The Sound of Smart Things

Final Report

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Elective DCM180 The Sound of Smart Things by Bart Hengeveld and Berry Eggen

Contents

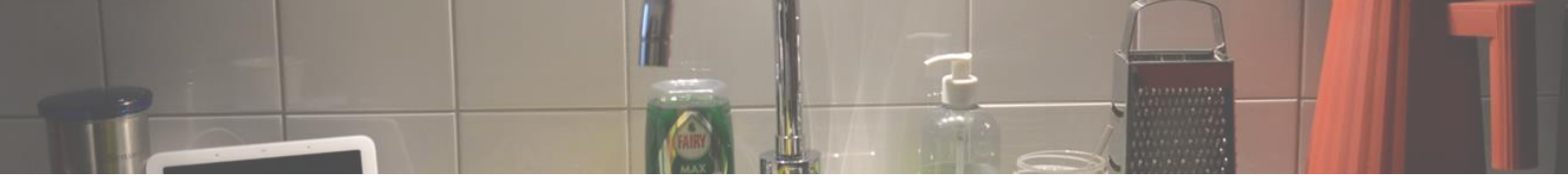
Choice of objects

the kitchen tap and pans.

To pick two items in my house that could become ‘smart’, I made a list of things I did throughout the day. Most items in my living room are already smart (e.g. television, Google devices, phone, tablet), so were not that interesting for sound design. Others had no connections to other items and were more focused on my comfort (e.g. coach, clock, desk chair). So, I decided to zoom in on my interactions in the kitchen, as most of those were not smart. I looked for things that annoyed me or made me feel like it could be better to design for.

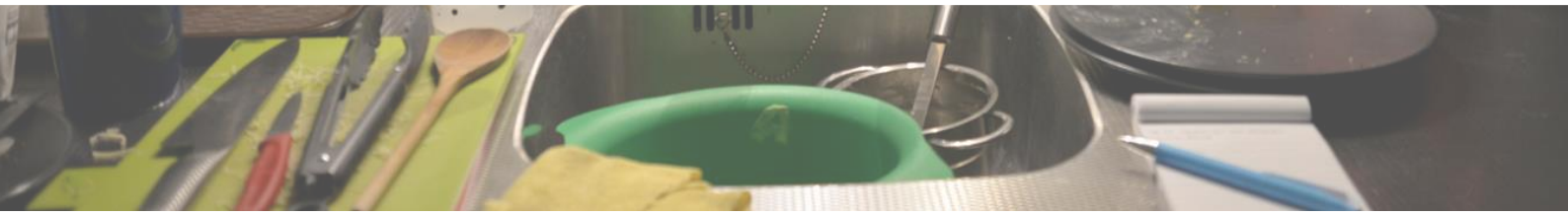
The time I spend at the kitchen tap often feels like a waste of time. I am either waiting for the water to get cold to be able to drink it after washing the dishes, or I am waiting for the water to get warm to be able to wash the dishes. I spill water, as I am waiting for the water to change temperature and I walk away to do something else. Simply because I cannot see when the water is warm. The extra challenge for the sound design in this case is that I am often playing music or the radio is on in the living area when I am in my house, while interacting with the kitchen tap.

The second item I got interested in are my pans. They have an open relationship with my tap, getting water to cook whatever you put in them. Even though these daily used kitchen items are just kitchen utensils to us, they fit, taste and prepare everything we later on put in our mouth. So it was interesting to me to discover what sound design can add to this experience and perhaps in both cases can make us a bit more empathic towards ‘them’.



An Ethnographic Study

of the life in the kitchen.



Observations & Perspectives

To better understand the life of the tap and the pans, a diary (appendix A) was kept for four days to see what interaction the items encountered. After four days interactions started to reoccur and there was no meaning in repeatedly recording them. This was written from the human perspective. A few interactions created friction or irritation for the human and therefore gave sound design opportunities.

First of all, the temperature of **the kitchen tap** was often changed. To be able to reach the desired temperature of the tap, the water ran multiple minutes without actual usage of the water. The second interaction that stood out was that there was a slight fear of the user of the temperature of the water. Especially when someone else touched the tap and it was unpredictable what temperature the water would be when pouring it into a glass or washing hands.

Thirdly, finding a suitable **pan** and amount of water for cooking foods was a gamble. Often a pan was later on switched with another to better fit the vegetables and created more dishes to wash. And lastly, the amount of time it took for the water to boil before the pan could be used was unpredictable. This led to a waiting game and harder to plan the rest of the steps for making a dish.

In the week that followed, the sounds of the kitchen during all these and other interactions were recorded and annotated to create an 'audiocumentary' of the life in and of the kitchen. A small personal database of all the sounds heard in the kitchen was made. These could later on be adapted to fit a soundscape for the objects. Interesting sounds were summarized and described in more detail (appendix C) to be able to revisit them later while designing.

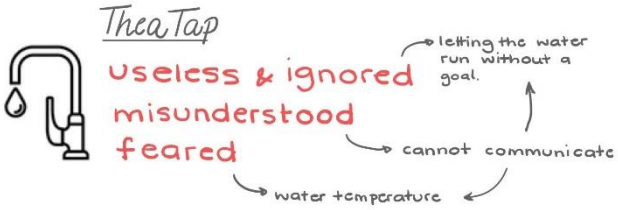
Figure 1. Keeping a diary about the human-item interactions.

Figure 2. Recording all the sounds while using the items.

Figure 3. One of the human interactions with the kitchen tap.

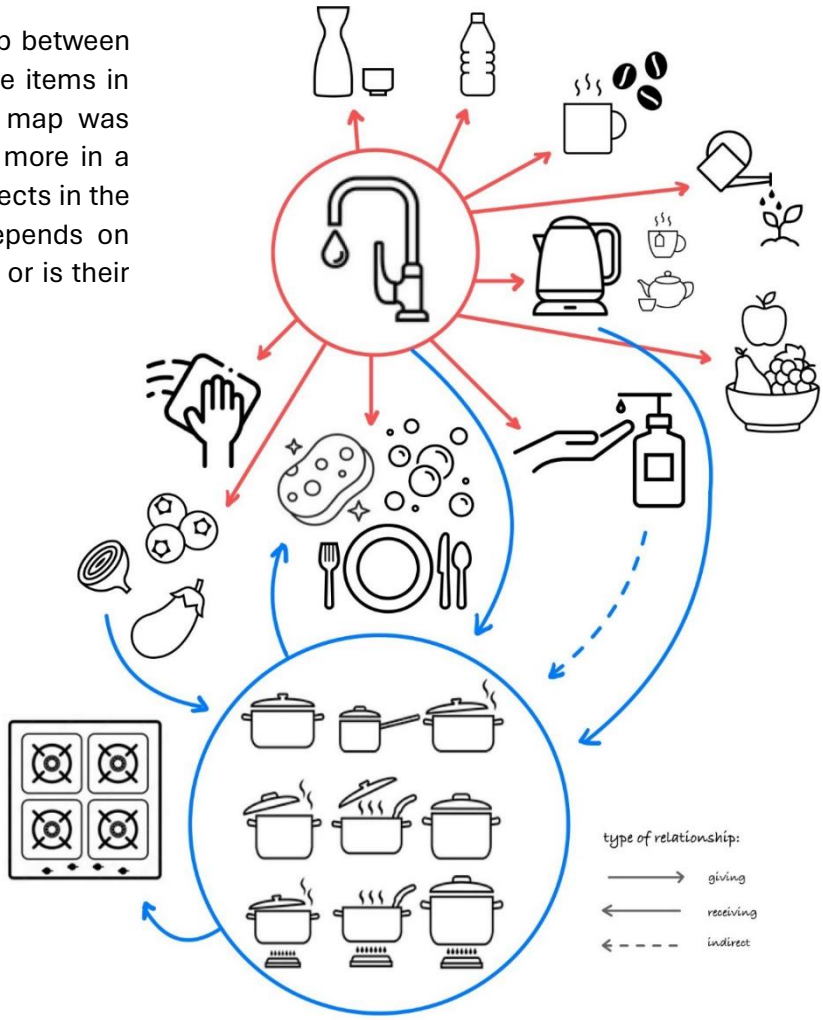
Figure 4. Snapshots from the point of view videos of the tap (left) and a pan (right).

To finalize this ethnographic study, it was necessary to imaginatively step into the kitchen tap's and the pan's shoes. To start off, a recording phone was placed behind the kitchen tap and the stove while interacting, to literally view the world from their point of view. The interactions involved the four scenarios as described before. The kitchen tap and one of the pans were anthropomorphized, by imagining their emotions and giving them names. Three core findings were noted in the picture below. But the conclusion was that both objects felt misunderstood, because they just wanted to help but did not speak the human language.



Relationship Maps

To better understand the relationship between the chosen items and the rest of the items in the kitchen, a simple relationship map was created. This shows that the tap is more in a giving relationship towards other objects in the kitchen, while for the pans this depends on their position: being a utility to cook or is their job already done?



Sound Design

Meaning of ‘smart’

Before transforming the kitchen tap and the pans into smart objects through sound, it is important to understand what ‘smart’ actually means. In 2013 a literature review was released by Gutiérrez, Garbajosa, Diaz, & Yagüe gathering all the definitions that have been given to smart products over in the past decade. They concluded that there is no general definition of what ‘smart’ means. However, they created a model that includes the definition given by multiple scientists from different backgrounds over the years (figure 5.). In the grey box you can see the most repeated terms used to describe smart ‘things’ in the literature used.

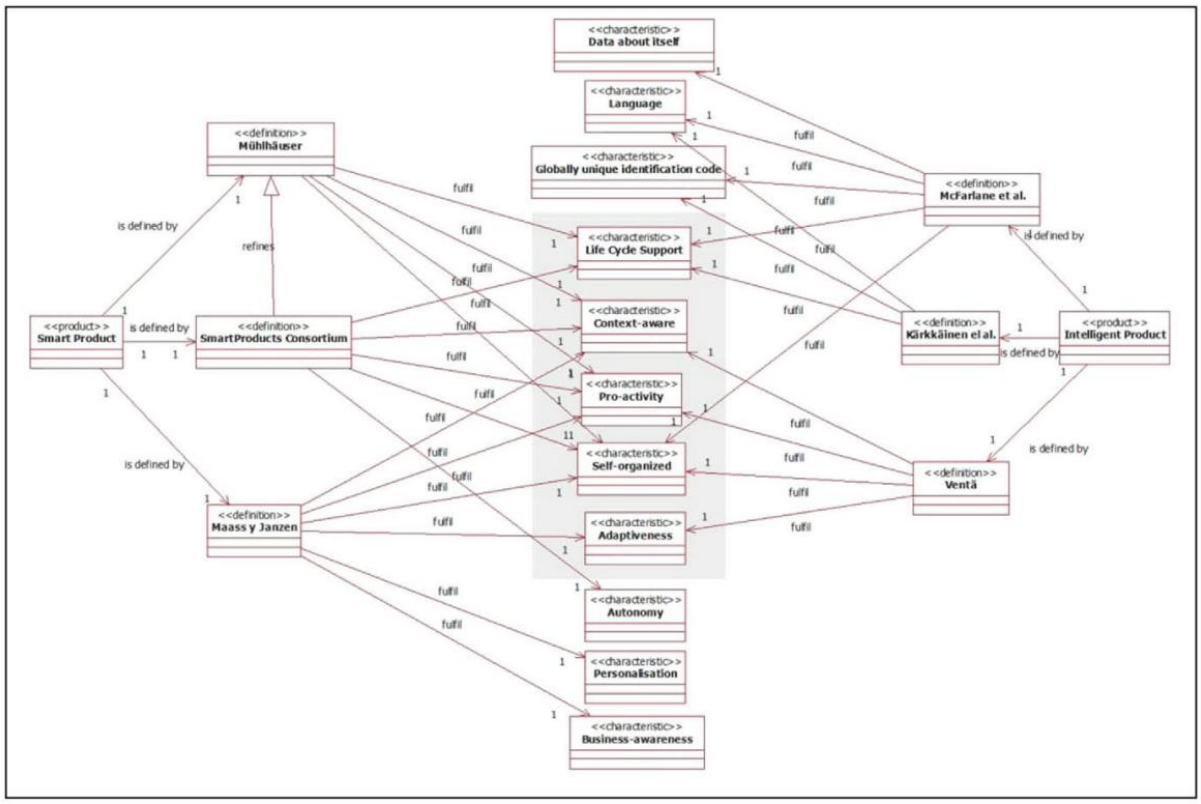


Figure 5. Definition of a 'smart object' in a model (Gutiérrez, C., Garbajosa, J., Diaz, J., & Yagüe, A., 2013).

An interesting term used here to categorize smart objects is ‘context-aware’. This is especially relevant for sound design, since an object has to know when and when not to interfere. Hugo Verweij tells in his lecture about sound design for Apple products that sound should be used when it is absolutely necessary (Apple inc, 2017), but also teachers from this course have repeated multiple times that silence is often underrated and sounds should carefully be considered. Are they necessary or are they annoying or disturbing the atmosphere? Is a question that should be considered constantly when giving sound to an object in order to make is smart.

Design Rules

- The sounds from the items should give a nudge to the human, trying to help them. However they should not alarm the human whenever there is no rush in acting.
- Whenever the human should be alarmed, the sounds should be repeated faster in order to give a more urging feeling, like music can do when increasing the beats per minute. A higher number of beats per minute results in a higher heartrate and blood pressure, which can give you an urging feeling (Harvard Health, 2021).
- Notifying the human should only slightly surpass the volume of surrounding or atmospheric sounds already in the room, to avoid overstimulation and misunderstanding.
- The sounds of the kitchen tap has to have some kind of connection to the sounds of the pans, so that they can form a small sound family.

Design and Video

Finally four scenarios were chosen from previous insights to create the video with sounds to make the kitchen tap and the pans smart. Rationale for the chosen sounds are described per scenario. The video script can be found in appendix D and the video can be watched here: https://youtu.be/tiji7pGOqEo .

1. Heating and cooling the water coming from the kitchen tap.

To increase the temperature the water of the **kitchen tap**, the sound of the electric kettle to boil water was used as an inspiration for a new sound design. The kettle gives you immediate auditive feedback when turning it on, by a little click sound whenever you push the lever to turn the kettle on. When the water is heated, the sound of the water gets louder the longer it is on and the closer the water is to boiling. You can even hear when the water is almost 'ready'. Old kettles whistled as a sign to the human user, the water was boiling. But this says nothing about the temperature of the water in the kettle and the sound of the water heating up, it is always the about same, no matter how much water is in the kettle. So I took the element of slowly increasing volume to slowly getting to the desired temperature of the water coming from the tap.

For this sound I found it was most suitable to use an instrument that could scale up and down like keys of a piano. Sounds of bubbles or water were too similar to the water that was already heard when opening the tap. So I looked for sounds that are often used to represent rain or drops, imitated by instruments. The instrument had to be friendly, as the tap only had the intention to help you and warn you whenever you are in slight danger. The kalimba was one of the instruments that had a nice ring and slight resonance at every tone, which made the tones not

too sharp but it was possible to make a scale. For this scale tones that were in the right order but not all pure, to keep the person using the tap aware that the water was running, even wasting water and the water temperature was heating up or cooling down. Also, the tap should not become a musical instrument or 'play thing', to avoid encouraging wasting water.

Inspired by the singing elevator in the Eindhoven van Abbemuseum (can be seen and heard here: https://www.youtube.com/watch?v=x8SdVgJQRCk), I wanted to create a scale of tones that indicated the temperature going up, and the tones going up in pitch and the other way around. Since you cannot push a button to get a desired temperature of water, the pitch heard when the tap was opened at a desired temperature, was the tone the scale was heading for. After that tone was heard, the scale started and increased in loudness. So that when playing music in the room, the sound would only clearly interfere with the surrounding music whenever it reached the desired temperature as a notification to the human. When the desired temperature was finally reached, the pitch of the temperature repeated itself until the human interacted with the water or the tap. This in order to give a slight warning sound, so that the activity at the sink could be continued.

2. Using the tap water without checking the temperature.

Washing your hands after just using the hottest water to flush your dishes, can be startling. Especially when someone else used the water and you do not know how hot the water is they just used. This is a more alarming situation for which repetitive and louder tones are allowed as it should warn. To create a smart interaction between the tap and the human using the water, it recognizes that the person who is requesting water, is using the soap dispenser first. To inform the human that it recognizes the water temperature is mostly desired to wash their hands, this tone is first heard. After which the tones corresponding with the current water temperature that is still in the tap from previous use, is heard twice. The user now knows that the temperature of the tap should be changed before using the water to wash their hands.

Listening to the tap while letting the tap run, humans can learn the language of their tap. They can hear what temperature corresponds to what pitch and they can put their hands under the running water whenever they think the temperature is acceptable to flush their hands with. Or when the water temperature is okay to fill a drinking glass with. Trusting the tap more and more over time and washing away the fear that comes with hot-and-cold water interaction.

3. Filling a pan with a sufficient amount of water before cooking

This is the interaction where the **kitchen tap** meets the **pans**. Before cooking the pan is chosen in which the food is boiled or steamed. Apparently quite a complicated job, as there are numerous blogs on the internet about fitting your food in the right pan (e.g. *Steam Table Pans 101: Sizing Guide | Cook's Direct blog*, 2021). Using different kinds of sounds to indicate what kind of result is achieved with what pan, can help to decide. However, creating this scene for the video immediately made me realize this is one of the moments sound can become overstimulating. The sounds can be handy once or twice to be educated, but at some point you know how much water to put in a pan for a certain dish from experience, and after a while these sounds can become an annoyance when using your pans. So it was decided to not interfere with this interaction.

After picking the right pan, it is filled with the amount of water that is appropriate for the food that is being prepared. This is where the tap synchronizes with the tap. After the tap gives a short call in her language, which means a scale of three tones, the pan can return it in the form of his own two tones. This is their meeting greet. The sounds of the pan lower pitches of the kalimba as well, which represent the heavier stature of the pan compared to the tap. But makes sure that the sounds are clearly part of the same family. When the pan reaches the amount of water that is appropriate for the food that is about to enter the pan, their first tone of the call and response overlap as a signal.

4. Reaching boiling temperature of the water

It takes some time for the water to reach the temperature of about 100 degrees and boil. Therefore, it is better to close the pan with the lit, in order to speed up the process and not waste heat. The lit however also closes the window to the pan, which means the human cannot see whether the water is boiling and has to check continuously or keep the lit of. A short call and response was again implemented, to remind the human closing the pan with the lit is beneficial for all. The pan is making two tones like before at the tap, to keep it recognizable, repeating twice. After which the tone that followed in the riff was the answer of the lit that was still sitting on the kitchen sink, also twice. Whenever the lit touches the pan, the whole sequence is heard as a thank you to the human.

Trying some extra tones to indicate there was no salt in the water yet or the water should be stirred, were interesting but caused a lot of extra noise. This was because during the time in the kitchen there was almost always music playing or people talking. It was decided that there should again be silence instead of extra sound design.

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