Touchy Tap: a Slow Technology for Shared Reflections on Water Consumption

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Abstract. Turning on a water tap in one's home is an easy, simple and typically solitary interaction that masks the huge amounts of resources and efforts behind the collection, processing, and delivery of fresh water. There are many design and design research examples that aim to raise environmental awareness by drawing attention to consumption of domestic utilities. However, less common are designs that aim to provoke reflection on sustainable behaviors through an effortful and shared interaction. In this paper we present 'Touchy Tap' - a multi-touch kitchen faucet prototype in the form of a dynamically illuminated 2-meter wavy tube that requires control by two people. A slow interaction was designed with the intention to evoke reflections in use on issues related to water consumption. A preliminary evaluation indicates the potential of this 'slow technology' approach to highlight water consumption issues, even though the ambiguity of such an unconventional interface may negatively impact on overall user experiences.

Keywords: taps, faucets, water, kitchens, collaborative interaction, tangible interaction, social interaction

1 Introduction

Water taps come in different forms and with different interaction possibilities, for example turning knobs, pushing levers or buttons, or making gestures. It is therefore an interesting object in interaction design education and research to demonstrate and illustrate usability issues [1], design principles [2], or intuitive interaction [3]. The plurality of interaction possibilities with the water tap also offers possibilities for design research explorations that are directed at reflecting on water consumption e.g. [4]. For most people in the developed world, the activity of receiving water in their kitchens is thought- and effortless. However, the delivery of fresh drinking water to our homes relies on complex, highly engineered infrastructures, typically resulting from years of coordinated skilled human collaboration. Although the process of water distribution is now mostly mechanized in many developed countries, a lot of energy is required to run machines. The contrast between the effortless individual interaction with a faucet and the strenuous collective effort behind the supply of water prompted us to explore how the interaction with a water tap can evoke reflections on related invisible processes and issues.

This paper describes the development of the prototype named Touchy Tap that explores how to evoke reflection on water consumption and related issues, and reports on early evaluations from preliminary user evaluations. Our explorations took a Research-Through Design approach inspired by 'slow technology' and 'collaborative design'. Slow technology was proposed by Hallnäs and Redström as an alternative to mainstream products and systems which tend towards speeding up actions and processes. 'While many current technologies aim to allow people to finish existing tasks faster, slow technologies enable people to do another thing—reflection on what they do with the technologies [5]. Collaborative design in our project simply referred to accomplishing something that cannot be accomplished by an individual alone [6], inspired by the spirit of collective interaction [7] and social contraptions [8]. Interaction with a water tap is typically individually, we worked to harness how reflections with others can lead to questions one cannot think by oneself.

We start this paper by highlighting related work that inspired the development of the Touchy Tap. We then describe the formal qualities of the prototype and two iterations of the prototype's behavior. Based on preliminary user evaluations we discuss shortcomings of, and future developments for, the Touchy Tap.

2 Related Work

HCI offers several clever tap designs that draw attention to water consumption through data visualization or data physicalisation. For instance, Togler et al. [9] created 'The Thrifty Faucet,' which is a stiff, yet bendable kinetic plastic tube controlled by Arduino. It moves as if it is alive and demonstrates live motion patterns. 'Waterbot' by Arroy et al. [4] is an instrument which offers water usage feedback constantly via a small display screen and it gives positive feedback to users' water-saving behaviors via LEDS that illuminate the flow of water. This arose out of an earlier prototype 'HeatSink' that aimed to provoke reflection on the energy used in heating water by varying the illuminated color of a tap's output according to the temperature of the water [4]. However, rather than displays, we were more interested in inputs, i.e. designing for fostering more meaningful user actions and interactions for controlling the dispensing of water.

A purely mechanical, but highly embodied project of note is the 'Play Pump' by Borland [10]. This was a well-intentioned, but ultimately discredited attempt to deliver fresh water by providing a playground-roundabout resemblin large wheel that required collaborative exertion from children to turn it, and hence drive a water pump. 'Water Games' by Pares and colleagues was more successful in offering a celebratory collective control of water [11]. If visitors to this outdoor installation held hands to form a circle, they could then rotate as a group around different fountains and thus dynamically control the behavior of the pumping and spraying water. Similar notions of requiring full-bodied physical effort influenced our early design development, but for reasons of space and safety, most kitchens are not suitable for very energetic exertions.

A liquid dispensing design that requires two people to operate is ‘Coffee Connector’ [12]. This machine only provided warm beverages when two users approached it at the same time. We were interested to see if shared experiences might require or provoke more active collaboration than mere presence. A recent review of social icebreakers [13] highlighted a range of examples in which accessing drinks or liquid food required collaborative actions e.g., one user pulling strings that released drops of liquid into the mouth of another, or special fizzy drink bottles that could only be opened by interlocking the caps of two such bottles together. However, these examples from the world of art and corporate advertising stunts are a little cumbersome for a domestic kitchen.

3 Design Development

The Touchy Tap was designed to be situated in a kitchen environment. It consists of a 2-metre-long undulating clear plastic tube with a spout at one end. The long wavy form of the tube was hoped to help make users think of water in nature and the many pipes that water passes through as it travels to reach our homes. The tube was mounted away from walls to allow users to squeeze it, and as an attempt to invite physical interaction. The two-meter length was intended to be long enough to allow for, and encourage multiple hands to touch the tube, including for simultaneous multi-user inputs. Mounted all along the inner wall of tube was an LED strip. A semi-opaque film concealed the wiring and offered a soft diffusion effect so that individual LEDs appear to blend into each other. The behavior of the lights was linked to the dispensing of the water. The delivery pipe for water was also the interface for controlling the water and light behavior. Thin wire was wrapped around the full length of the outside of the plastic tube to detect hands touching the tube. This allowed for experimenting with different kinds of touch sensing as input in controlling a motorized valve that opened the water flow, and different lighting behaviors for instance lighting the tube at the point where someone touched it. We developed two iterations of the prototype’s behavior, firstly ‘Rainbow Fish’ and then ‘Touchy Tap’.

3.1 Rainbow Fish

For the Rainbow Fish behavior, we used moving multi color lights in the tube that illuminated a few centimeters “downstream” of where hands touched the tube (Figure 1). The intention was to create an eye-catching but intriguing experience for users. We were motivated by an interaction metaphor of controlling a colorful fish, swimming down the pipe. Namely, that the tap could be turned on by dragging or pushing the ‘rainbow fish’ towards the spout. However, feedback from informal user tests at a campus design exhibition indicated that this coupling of input and outputs was unclear. Not least because rainbows have their own eponymous associations with gently curving shapes. The rainbow fish also did not invite for a collaborative interaction, instead, for a performative interaction with onlookers.

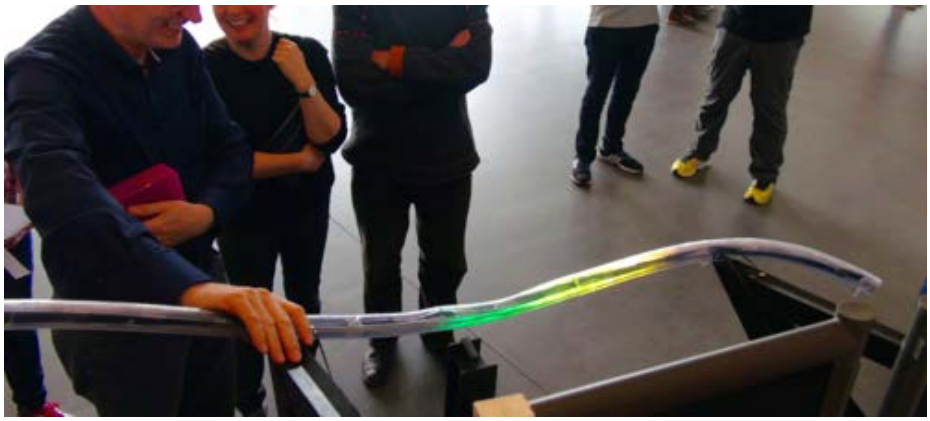

Fig. 1. The colored lights of Rainbow Fish react to a user's hand. Water can pour from the end of the tube by a hand moving along to the end.

3.2 Touchy Tap

The second iteration featured blue and white colored dynamic lighting, as these tones are in most cultures associated with flowing water. It also considered collaborative design in its interaction by requiring two hands for interaction, even though the tap did not strictly require two person's input to function (Figure 2). However, a two-handed tap was hoped to foster collaborative operation, as when in a kitchen, one hand is often occupied with food or drink preparation, cleaning, or holding a telephone.

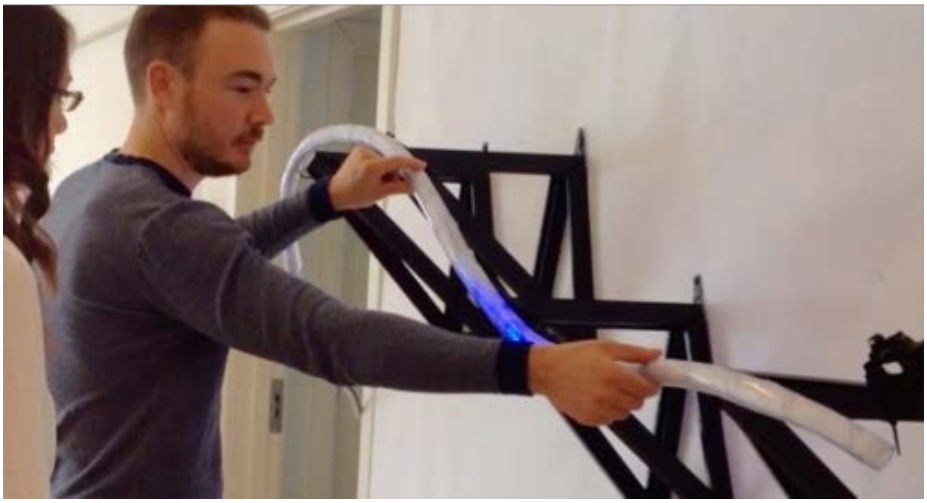

Fig. 2. The blue colour reacts to touch.

As a default setting, some LED lights (1⁄6 of the length of the tube) are lightened in blue color. This blue light stays in the middle part of the tube. When a user touches one contact point of the tube, the blue light moves to that touch point (Figure 3). When a user stops touching the tube, the light moves back to the middle part of the tube. When the tube is touched in two separate contact points, the blue light moves to the middle of these two contact points (Figure 4). When users continue touching these two points for three seconds, the blue light in the middle changes into white and then, the length of the light increases starting from the middle (Figure 5). People can see how light expands and moves. This transition in the interaction intends to communicate users that the water tap has been activated, and that water will come out from the end of the tube as the white light reaches it.

Fig. 3. When a user touches on a single contact point, the blue light moves to the position of the hand.

Fig. 4. When users touch two contact points, the blue light moves to the middle position between the points.

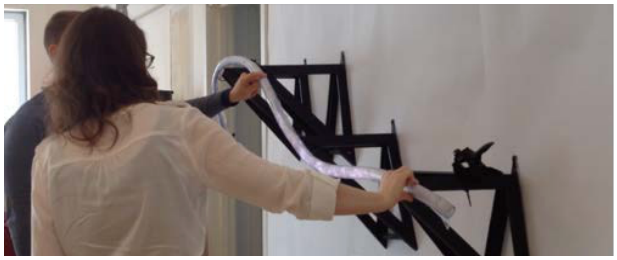

Fig. 5. If the users keep touching for three seconds, the light changes from blue to white, and then expands and shrinks three times to indicate water will come out from the end of the tube.

We designed this slow and evocative interaction with the intention to give two people a moment to pause and reflect on what is going on, and to juxtapose this experience with their normal interaction with a water tap, for example on its effortless dispensation of seemingly unlimited amounts of water.

4 Evaluation

A preliminary evaluation of the Touchy Tap was conducted in a kitchen of a workshop facility, in pair sessions with 6 students from a design graduate program and a tourism graduate program. The participants were 3 males and 3 females in their 20s. For the user test, we used informal interviews and employed the methods co-discovery [5] and video analysis [13]. The test took 30 minutes for each pair, and it was composed of two parts; in the first part the participants interacted with Touchy Tap and in the second part they were asked to discuss their interaction.

The participants explored the interaction through trial and error, while the ambiguity concerning the functioning of the tap confused but also intrigued study participants. Some participants made 'sound effects' in relation to the moving lights, for example one participant shouting "Wuuuu!". The shape of the pipe suggested to several pairs of users that they might operate the pipe by "pulling the lights" up or down (Figure 7, 8). However, for many participants the intended coupling between the light and the water remained unclear. The response time of three seconds turned out to be too slow to keep the explorative interaction engaging, while the color transition from blue to white confused participants and prevented them from understanding the coupling, as one participant said, "Time is too long. We didn't understand what it is.".

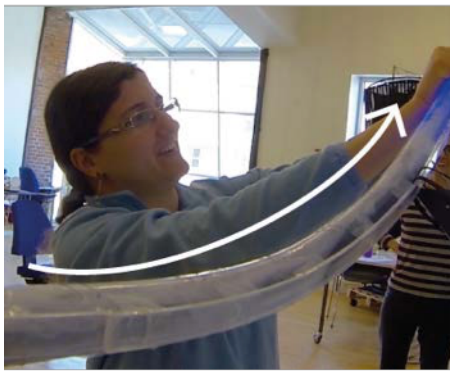

Fig. 6. A participant trying to 'pull' up the light to the end of the tube.

Fig. 7. A participant trying to 'pull' the light down to the spout

In terms of collaboration, only one pair in our test jointly touched the pipe from the very beginning of the test. The other two pairs took much more of a turn-taking approach: one user would explore the interaction with the light while the other stood back and offered suggestions and observations about understanding the functionality.

Upon reflection, four out of six participants expressed a positive view of the design, as illustrated by one participant saying “It was very compelling because in order to make it work you have to use your hands differently”, while several commented that the exploration of the interaction was playful. Some of the users suggested to maintain the light in blue, opposed to white.

The slowness of the interaction did evoke some users to reflect on their water consumption, albeit minimally. Some mentioned water sustainability without any prompting from us, for example “I think it could save water” and “For sure it supports sustainability”. However, surprisingly, these reflections were evoked not so much by the interaction but rather by the amount of water that participants could get out of the Touchy Tap. Due to its technical mechanism, this was a small amount of water, which compared to their ‘efforts’ to get the water was at stark contrast with one other. We believe that these slow and un-efficient system qualities are an opportunity for futuredevelopment and study in evoking reflections on water consumption.

5 Discussion

As an unusual and complex design, the Touchy Tap has not been entirely successful in evoking rich reflections on water consumption. However, we learned that there is a lot of merit in future developments to design the interaction more around inefficiency, with support from a lighting behavior. Working with light in a tap certainly offers promise, though our preliminary tests suggests that slowness might not need to be sought in its response time, but rather in the ways in which water is dispersed. The light could play a supportive role in illustrating water behavior and providing ongoing dynamic feedback in this respect. This could also draw attention to the unseen efforts involved in delivering fresh waters, as in many typical kitchens, the only point at which water pipes are visible are the taps themselves. Highlighting the water delivery route through forms and behaviors such as present in the Touchy Tap offer opportunities for further investigation – regardless of adding any novel interactivity or materials.

6 Acknowledgements

We thank Asger Bøgh Lautrop, Elena Garcia de la Fuente, and Emma Berlekovity for collaborating on the design and development of the Touchy Tap, and our study participants for their time and reflections.

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