skreksto.re/products/durr), a simple wrist-worn device that vibrates every five minutes. The device received considerable media attention: one journalist who used the device stated *"*[I] *found it makes me more productive than any smartwatch ever has".* He also reported other less positive reactions: "[it's] *a friendly vibrating reminder that your death is now five minutes closer"* [7]. The designers provide some documentation of the build, but there is no evidence of user evaluation. Inspired by this device and potential users' reactions, we decided to prototype a similar device of our own in order to carry out user-evaluation and understand the relationship between time perception and sense of touch.

Design rationale

Weiser's [9] vision of a world where technology is disguised in physical artefacts and embedded in the everyday routine, to lessen the attention burden, has never been so pertinent. Technology has changed our relationship with time over centuries and continues to impact our lives. Working hours were once determined by daylight and seasons; later, public clocks, such as church bells, helped create a shared experience of time. Fast-forwarding to the 19th century, time became more of a personal experience with pocket watches and later wristwatches. Today, we can tell the time on a range of devices, including smartphones and now smartwatches.

While all of these technologies heavily rely on our visual or auditory senses, little academic work has looked at time perception and the sense of touch. One exception is Töyssy et al. [8], who developed a system that allowed users to accurately read time just through vibrotactile signals. We introduce the idea of experiencing time through our tactile sense, with the purpose of enhancing perception and knowledge of time in a less intrusive and more personal way. We built two wearable prototypes (Figure 1) that vibrate every five minutes and evaluated their use in the wild.

Prototyping our device

The initial prototype used an Arduino Uno controlling a 10mm coin vibrator through a simple circuit. Similarly to the *Durr*, we included a delay of 30,000ms (5 minutes) between each vibration, in order to indicate that five minutes had passed. The SeeedStudio Xadow platform was then used to create a small, versatile and wearable prototype for evaluation. For this we used the Xadow main board (a miniaturised Arduino with FFC connectors and USB charging circuitry), with a coin vibrator module and a small (170Mah) lithium-ion battery (Figure 1). With use of sleep code the prototype lasts approximately 200 hours before requiring recharging. Two different form factors were used

Figure 2.
A1 used the device in a repurposed watch strap.

Figure 3.
A2 first used the device in a wrist sweatband and subsequently in a case around the neck. The wrist sweatband was not as inconspicuous and disguised, however using the necklace meant it was not easily felt since the device was not always in contact with the body.

(Figures 2, 3). As a result of our implementation to maximise battery life, the duration between each vibration was not always consistent, fluctuating by approximately 30 seconds depending on conditions (battery level, temperature). We are currently developing a third prototype utilising an ATTiny85 chip and custom PCB to allow for further miniaturization, less expensive manufacture, and a greater battery life. In addition this will allow the device to be worn in a wider variety of ways.

Method

The first two authors each carried out an eight-week (March-April 2015) autoethnographic study [5], during which they used their device in their everyday lives and recorded salient interactions and insights. In addition, the authors used the device to prompt discussions into the concept with friends and family.

Findings

Expectations vs. reality of use

Both authors expected the device to help them focus and increase productivity, and reduce time spent procrastinating. In addition to this, author 2 (A2) expected the device to help her keep better track of time.

Author 1 (A1) did not envisage using it outside focused working moments (e.g. when writing a paper, marking, etc.). However, over the eight weeks, he found the device to be particularly useful in meetings and when teaching. The device reminded him to maximise use of time and move on to the next topic, especially in limited time situations, such as during an hour-long meeting: "*I found that it was very useful. I wasn't spending too much time with each individual student and I remembered to move on, without them noticing. It's very easy to get distracted working on one particular problem and forget that there's other people waiting*" [Author 1, diary entry from 25.03.2015].

Both authors also experienced situations where they did not enjoy or benefit from wearing the device. For example, when commuting, A1 felt he was not in control: "*Sometimes* […] *I didn't like it. I'm stuck on a train and I don't want it reminding me that I could be doing something more productive"* [A1, 03.03.2015]. A2 did not appreciate it when it was not providing useful information, especially during dead moments: "*When I'm on the underground on my way to work, I already know how long the journey will take and having it remind me how slowly time is going by is irritating!*" [A2, 01.03.2015].

A1 found it annoying in social situations because, "*it's a time where I'm purposely relaxing and don't want to be reminded how long I've spent*" [A1, 05.03.2015]. As a result, A1 unplugged the battery from the device during personal time. After approximately 4 weeks of use he started to only rely on the device during meetings. However, the process of turning the device on and off is problematic and he would appreciate a more straightforward solution, e.g. using a button.

Contrarily to A1, A2 did not notice the device vibrating during her personal time and when relaxing. When she did occasionally feel it, she often wondered if her perception of five minutes was unrealistic or if she just didn't feel every vibration: "*Sometimes I feel it vibrate and then it's a while before I feel it again. I wonder if I just missed one or two, or if time is actually that slow! Funnily, I don't double check with the clock. I only use*

Side Bar 1

Other expected appropriations:

- Tracking exercise (Male, 29);
- Encouraging movement (Female, 51);
- Remembering to drink water (Female, 64);
- Reminding busy people when the next meeting is (Male, 65);
- Knowing how long a salesman is spending with each customer (Male, 42);
- Being kept awake whilst driving (Male, 31).

Several people also mentioned their desire to have control over how often it could vibrate (e.g. every 30min) or to be able to turn it on and off.

the clock if I have an appointment to know how much time I've got" [A2, 23.03.2015].

During the auto-ethnographies, the two authors interacted with numerous friends and family. In general, people were initially sceptical about the concept, but as they were prompted to think about how they would use it, they either came up with scenarios in which they would find it useful, or times when others might (Sidebar 1).

Conclusions and Future Work

In this paper we discuss implications of a wearable device that vibrates every five minutes and how it can affect individuals' experience of time by self-enhancing their perception of it through peripheral tactile interactions. We found that several people could see the benefit of having a personal and subtle reminder of time slipping by, particularly during busy schedules. Perhaps unsurprisingly, the form factor of the device also had a strong influence on whether and when the device would be worn. We also found, consistently with the theory of flow [3], that, when deeply engaged in a task, vibrations may be missed, altering one's time and tactile perception.

As this is a work in progress, we are following a user-centred design process to develop new iterations and deploy the device in the real world. We are currently making new prototypes for a small scale in the wild evaluation, that include a start/stop button, and that will help uncover further use case scenarios and inform iterations of the prototype. In this paper we produced a prototype device, however considering benefits and drawbacks of using commercial devices [4], future work could include deployment as an application for an existing wearable such as a smartwatch. Existing research [2] shows that early smartwatch adopters struggle to see how it differentiates from their smartphone, demonstrating space for new functionalities to be added. Ultimately, we are interested in seeing how, on a higher level, technology can be used for self-enhancement and support cognition through lightweight interaction.

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