Trækvejret: A kinetic device encouraging bodily reflection.

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Abstract

A flexible wooden device, "Trækvejret" which emulates a slow rate of breathing is placed in a coffee break room. This work examines related works on reflection, triggering reflection, and breathing and biofeedback technologies. We demonstrate how simple technology such as Trækvejret, which does not measure or give feedback about a user's breathing can nonetheless potentially be useful and provoking, encouraging reflection and potentially, behaviour change.

Author Keywords

Breathing; bodily awareness; serendipitous discovery; kinetic; wellness; offline.

CSS Concepts

Human-centered computing~Interaction design process and methods   • Human-centered computing~User centered design

Introduction

We developed an artefact to explore how opportunities for momentary bodily reflection as part of everyday activities might be created - in this case, as part of the daily routine of getting a cup of coffee at work. Trækvejret (Danish for `Breathe') is a device situated in a coffee break room, which people can choose to engage with, when and if they happen upon it. A video of Trækvejret can be seen here: https://youtu.be/e_dx-aC0IXc

Figure 1: Trækvejret from front, in use, and from the side.

This a conceptual work in progress which does not present a mature study but utilizes research through design as a method to generate insights which opens for debate and engagement. This work is part of a PhD study in "Designing for Meaningfulness in Smart Products" wherein one of the design goals is designing unconnected devices for personal development.

Serendipitous Discovery
Ambient displays act as dispensers of non-critical information whose aim is to provide information without overly distracting the observer [22]. In this work, we see the value of serendipitous discovery as creating an opportunity to engage a person momentarily.

Motivation: Non-quantified reflection
We are especially interested in the role of physicality in bodily sense-making [6] and creation of technology (in a semi-public space) which has a low threshold for initial engagement. Further, this engagement happens without providing personalized feedback via insights, app-notifications, or reports. We focus on in-the-moment engagement with a device which requires the user to evaluate their own situation and draw their own conclusions.

Trækvejret
Trækvejret is a small wooden device which emulates breathing by moving inwards and outwards, shape shifting from a straight board, to a rounded board. See Figure 1. We present how Trækvejret was designed and built in the sections "Design Rationale" and "Process". A scenario:

A person at work feels it's time for a cup of coffee and walks to the coffee break room. They put their cup in the coffee machine and as they wait for their beverage, they discover a small wooden object moving beside the machine. They are curious about it and regard it for a moment, before realizing it is imitating breathing. They sync their breathing to the device, taking a few slow, deep breaths.

Related Works
To frame this work, we explore related works about ad-hoc, opportunistic and unexpected experiences as well as the area of reflection in everyday life.

Bodily reflection in the everyday
We are particularly interested in ad-hoc reflection, without an intention to reflect, but rather, coming upon an unexpected opportunity and being invited to engage in it. In their work, "Reflecting on Reflection - Framing a Design Landscape", Fleck and Fitzpatrick [7] describe how technology can help with reflection and encourage designers to ask "What reflective behaviours do you want to encourage? Which technologies and techniques can support these behaviours?"

In this work, we want to encourage a bodily reflection, a focusing on, and scanning of the body [26] to foster reflection about breathing and pause in the everyday. The focus on everyday reflection is also being explored in recent works in HCI, namely by Mols et al. [24] who recommend that designers should consider the "the timing of reflection, the balance of system and user initiative and the preferred social context" and by Prpa et al in exploring virtual environments and awareness of breathing [27]. We aim to address Mols et al's recommendations by situating the opportunity for reflection in a place where people choose to go to take pause in their day, and by considering the level of user

initiative (the user can choose to engage with Trækvejret, or not) and setting the social context as a semi-public space.

Bumping into technology
By placing an object in a physical space, the object becomes a persistent part of our reality in that space and one can choose to recognize or interact with it. In the case of Morse Things, Wakkery et al. [34] inquire about our relationship to things in our world, explaining that "designed digital artifacts, or in our case things, manifest technologies and directly influence the mediation of our experiences and practices".

Creating objects which exist in our world, but do not demand attention, or require attention to function is explored in other works, such as with calm [35] or slow technology [12]. Grosse-Hering et al. describe how one design principle of Slow Design, "Reveal" might be revised to "Creating awareness, uncover the function and essence of a product" [11].

We aim to create awareness of the body [27] and to uncover the essence of slowness, of taking a deep, slow breath. This emphasizes how we can use unexpected discovery and encounters with physical objects to create a trigger for reflection [25] in a slow technology way.

Awareness of breathing
For athletes [17], mindfulness practitioners [28] and those seeking to reduce their stress levels, breathing becomes something to pay attention to, to change for their purposes and to enhance their lives and practices [33]. There are increasingly more devices and apps being developed to help people train themselves in

various breathing techniques. A brief overview of these is presented here. Wearables which encourage or guide mindful breathing include the Apple watch [16] or FitBit's Charge 2 [23] combining haptic feedback and visualizations to encourage wearers to take deep breaths throughout their day. There are also stand-alone apps which use visualization on a phone app [1, 2] to guide meditation, but still require the user to look at their phone screen and possibly be interrupted and distracted by other notifications [10].

Small non-watch wearables are being introduced, such as Spire [29] a device to track your breathing and give you insights about it. Breath-Minder [3] provides alarms via vibration, reminding you to breathe deeply. Vitali, a smart fitness bra [32] measures HRV (Heart Rate Variability) and breathing and provides cues to breathe deeply to reduce stress. Breathing Friend [21] uses haptics to stimulate breathing and Breathing Light [30] uses somaesthetics via light and sound. BrightBeat [10] uses subtle indicators in the form of sound, visual and temperature cues to influence slower breathing. One of our ambitions is to move from on-body cues (such as BrightBeat, the Apple Watch or Fitbit Charge 2 or Spire) to off-body, subtle, in-context cues such as Trækvejret, which is in the environment but does not demand attention. Rather, it invites engagement from afar.

In nearly all of the above mentioned examples, measurement of the user's breathing and feedback is provided. Each requires a decision to use an app, use a wearable, or use a device to consciously take time to monitor and train for mindful breathing. We are instead interested in how we can explore how placing a physical object (Trækvejret) in a commonly accessed place can

facilitate ad-hoc situated serendipitous discovery
leading to spontaneous bodily reflection.

Method
Throughout this study, we recall and use Buxton's
sketches, a process filled with ambiguity [4] giving us
the opportunity to discover, define and unfold an
emerging design space.

Research through design allows us engage in "exploring
and speculating, particularising and diversifying" [9] a
design situation. We generate intermediate level
knowledge [15, 19] which is not a theory, but rather,
generates "knowledge that plays a direct role in the
creation of new designs" [19]. Trækvejret is not
intended to become a product on the market, it is
rather an exploratory probe, helping us elicit qualities
of a design goal.

Design rationale
In line with our method we engaged with the
particularities of the design situation including the
chosen space, the choice of materials, and the opposing
qualities of engagement with the artefact.

The coffee break room
Before setting up Trækvejret, we saw that many
individuals getting a cup of coffee pull out their phone
and glance at notifications. We chose the setting of the
coffee break room because it is a place of interlude.
The people accessing the coffee break room spend a
brief amount of time there, and so there exists
potential to engage them momentarily without undue
interference in their daily routine.

Material choices
We deliberately chose wood as it is both a natural
material, representing nature, life, and warmth, and
also it stands out amongst the plastic and steel of the
coffee machine and sink.

Opposing qualities
Trækvejret does not measure the observer's rate of
breathing, nor does it provide feedback. The movement
of the device, the breathing, in and out, represents the
average, slow rate of human breathing [5]. However,
the rate of breathing is only communicated to the
person engaging with the system via observation.

We asked ourselves about the opposing qualities of the
artefact: how we might create an object which was
non-connected, displaying information but not
collecting it, allowing for engagement but not engaging
itself, and encouraging behaviour change, but not
demanding it?

Process
Brainstorming process
In designing Trækvejret, a brainstorming and selection
process took place wherein the authors took the
context of a coffee break room, and tried to imagine
how we might facilitate an opportunity for bodily
reflection during the process of getting a coffee.

Our aim was to generate as quickly and simply as
possible, an early artefact that we could immediately
make available to encounter in context. We describe
this below, in "Trækvejret: artefact building".

Trækvejret artefact: Building
Trækvejret consists of a servo motor attached to a piece of laser cut medium-density fibreboard (MDF) which has been cut using a kerf bending pattern, that is, cutting through a piece of material in a geometric pattern to allow it to be flexible without segmenting it into more than one piece. The flexible piece of MDF is attached to a stand, which was laser cut for the purpose of holding the servo motor and the flexible piece in place.

Our concept for the moving material was inspired by a piece of kerf bent MDF in the lab which we picked up and began to bend as we tried to demonstrate what we had been envisioning. We asked 'what if it looked like this?' 'Might this look like someone breathing?' 'It would be easy enough to attach a servo motor here, let's try it.'. This approach is a way of sketching [4], exploring materials and function iteratively.

An Arduino board is mounted on the back of the stand, and the servo motor is attached to the Arduino board. A small arm extends from the servo motor and attaches to the flexible piece, moving it up and down. The Arduino has been programmed using the 'Sweep' example from Arduino's servo library of examples, to move the servo at a normal rate of human breathing [5] namely, 12 breaths per minute. The servo moves, pauses, moves again and pauses, to demonstrate inhalation, pause, exhalation and pause.

Encountering Trækvejret
We conducted two small explorations to look for early indications of how we might enable bodily reflection via serendipitous discovery.

First encounter
People, upon entering the coffee room, would place their coffee cup in the machine, stare at Trækvejret and then leave the room after their coffee was made. Many who had been observed getting their coffee near it said they hadn't known it was something they should engage with. In the second study, spanning two days, we placed a small sign above the device, which said simply 'Trækvejret' or 'Breathe' in Danish.

Second encounter
The second exploration took place over two days at four new sites: four different break rooms with coffee machines throughout the building for a duration of one hour per site. These were different break rooms from the first encounter and as people tend to frequent the same break room, our aim was that these would be people who had not previously encountered Trækvejret. We attached the instructional sign to the device, 'Trækvejret' or 'Breathe' in Danish. Following the observations, 10 verbal interviews of approximately 5 minutes each were conducted in the afternoon (to give people time to think about the experience). The interviewees were randomly selected among the people passing by the device. Questions can be read in Figure 2 and some key responses in Figure 3.

Discussion: A Design Goal
A non-connected, non-quantified device
Trækvejret communicates information about how to breathe at a slow pace, but otherwise is not measuring or sensing anything, or giving any kind of feedback. In some ways, it can be considered a display, a non-connected element of the physical environment. It differs in this way from many of the IoT or smart products that are emerging today, both in research and

on the market. As Hartzog and Selinger explain, 'A chip-centric mentality has taken over, one that is guided by an overly simplistic principle: 'Internet connectivity makes good objects great" [13]. By not being connected, Trækvejret was immediately accessible, requiring no set up, calibration, or instructions besides the one word 'breathe'.

Further, people who engaged with Trækvejret did so of their own accord, due to their own curiosity, and not because it promised health improvements, quantified-self reports, or other benefits. It was an interaction of opportunity. We suggest that perhaps moving away from connectivity, for some devices, might be an interesting design goal to explore.

The design goal: designing devices which encourage reflection and action rather than being data-driven
We propose the definition of this goal as being one wherein research through design is a method to propose sketches featuring simple, non-connected devices for the betterment of the self, preferably in a combination of physical and psychological aspects. In this space, the interaction is not data-driven or data-collecting but rather is passive, and potentially as beneficial through encouraging people to explore their own abilities and act upon those explorations.

Current limitations of this design space.
Firstly, we aim to avoid decorative items. By having non-connected, tangible objects which may offer serendipitous discovery, we do not include objects designed to be decorative. Instead, we point towards objects with a clearly designed intention, such as Trækvejret, encouraging people to stop and breathe, and learn to take a breath throughout their day.

In a time where privacy [8] and questions about how much time we are spending online [31, 14] and with our devices [18], we think a focus on designing for non-connected, personal development devices will be of importance.

Future Work
Trækvejret is part of a series of design artefacts being developed to explore non-screen, tangible and physical devices, and something we call Designing for Meaningfulness. We hope to expand this research in collaboration with other researchers and industry.

Conclusion
We built Trækvejret, a simple artefact which emulates a slow human rate of breathing to act as a vehicle for research into openings in design where we might invite researchers to explore how we might design for serendipitous discovery and spontaneous bodily reflection.

From our observations over two encounters with the artefact, we learned that Trækvejret elicits curiosity: people briefly engaged with it and thought about their breathing patterns and practices. We invite discussion about a design goal of designing for non-connected artefacts which can potentially be beneficial for bodily reflection and action.

We conclude that Trækvejret is a preliminary success as a research vehicle because it produced openings in design, demonstrating how something which is unexpected and simple in its design and function, promotes curiosity spontaneous engagement, and bodily reflection.

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