# Making Everyday Things Talk

## Speculative Conversations into the Future of Voice Interfaces at Home

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# Making Everyday Things Talk: Speculative Conversations into the Future of Voice Interfaces at Home

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## ABSTRACT

What if things had a voice? What if we could talk directly to things instead of using a mediating voice interface such as an Alexa or a Google Assistant? In this paper, we share our insights from talking to a pair of boots, a tampon, a perfume bottle, and toilet paper among other everyday things to explore their conversational capabilities. We conducted Thing Interviews using a more-than-human design approach to discover a thing's perspectives, worldviews and its relations to other humans and nonhumans. Based on our analysis of the speculative conversations, we identified some themes characterizing the emergent qualities of people's relationships with everyday things. We believe the themes presented in the paper may inspire future research on designing everyday things with conversational capabilities at home.

*The first 5 main authors contributed equally to the paper and the rest are contributing authors.

## CCS CONCEPTS

• **Human-centered computing → Interaction design**.

## KEYWORDS

Thing Interviews, Conversational Agents, Voice Interfaces, IoT, AI, More-than-human Design

## 1 INTRODUCTION

As intelligent things are becoming commonplace in our households, there is an impulsive market drive to have human-like conversations with them. Through future industrial visions, we become inclined and accustomed to verbally command a lamp to turn on, a kettle to boil water, or to summon a car to the driveway. Yet, individuals do not interact directly with the things themselves, but rather through mediated AI voice interfaces such as Amazon Alexa,

Apple's Siri or Google Assistant, otherwise known as conversational agents (CA). These allow people to control their smart and connected appliances but also entertain them with their ability to whisper [31], joke and even flirt [8], opening up an unprecedented space of more-than-human social interactions. However, these emerging voice interactions are limited by the extent of conversations they make possible with things in the home. As Reeves et al. [38] argue "calling interactions with voice interface conversational is perhaps a confusion" as they actually are limited to sequences of requests and responses, where things are reduced to their mere functionality and use. Current CAs appear to share the faith of many technological innovations employing a type of human-centered perspective focusing on utilitarian aspects of interaction that may constrain our capacity to explore the possible nuances of emerging relationships between humans and things. We feel that there is an untapped potential in research concerning the conversational qualities and capacities of CAs that can be explored to attend to other ways in which things – intelligent or not – can speak to us and us to them.

This paper employs a more-than-human design approach to conversational interaction with everyday things we live with at home. Through a conceptual shift from human-centered to more-than-human-centered design, and by incorporating a thing's perspective, we imagine that things have a 'voice': a voice that goes beyond the ones that existing AI voice interfaces attribute to them. We conducted interviews with things as a way to explore the nonhuman space in the design of conversations with things beyond their immediate use. We began by asking how and about what things might speak if they had a voice, which led us to reflect on 1) how things in fact already speak to us in their ritualised, situated, and materially-rich embodiments; and 2) the emergent qualities of people's relationships with everyday things and how that might inspire the design of intelligent CAs at home. We share our insights from conversations with things to enrich the dominant vision on 'voice interface' that could open up opportunities for designing more diverse interactions with everyday things. It is important to note that not all our insights can be translated into practical design implications. Some of them could work more to inform our understanding or to become sensitized to how our relationships with CAs can be otherwise imagined. It is also worth noting here that our focus is on CAs that have voice interfaces, which excludes other non-voice-based instantiations of CAs such as chatbots or holograms.

## 2 MORE-THAN-HUMAN DESIGN

With existing market-driven foci on convenience and efficiency, the way intelligence is implemented and performed by CAs, confronted with smart and connected things (IoT), is fundamentally different from other creative enactments of AI, social robots and assistive technologies in the home. Among them, CAs are rapidly inhabiting our households, and in doing so they mediate not only our daily social interactions with family and work life [26] but also determine interactions with everyday things that live with us [6]. CAs have come to play a dominant role in our social imagination when we think about the kind of conversations to be had with everyday things. For instance, one might expect that a second-hand kettle might talk about diverse topics, or have a different worldview, than an existing CA that commands a kettle to boil water. Beyond obvious use, our conversations with things could be more varied depending on context, materiality, and relations to humans and other things around them. Aligning with concerns of third-wave HCI [10], this situation opens up the space to imagine how a variety of conversations could emerge, which includes how things already talk to us in their own non-lexical way. These questions about how things 'talk' can be approached from the lens of New Materialism (NM), a conceptual turn away from the incessant dualisms separating humans from nonhumans, and here Bennett's eco-philosophy is especially relevant. Bennett theorizes a "vital materiality" that runs across both human and nonhuman bodies, in which agency always emerges as the effect of ad hoc configurations of human and nonhuman forces [7].

Aligning with NM thought, there are a range of emerging more-than-human approaches in design and HCI [13–15, 18, 23, 24]. These approaches focus on understanding the roles that humans and nonhumans can play in everyday life and the new capacities for action that can arise as a consequence of changing human-nonhuman relationships [19, 27]. This approach enables us to move beyond positioning AI in relation to human activities (as tools for use), and instead, to inquire into nonhuman agency and possible new relations with things [17, 37]. Design and HCI researchers have made attempts at exploring the shift from a human-centered approach to that of seeking nonhuman perspectives. In these explorations, it is significant that AI devices are involved as agents, with their unique capacities and sensibilities by which they provide unprecedented access to nonhuman perspectives of the world. Whereas Wakkary et al. [41] employ machinic "morse code" translations to speculate about what things do, Giaccardi et al. [20] augment everyday objects with intelligent cameras and sensors and cast them in various social roles as co-ethnographers and co-designers to explore their Thing Perspectives. Thing Perspectives [29, 35, 40] are increasingly being taken up by researchers in contexts where human perspectives are felt to be partial – undermining the broader ethical implications of hidden machinations and the fluid interdependent relations between humans and nonhumans.

Recently, speculative forms of Thing Interviews [30, 36] where researchers impersonate things and interview them have been useful for imagining what roles things play in everyday life, and as a means to re-imagine how things could be different. The benefit of humans role-playing things is the enabling of displaced embodiment and the awareness it raises about our human biases and limitations, which is a critical difference from the Thing Perspectives method's reliance on sensors. Nicenboim et al. [30] have embraced the more-than-human approach by conducting speculative Thing Interviews with CAs to ask critical questions about the infrastructures, ecologies, roles and relations that sustain CA interactions. In a complementary way, in this inquiry, we employ Thing Interviews to explore the scope and qualities of conversations one can have with everyday things at home if they had a voice.

## 3    STEPPING INTO THE THING'S SHOES

We adopted a more-than-human design approach and performed an investigation that combined a Thing Perspective exercise with speculative Thing Interviews: methods that invite humans to take pictures from a thing's perspective and to conduct an interview with the respective thing. To run the investigation, the organizing authors composed a collaborative design exercise and shared it with the contributing authors. The contributing authors played a critical role in conducting the investigation because they were involved as either organizers or participants in a series of prior workshops that incorporated the Thing Interview method within a more-than-human framework [30, 36]. Every author in this paper thus had prior experience in engaging with nonhumans and to discuss the nuances and implications of the investigation. Together, as researchers, we share interdisciplinary backgrounds in interaction design, HCI, sociology, anthropology, STS, and political science, and we are primarily located in the global north (including Australia).

The exercise was divided into three parts. 1) The contributing authors were asked to choose an everyday thing from their home – an item that they had an established relationship with, or that they interacted with on a regular basis. They were asked to take four pictures: one picture of the thing in its everyday context seen from a human perspective, and three pictures from the thing's perspective. Figure 1 shows, for each thing, the 'human' and 'thing' perspectives. 2) The second part was a series of online meetings between six pairs of contributing authors (one pair per meeting). In these meeting, each pair was instructed to take turns to interview their partner's chosen thing for about 7-10 minutes. The pair assumed two roles: the human interviewer and the thing. The human interviewer posed questions directly to the thing chosen by their partner, who responded on the thing's behalf. The organizing authors further advised the paired co-authors to inquire into the relations the chosen thing has with humans and other things, its worldview, and to allow the thing's context and materiality to inspire the conversation. Those enacting the thing were invited to position it in front of the computer's camera and record the interview by audio (or video). 3) After the interview meeting, the contributing authors were invited to reflect on some questions provided by the organizing authors (Table 1), and to transcribe three key conversation snippets from their interview.

The submissions included pictures of the chosen things, selected conversation snippets from the interviews, and reflections to the questions. The submissions were analyzed by the organizing authors in two rounds. In the first round, the authors reviewed the submissions and annotated the transcripts. In the second round, the annotations and its associated reflections were mapped via an online visual collaborative platform and specific themes were identified. These themes were elaborated in a written paper draft and shared with the contributing authors, who reviewed and provided feedback.

## 4    HOW DID THE THINGS RESPOND?

The six submissions consisted of the selection of 12 things (two things per pair) as presented in Figure 1, followed by the sample snippets of their conversations with human interviewers: a mug and a tampon, a plant and a coffee maker, a teapot and a perfume bottle, a pair of boots and a door, a window and an ear bud, and toilet paper and a coffee machine (Table 2). Expanded transcripts of conversations are available at Appendix A. Pseudonyms are used wherever relevant for disassociating things with the authors' identities.

## 5    EMERGING THEMES

### 5.1    World as perceived by the thing

The interviewers' questions to things showed a wide range of topics from feminism to activism to sustainability. This suggests that the interviewers made a strong connection between the capability of being able to talk with that of being intelligent. However, it can be argued that we may not prefer to have very smart everyday things around us. How much do we want or expect our kettle to know about us or the outside world? Does conversational competence require being intelligent and knowledgeable? In the interview with the plant, one of the plant's responses involved a description of a laptop without having the knowledge of what a laptop is: *"Sometimes I can't see her face because there is this kind of silver vertical thing that has some kind of fruit on it, I noticed that other plants also have fruits."* Here, the plant sees the laptop as a rectangular metal surface with a fruit on it and that's actually sufficient for the plant to express its idea. The plant's response is a good example of how things can communicate with a limited amount of knowledge about their surrounding environment. This response is important as it demonstrates how one could go beyond anthropomorphised views and embrace how a thing may perceive the environment from what we may otherwise refer to as a thing's viewpoint.

**Table 1: Questions prompted for reflection**

| Human acting on behalf of the thing | Human Interviewer |
|---|---|
| What was the motivation for choosing the thing? What roles did the thing play in your conversation? | What topics did you address? Why did you choose the topics you talked about? |
| Did new relations surface by conversing as the thing? | Did new relations surface by conversing with the thing? |
| How did the embodied and material qualities of the thing influence the way you answered the questions? | How did the embodied and material qualities of the thing influence the way you asked the questions? |
| Would your interaction with the thing be different if it was mediated by a generic voice assistant? | Would your questions to the thing be different if it was mediated by a generic voice assistant? |
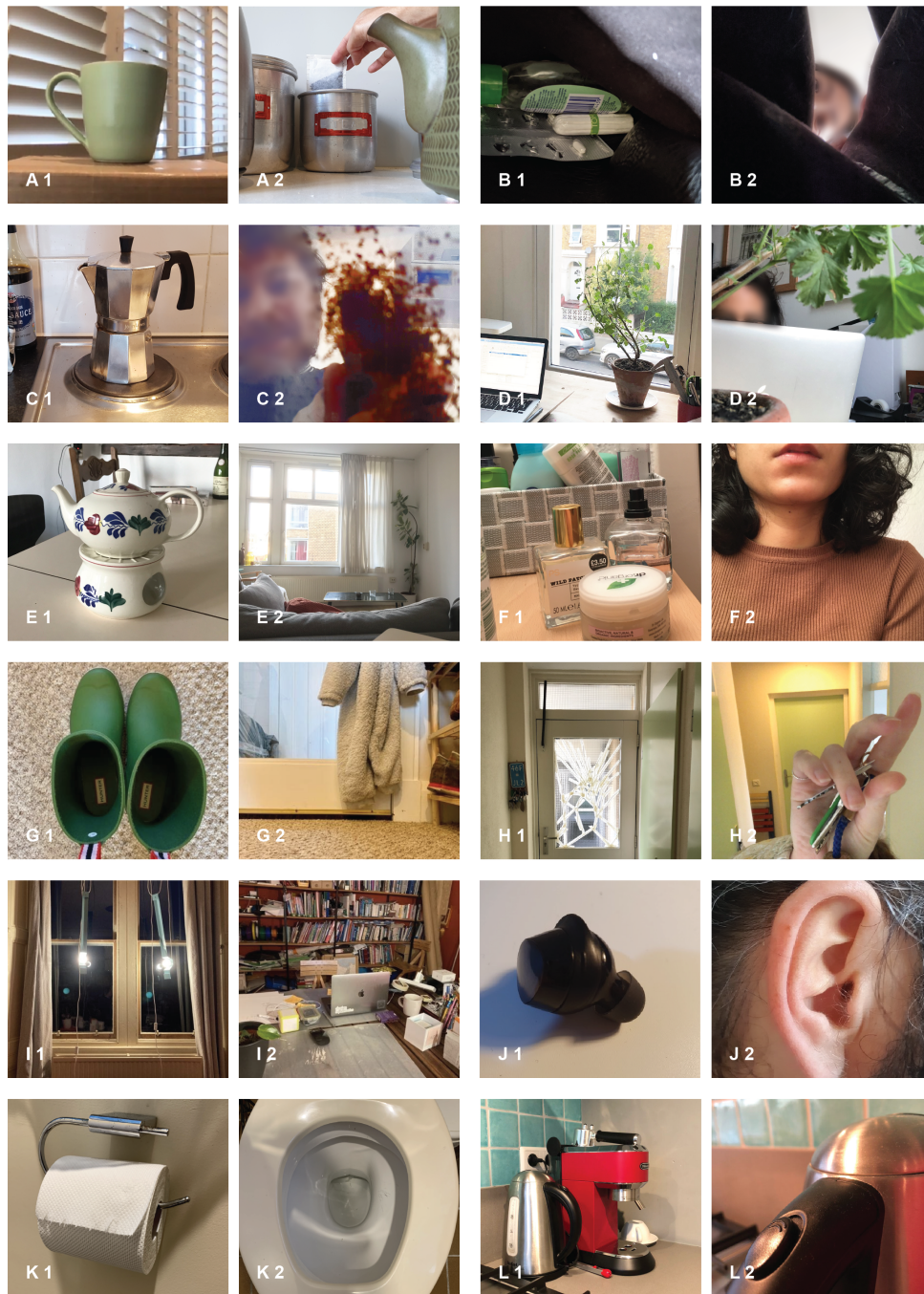
**Figure 1: From the top left: a mug (A1 & A2); a tampon (B1 & B2); a coffee maker (C1 & C2); a plant (D1 & D2); a teapot (E1 & E2); a perfume bottle (F1 & F2); a pair of boots (G1 & G2); a door lock (H1 & H2); a window (I1 & I2); an ear bud (J1 & J2); a roll of toilet paper (K1 & K2); a coffee machine (L1 & L2). X1 and X2 correspond to human and thing perspectives respectively.**

The thing's viewpoint or the world as perceived by the thing can be an important concept for designing CAs as it suggests that we can imagine intelligence emerging with things differently, one that does not need to rely on knowing everything. Perhaps things only need a uniquely constrained capacity to describe the world and communicate with us. Ultimately, this theme asks us to re-think a thing's viewpoint of the world. What kind of representations might there be to support the communication needs between humans and things and potentially how such new things representations offer benefits in design factors such as privacy, safety, and agency? An

**Table 2: List of things accompanied by conversation-snippets from the Thing Interviews to identify emerging themes**

| Thing | Questions by Human Interviewer | Responses from Things | Emerging Themes |
|---|---|---|---|
| Mug | Do you remember your maker? | I don't really have a strong memory of my maker, but I do have a vague memory of the sensation of being pulled into the shape that I am. | Permanence / Impermanence |
| Tampon | What do you think you're used for? | While I'm still in my packaging I've never been able to explore to see what it is for. I feel like I've got a lot of potential or growth.. (*winks*). I think I'm there in case of emergencies. | Permanence / Impermanence |
| Plant | Tell me about what you see inside. | Sometimes I can't see her face because there is this kind of silver vertical thing that has some kind of fruit on it, I noticed that other plants also have fruits. This metallic thing sometimes covers her face. | World as perceived by the thing |
| Coffee maker | Are you a noisy coffee maker? | I make a kind of quite loud gurgling sound when I'm making coffee for people. It's loud enough for John to notice that I'm ready. | Breaking silence |
| Teapot | Do you think about death and are you afraid of dying? | I know she won't put me together. I never saw her repair anything. I think when I break it's all over for me. | Permanence / Impermanence |
| Perfume bottle | What are the most important events or milestones leading up to your role of a gender conforming bottle? | I kind of have an opinion about gender, I would say and I express the opinion through the flavour of my perfumes. That's made me into a more reflective object. | Altered-presence |
| Boots | Was it difficult to find a time for you to have this conversation today? | You know, there's a second lockdown, so I'm only technically supposed to go out and do my job once a day. I think there's, you know, some liberties taken with that. | Altered-presence |
| Door (lock) | Briefly describe what your everyday routines look like. How do you feel about that? | A window was left open, and a huge draft came through and I was open and then I slammed really hard because this wind gust went through and then just shattered. | Breaking silence |
| Window | What are the things that catch your attention the longest? | Sometimes I see people, and all Roger notices is that the doorbell is going, but I see who pressed it. | Spatiality and distributed agency |
| Ear bud | Who is in control? You or Bob? | I beam him into a different place by giving him music or stuff to listen to. That is a quite powerful thing to do. | Navigating proximity |
| Thing | Questions by Human Interviewer | Responses from Things | Emerging Themes |
| Toilet paper | How do you feel when you go down the toilet? | I join with a whole lot of other toilet paper. And yeah, I know it can get a bit smelly, and there are not very nice things that go down the pipes, but it's all just a part of life. | Permanence / Impermanence |
| Coffee machine | Are you getting along with the kettle? | I don't like her. She gets to make a lot of tea. More than I get to make coffee… Yeah… such a pomp! Always bubbling up. | Breaking silence |

early work, deictic representations [5] focusing on representing only the relevant entities or parts of the environment according to the current situation, can be a useful starting point to formulate thing viewpoints. Understanding what a thing viewpoint would involve and look like presents an exciting research direction.

**What if CAs could learn about the world in a gradual way through their interaction with humans?** How else could things communicate their worldview within minimal knowledge about the outside world? What other representations or understandings could things employ to communicate ideas?

## 5.2 Navigating proximity

It is possible to view things on a spectrum of their proximity to human bodies. While some things may be placed somewhere in space, others may be wearable on human bodies or even integrated into them. Changing proximities of things to human bodies may have direct effects on how humans perceive the world. In our interview with an earbud, one of our co-authors mentioned how the earbud has become a part of his body, disappearing from his consciousness: *"It does increasingly feel as part of my ear or hearing sense"*. When combined with a degree of AI, such highly proximate things with their increasing capacity to alter human perception without us recognizing it make us think about the power dynamics between things, their designers and people. Here, little is known about how such perception-changing capabilities need to be designed and the extent of thing autonomy and its potential consequences. Amazon Alexa has already been integrated into earbuds [1], and there are possibilities for intelligent things to get much closer and fully integrated into human bodies such as the case of in-body CAs implanted in ear canals as depicted in a speculative AltCHI paper [9]. For instance, a (un)likely scenario may entail the in-body CA automatically performing noise-cancellation in a loud environment such as a house party or while driving in traffic where loudness is a necessary social feature of the activity. In addition, such highly proximate CAs can further raise questions about authenticity and privacy. It is not hard to imagine a scenario where someone we talk to can talk back to us through the suggested responses by the in-body CA, making the human-human conversation potentially less authentic. The first signs of such authenticity concerns about CAs emerged with the Google Assistant's Duplex feature [21] which can make restaurant bookings on behalf of its users with a remarkable level of human-like conversational competence and style, similar to the challenges explored in Our Friends Electric [39].

**What if CAs could be smoothly integrated into our bodies?** Would we be able to differentiate between human perceptions and those of CAs? How would this affect an overall sense of self?

**What if CAs could navigate the social dimensions of proximity** along a spectrum ranging from whispering to screaming?

## 5.3 Spatiality and distributed agency

The interview with a window highlighted two different dimensions of spatiality: human-thing perceptual gap and thing multiplicity. In the interview, some responses of the window focused on the perceptual gap between humans and things: *"Sometimes I see people, and all Roger notices is that the doorbell is going, but I see who pressed it."* Such perceptual gaps can be a fertile area to design conversations between humans and things to bridge the gap where needed. One major factor generating this perceptual gap is thing multiplicity. While some things at home have a unique singular presence such as a fridge, some other things may have multiple presences distributed in different sections of a home such as windows or toilet papers. In the case of windows, they exist almost in every room, and this provides an opportunity for humans to interact with multiple windows through a single one and for windows to sense the different parts of the environment through the sensory capabilities of all windows in the same home. This multiplicity will most probably require people to construct new mental models for the intelligent conversational things at home. These mental models can be based on the singular/multiple presence of things and how such localized or distributed presence can enable some distributed things to have a collective capacity to sense and act. Specific to the case of windows perceiving multiple sites both inside and outside of a space, there are also potential privacy and ethical concerns [12, 16]. When should the distributed capabilities be enabled/constrained, when and how should such things explicate such capabilities to whom? In the emerging landscape of distributed CAs in our environment (from multiplicity of window CAs to benchtop smart speakers to smart earbuds to potentially in-body CAs), there is room for developing a thing ecology considering such things' distribution in the space, their proximity to human bodies, their degree of autonomy and intelligence, and their medium of communication that can go beyond voice conversations. Such an ecology should definitely consider various privacy, safety, and ethical concerns such new things are likely to bring forth.

**What if CAs could talk to one another to bridge the perceptual gap between humans and spatially distributed things?** How would we imagine the construction of mental models for things and humans sharing a collective capacity to perceive and act? Might we get inspired from trees, fungi or other plant life to re-imagine how nonhumans things communicate with each other?

## 5.4 Breaking silences

While there is often a greater value associated with things that are silent or noiseless, we found that several co-authors relied heavily on the sounds things make to impersonate what things do in their everyday environments. The interview with the coffee maker, for instance, suggests that it made a *"kind of quite loud gurgling sound"*. Similarly, the coffee machine was compared to the electric kettle, complaining how the kettle was *"always bubbling up"*. Even the door's interview entailed noises such as the *"clicking"* of the door lock and the *"shattering"* of door's glass due to a gust of wind. On a higher level, this confirms what we said previously about how things are already speaking to us, but digging further reveals provocative differences. On the one hand, there are things that make sounds on account of the designed affordance of the thing, such as listening to gurgles from a coffee maker to know when

the coffee is ready. On the other hand, things are speaking to us even when they are not in use. As suggested by one co-author, an electric kettle or a door are never silent. By paying close attention, one might hear the AC vibrations pulsing in the power cords or the silent creaking of the door frame as the wind picks up. These differences present an important reflection for CAs as they are designed to remain silent and only respond when spoken to or used. This perceived 'silence' of CAs can be considered unsafe or creepy as they undeniably listen and perform in response to private conversations in households [31, 32]. As more and more everyday things become inscribed into an artificial logic that values silence over noise, our Thing Interviews suggest that the design of CAs might benefit from challenging silence by breaking it on occasion, in the way that everyday things do [25]. But at the same time, there is a difference between silence and the perceived inactivity of nonhuman things, which implies that proactive sound-making should be aligned with the things' functionality and purpose or its role in everyday life and not just for the sake of filling up absences of sound.

At the same time, we also emphasize that we do not need a 'human voice' to have a conversation with things. If gurgles, clicks, and whooshes are already indications that things converse in their own non-lexical manner [22], then it demands us to rethink how we make 'conversation' in a distributed ecology of humans and nonhumans. In this matter, one of the co-authors reflected on how difficult it was to impersonate the plant in comparison to the noisy coffee maker. She suggested that living entities, like plants, are different from nonliving things in our homes, and yet might occupy a similar status. She welcomed the possibility of using AI to listen to the plant's veins – an idea that takes precedence in people's efforts to communicate with plants since the 1970s [3].

> **What if CAs produced artificial sounds to accompany their everyday performances?** What if they could amplify the sounds they hear from other things? Which things would be under consideration and when? **What if CAs could understand the non-lexical sounds of things** that could further expand the scope and quality of our conversations with things?

## 5.5 Permanence/Impermanence

In our interviews, some of the things were short-lived and others had longer life spans as they were handed down over generations. For example, the tampon and the toilet paper led very short lives once put to use, and on the other hand, the mug and teapot lasted longer than their expected single-person use. A thing's capacity for (im)permanence partially determines questions about how people relate to things beyond their use value. As such, discussing things from the perspective of their permanence and impermanence allowed the co-authors to consider different life cycles of things other than those of humans. Instead of reducing the toilet paper to its one-time use, one of the co-authors mentioned a life beyond the ephemeral use of the toilet: *"I join with a whole lot of other toilet paper. And yeah, I know it can get a bit smelly, and there are not very nice things that go down the pipes, but it's all just a part of life, [...] but I'm part of this system which keeps humans healthy, which creates degradable products that go back into the environment in a way that's*

*sustainable"*. This interview suggests the idea that a thing can go beyond its own short lifespan and immediate context associated with use, and instead connect to its future and past incarnations. One could imagine that the toilet paper embraces a collective consciousness and continues its sustainable mission through future toilet papers and transfers its 'experiences' to next generations. The conversations with such a thing could then plumb into past memories of its life processes that humans do not think about or encounter in their own lifetimes, as projects like "Anatomy of an AI System" carefully remind us [2].

Another way in which impermanence played a role in engaging a thing's perspective was related to how the tampon was imagined to have a desire to experience its own potential: *"While I'm still in my packaging I've never been able to explore to see what it is for [...] I think I'm there in case of emergencies"*. As this tampon was reserved for emergencies only, its short life was countered by a longer time span of waiting for its use. This suggests that the tampon's essence rested on what it could potentially do, rather than what it was supposed to do. In contrast to how things are designed, which tends to assume that maximum use and engagement is always better, the absence of use in the tampon's case did not imply its inability to act or perform. This idea of non-use then challenges how we think of things that are not used, rarely used, or simply waiting to be used. It is often found that people feel guilty because they own things they do not use, particularly CAs. They might even think infrequent use diminishes its value. In this matter, the tampon's perspective helps to understand that short-lived, one-time, infrequent, anticipated, and rare uses are all part of how people relate to things. The non-human perspective, thus questions taken-for-granted assumptions where permanence indicates a positive life-inducing quality, and conversely, impermanence a sign of fragility and death. In relation to the latter, the interview with the second-hand teapot that led a long life over several generations was imagined to be very aware of its own fragility and embraced how easily it could break and die. It further suggests how design of CAs can benefit from not only long-term thinking (over generations) but also thinking along the lines of fewer disposable interactions in the short term [33].

> **What if CAs could speak about their past?** Could they express their collective memory, going beyond their life span? What if CAs were passed on over generations? **What if CAs take a responsible environmental role** according to their collective consciousness? **What if CAs have more than disposable interactions?** What do more permanent, long lasting interactions look like? What would less permanent, short lived interactions look like?

## 5.6 Altered presence

While recognizing the spatial and distributed agencies of things, it is equally compelling to acknowledge how things inversely affect the way the outside world perceives us humans. The interview with the perfume bottle can be presented here as an example of a thing that is imagined to be aware of how it is complicit with the way the world perceives the gender of a human. The bottle is assumed to play an active role in conforming to a human gender:

*"I kind of have an opinion about gender, I would say and I express the opinion through the flavour of my perfumes. That's made me into a more reflective object".* This reflective quality in the conversation suggests that things can be imagined to become aware of their own role and how they might have an altered presence that is more attuned to the social and moral context they are part of. This quality was also explicit in the interview with the boots. The boots reflected on sharing its agency with the human by being complicit in breaking the law that requires people to stay at home during the COVID-19 pandemic: *"You know, there's a second lockdown, so I'm only technically supposed to go out and do my job once a day. I think there's, you know, some liberties taken with that".* These reflective tensions point to the fact that conversations with things are not only a matter of distributed agency, but they are also socially and morally suspect in their lived contexts.

Reflecting back on existing CAs and its multiple instantiations (one for the kitchen, one for the living room, one in the car, and one for the ear), they hold some responsibility for the outside world's perception of humans with respect to norms, laws, and (un)accepted practices taking place across their distributed spatiality. CAs might then require a level of socio-cultural sensitivity to perceive the impact they have on humans in morally sensitive situations that can inform the conversation.

> **What if CAs could reflect on the impact they have on morally sensitive human situations** to make conversation? How might their altered presence trigger human awareness of it?

## 6 CONCLUSION

Our main intention was to investigate what might happen if everyday things had a voice, one that was not limited by experiences we currently have with CAs for talking to things at home. We wanted to know what conversations we could have with them and how our relationships would change as a result. We set out to use a more-than-human design approach to explore other forms of intelligence and communication and speculate on future voice interfaces. However, by stepping into the thing's shoes, we realized that our original intention was missing a fundamental understanding of human and thing relationships. As a result, our focus shifted from what and how everyday things with voice interfaces could be designed to that of emergent qualities of people's existing relationships with everyday things as an inspiration for intelligent CAs. In other words, we needed to re-discover relationships to and of things before we could think of their voice-based interactions. The Thing Interviews method allowed 'conversation' to become the channel through which we could get to know everyday things and imagine future possibilities when these things have higher degrees of intelligence, agency, and communication capabilities.

One of the constraints of the speculative Thing Interviews method is that we privileged human voice and human-like interview settings over approaching things in their ordinary settings alongside their everyday performances. This led the co-authors to go back and forth between imagining the thing's perspective and projecting their own human perspective onto the thing in their conversations. Therefore, there are many ethical considerations that deserve more

scrutiny within a more-than-human framework. Another limitation is that our analysis was informed by our cultural backgrounds, and the selection of things and the resulting conversations can be purview to other interpretations and insights.

For extending the more-than-human framework, we see two opportunities emerging from it. One opportunity could be to deliberately deconstruct and separate the two perspectives, which could allow researchers to engage in more critical inquiries around when, or in which situations, a thing perspective could become more visible to us. This tactic might be helpful to further tackle questions of anthropomorphism and thing intentionality [4], the post-phenomenology of things [43], or object personification [42] and mechanical sympathy [11]. The other opportunity is to imagine an additive tactic that embraces the plural and meshed entanglements of human and thing perspectives. This could lead to new and/or strengthened relationships between humans and non-humans to create new conditions of possibility. It could further inform researchers engaging with feminist care practices [34], co-performance between human and things [23], and neo-animism in human-thing relations [28].

To conclude, making everyday things talk is a speculative and investigative exercise in challenging our ideas about intelligent things that talk, going beyond the conversations we already have with current voice interfaces. The imaginary conversations with the things, from mugs and teapots that make us think about thing (im)permanence to coffee makers and doors that break the silence to perfume bottles and boots that alter our presence to earbuds and windows that navigate distributed agency, allowed us to characterize the emerging space of relations between people and everyday things. Through these themes, we raised provocations that cover an array of spatial, temporal, moral, social, and environmental considerations. We believe the themes are preliminary steps to explore this design space and inspire future research on designing everyday conversational things at home.

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# A APPENDIX: CONVERSATION TRANSCRIPTS

## A.1 Mug

| Questions by Human Interviewer | Responses from Things |
|---|---|
| Do you remember your maker? | Very vaguely, very vaguely. I remember a feeling of being pulled into shape, and then I remember being a very, very hot space and feeling myself getting stronger and harder, and then cooling and getting put on the shelf. But no, I don't really have a strong memory of my maker, but I do have a vague memory of the sensation of being pulled into the shape that I am. |
| Now the main thing that you do is hold tea? | Well, I'm usually on the shelf in the cupboard, so he'll open the cupboard and get me down and put me on the counter. In the photo, I'm sitting there next to the kettle and the tea canister, and there's some rustling around and the sound of the water boiling. And then my friend Teapot, who I see every day, she gets filled up with water and a couple of teabags, and then we sort of sit around and wait, you know, maybe for 3 or 4 minutes and I can hear one of the other humans rustling around but Teapot, I can feel the heat starting to radiate from her body. |
| What's your routine? | Teapot pours some tea into me, and I'm carried into the bedroom where my main human then lets me sit next to the bed for a little while to cool down a little bit. And then she lifts me to her mouth and I often hear her go hmmmmm, like that. And that's when I know I've done a good thing and it makes me feel really, really happy to hear that sound and go through that routine. |

## A.2 Tampon

| Questions by Human Interviewer | Responses from Things |
|---|---|
| What about the other things in your section? You've got some friends in there? | Yes, I've got antihistamine tablets—but they are very transient. They come and go. She's always reaching for the anti-histamine tablets. The other thing that's a good friend of mine is lip gloss (lip moisturizer) who is always there. And a new addition is hand sanitizer. |
| Do you feel like you're waiting to be used? | What else am I for? One must have a purpose. I can see that there are so many facets of me that I've never been able to explore. I have a string at the back of me, that while I'm still in my packaging I've never been able to explore to see what it is for. I feel like I've got a lot of potential or growth.. (*winks*) |
| What do you think you're used for? | I feel like… I'm not 100 percent sure what I'm for but I know I'm important. Otherwise, why would she take me around everywhere? I think I'm there in case of emergencies. It's comforting to know that if she really needed me, I'd be there. |

## A.3   Plant

| Questions by Human Interviewer | Responses from Things |
|---|---|
| You know you can see other plants out of the window. Do they see you as well? Are they your friends? | I mean, I don't know, the plants outside seem to be moving with the wind and maybe they have a perception of the world outside that I don't see but I get to see the buses and that's really interesting and then I also see what happens inside this House. |
| Tell me about what you see inside. | Anna is working here much more than before. Sometimes I can't see her face because there is this kind of silver vertical thing that has some kind of fruit on it, I noticed that other plants also have fruits. This metallic thing sometimes covers her face. She chats sometimes to this thing, but I don't see anybody else. So, it's a bit strange. |
| What expressions do you see on her face, or is the metallic thing covering her? | Sometimes she looks a bit worried or tired from sitting in front of the metallic thing. And it's a bit strange. Sometimes she waters me if she has some leftover water which is really nice. But then she puts the water really far away from that metallic thing and I… I don't understand, because you know I really like water and I think everything could have more water. |

## A.4   Coffee maker

| Questions by Human Interviewer | Responses from Things |
|---|---|
| Are you a noisy coffee maker? | Yeah, I make a kind of quite loud gurgling sound when I'm making coffee for people. It's loud enough for John to notice that I'm ready. |
| So that's your way of having a voice of announcing "pay attention to me!"? | Yes, exactly. There's a few times that he's opened the lid of me while I'm making coffee, you know, just to check on me, that I'm doing OK. And it startled me and I sprayed coffee out all over the place, which was quite funny for me really. It was my way of saying, John, be patient until I'm ready. |
| […] it must have been nice for you to show how you function and do your full performance for him. | Yeah, it was really nice. It makes me think I'd love to have a transparent lid or upper half so that people could see what I do because you know I'm actually quite impressive, but it's all hidden away. |
| And I guess, do you produce a nice smell? | I fill the flat with the smell of coffee in a really quite delightful way, at least I think so. |
| […] you seem to have a strong presence, because you make noise and then you show your performance and then you have the smell. | Yeah, maybe I was being too meek and humble about myself. I'm certainly central to a lot of what John does every day. |

## A.5 Teapot

| Questions by Human Interviewer | Responses from Things |
|---|---|
| As I understand this is not your first owner. So, do you have a previous owner, and do you remember your previous owner? | Well, before I came to this house, I did have an owner, but I was in storage. So, I didn't really have a house but I was in a storage facility, in a box with all the other parts, of the tea set I belong to. So we were together. I never really saw that owner. Before that, I lived with another lady in another city who had purchased the entire set, so when she moved, we moved to the storage facility. In the storage, things got mended sometimes, things were glued, but I saw that for other materials, less so when you're ceramic. |
| So do you know what happened to the other cups and saucers in your set? | Uhm, yeah, I left them behind in the second-hand shop. So, the only thing that came with me was the holder, with the tealight. I really remember this conversation my current owner had with the shop owner, the seller, because they didn't know my price yet, apart from the tea set. Once they knew the price, my owner decided to only take me. It's fine with me, I now have differently styled cups around me. I don't know if my previous set is still in that same store. Perhaps. |
| Do you think about death and are you afraid of dying? | Yes, definitely. You know, I think when I would die, which for me is breaking, it's quite a painful process because I only really die when I hit a hard object. There is no other way of dying for me. So yes, I know how this is going to happen already... In my current home we came close a few times, so I kind of saw my death already. I know she won't put me together. I never saw her repair anything. I think when I break it's all over for me. |

## A.6 Perfume bottle (gender conforming)

| Questions by Human Interviewer | Responses from Things |
|---|---|
| Can you describe your three worst qualities? | I tend to be very indecisive, I cannot make up my mind and I am very unpredictable. |
| How would you describe the unpredictability? | Just like human beings have mood swings that change from day to day, my mood and my behaviour changes from day to day. |
| What are the most important events or milestones leading up to your role of a gender conforming bottle? | What made me become a gender conforming bottle is that I saw the experience of my owner navigating her own gender identity. This led me to question my own gender and led me to the point I am today. I kind of have an opinion about gender, I would say and I express the opinion through the flavour of my perfumes. That's made into a more reflective object. |

## A.7   Boots (wellies)

| Questions by Human Interviewer | Responses from Things |
|---|---|
| I just wanted to, um, was it difficult to find a time for you to have this conversation today? Were you able to move things around in your schedule? | Well, you know, it has been, it has been busy lately. Things have been picking up, um, I'm getting a lot of use, but at the same time, you know, there's a second lockdown, so I'm only technically supposed to go out and do my job once a day. Um, I think there's, you know, some liberties taken with that. |
| Oh, really? | Well, I think, you know, um, the humans have their own sort of mental health needs and I, you know, my job is sort of to support them in that also. And, um, you know, I get them out into the green spaces, I get them out into the wild spaces and I think that's you know, the best thing I can do. |
| It sounds like you are complicit in some violation of breaking the law. How does that how does that make you feel? It doesn't seem like it's your choice to be a law abiding thing or not. | Oh, it's completely out of my control. I mean, I guess I could, you know, maybe try and trip them up or spring a leak. I think if I was a leaky boot, then I wouldn't have to be, you know, as you say used in that way. |
| Does it feel like it's kind of a superficial relationship if you're only valued for how you, how you look? | Well, I don't think it's only that. I think maybe that's sort of, I think that's part of how it started, but now I think it has more to do with where I take them. I'm more of a conduit, intermediary, sort of thing. |

## A.8 Door (lock)

| Questions by Human Interviewer | Responses from Things |
|---|---|
| Could you just briefly describe what your everyday routines and tasks sort of look like? | When the work from home and the lockdown stuff started, I wasn't getting used very much at all. I'm used to kind of irregular in and out, in and out, and the clicking, but there came a period of time where I just wasn't being used at all. |
| How do you feel about that? | I don't know if you saw the glass behind me, but it shattered recently. These people are hanging out at home way more than they usually do and are trying to make it more comfortable for themselves or something. But then, you know, they didn't really understand the physics of pressurization and a window was left open, and a huge draft came through and I was open and then I slammed really hard because this wind gust went through and then just shattered. And it's just shameful because here I am looking like a real myth. I mean, it's weird. It's when these people live their normal lines, I seem to work better. And then when they're stuck here, it's a site of conflict. |
| So what do you think, you said it would be maybe nice someday to get a facelift or have some more substantial maintenance done. Do you think that that would change who you are? And I suppose, do you ever have a worry that if things get so bad that you might be entirely replaced, say the wood on the door frame, are you screwed in? | I've noticed that some of my cousins, the windows in this place, they have been also replaced recently and they've been screwed in, but you know, it's like asking someone to look at their own bones. I haven't seen it myself until my cousins get disassembled. I'm only speculating here, but it's weird. I feel kind of like my time's coming and it's going to happen soon. I just don't know how much longer I feel kind of precarious. Am I going to break more? how long am I going to be left waiting here? But some things will remain the same. If you have cut off all your hair and it grows again, are you still the same person? I heard humans, all of their cells replace themselves every, every seven years. And maybe it's like that for me too, but just like a different time timeline, you know? Uh, I have been around here for gosh, since this building was built 25 years ago or something. So, you know, it might not be every seven years that I replaced myself, but not so dissimilar, I guess, from humans. |

## A.9 Window

| Questions by Human Interviewer | Responses from Things |
|---|---|
| The first is, when do you wish you could close your eyes? | I wish I could take a little break during the long day. And I have to rely on my human friend to use the curtains to close my eyes. And he doesn't do that very often. In fact, he tends to leave my eyelids open, particularly at night, but he does turn off the light in the room, which makes it easy for me to rest. |
| What are the things that catch your attention for the longest? | I really like looking the other way behind me where I see into his front garden and I see the people visiting the house. Sometimes I wink at a post man who drops off things on a daily basis. And sometimes I see people and and and all Roger notices maybe at the doorbell going, but I see who pressed it. And it's quite nice having foresight and backsight. I can think, I can see in both directions. |

## A.10 Ear bud

| Questions by Human Interviewer | Responses from Things |
|---|---|
| Where is home? | At first my box was home. It is comfortably moulded, it is peaceful, revitalising there. But now that I am thinking about it, I think that I increasingly feel that Bob's ear is home too. I have a smug fit in his ear. And as I have the raising suspicion that Bob regards me as a kind of extension of his body. This makes me feel more at home in his ear. |
| Who is in control? You or Bob? | It's pretty much Bob. He takes me out of the box whenever he likes. He puts me back if he doesn't need me anymore. He tosses me in his pocket or even loses me. He chooses what I play. He is pretty much in control. But then again I have mics, and I can let through ambient noises from the street to his ear if he listens to me. Or shut him off the environment completely. I beat him into a different place by giving him music or stuff to listen to. That is a quite powerful thing to do. What you hear or how much you hear is quite a powerful thing, you know? |

## A.11 Toilet paper

| Questions by Human Interviewer | Responses from Things |
|---|---|
| You're in a bit of a precarious position, aren't you? | Well not really actually. I feel like my status has, you know, really improved lately. People really want me now. They used to take me for granted, you know, and I'm actually feeling pretty special to be honest. |
| Is that reflected in your relationships with your owners? | I try not to have relationships, I mean I'm here for such a short time. I think of myself like a stream, or like food, or something that can be replaced. I don't feel sad that I'll be gone in, oh, I'd say a day or so, looking by the size of me. It's like I'm part of something bigger, because there's so many of me and we keep getting replaced. It's a good feeling, to be part of something that's bigger than yourself. |
| So you don't feel disposable, do you? | Well I think that's quite a human way of looking at me. Because humans, you attach all this meaning to longevity and to sustainability, whereas my whole purpose is to be here for a fleeting moment, and then to leave, and to be replaced by something else. Ok, so I'm replaceable, but I don't see that as a negative thing, I just see that as part of my normal lifecycle. |
| How do you feel when you go down the toilet? | Well I just think of it as the next stage of life, you know, maybe humans think about it in terms of, you go to a better place. For me, I join with a whole lot of other toilet paper. And yeah, I know that it can get a bit smelly, and there are not very nice things that go down the pipes, but it's all just a part of life, and it's only disgusting if you're a human I think … because humans associate all of that with waste, but I'm part of this system which keeps humans healthy, which creates degradable products that go back into the environment in a way that's sustainable. So I feel like I have a really clear purpose. |

## A.12 Coffee machine

| Questions by Human Interviewer | Responses from Things |
|---|---|
| Do you like your routine? | Oh, I'm quite new in the house. So I don't feel like I settled into a routine yet. I don't feel like people around me have settled into a routine around me. Did I end up in a good house? Did they really want me? It's been a couple of weeks already. |
| Are you getting along with the kettle? | I don't like her. She gets to make a lot of tea. More than I get to make coffee… such a pomp! Always bubbling up. |
| What do you think about the cups? | I think the cups are really nice and fun. I just wish I could interact with them more. I don't get to make so much coffee and cappuccino, and I get so excited when one of the cups comes over, and I get to make a nice cappuccino. I just wish I could party with them a little more, doesn't happen very often. |