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The Dog Internet: Autonomy and Interspecies Design

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Abstract: Activity trackers, smartwatches and other wearable technologies have become ubiquitous, and there is a corresponding interest in designing similar systems for pets. For example, Whistle, FitBark, and TailTalk, are devices that attach to dogs' bodies and record data using a range of sensors and radio transmitters, ostensibly to facilitate health and activity tracking by owners. However, arguably these developments reduce animals into just another data source, or "things" to be sensed, which raises issues of autonomy of the animal that is being subjected to technology that it does not understand. There appears to be significant tension in the design of such systems; narrative frequently flips between the wellbeing and welfare of the animal, and the entertainment and satisfaction of the owner. Devices that appeal most to the human will be bought and used, regardless of whether there is any scientific basis to the claims. To problematise this impending "Internet of Dogs", this Research through Design project asks instead what an "Internet *for* Dogs" might look like. Through the design and construction of a series of prototypes for canine users, based on their needs and capabilities, the Dog Internet exposes some of the profound challenges presented by inter-species technology design.

Kirman, Lawson, Linehan | DOG CAPTCHA – a speculative interface to the Dog Internet

Introduction

Although they share the same physical spaces and core needs for shelter, safety and companionship, humans and their pets have vastly different capabilities of cognition and reasoning. Despite this psychological gulf, our history is that of co-operation with animal companions, from hunting and security, to comfort and support, and as a species we seem drawn to form these relationships (Wilson, 1984). Arguably, much of this has to do with anthropomorphism, the human's reflexive projection of complex human attributes onto everything with which we interact. However, although we know, for example, Microsoft Word is incapable of actually hating us much as we imagine it does, when it comes to animals we are still quick to ascribe complex emotional reasoning to every behaviour.

Anthropomorphism has served humanity well, to the extent that we judge our morals based on our "humane" relationships with other species. However, there are many occasions where the trust in this natural intuition leads to harm. For example, dog bites involving children are frequently a result of misinterpretations of dog behaviour, such as a child misreading a dog baring its teeth as a friendly smile (Schwebel et al., 2011), whilst in cats, normal urination behaviours are often misinterpreted as pathological, in many cases leading to unnecessary euthanasia (p363, Overall, 2013). Humans remain convinced of their intuition around animals, projecting complex feelings and motivations onto animals based on little evidence – for example the famous "Grumpy

Figure 1. Focus group participant H2 explores Dog Internet prototypes. Photo: Kirman.

Cat" (2012) whose 2 million followers on Instagram find the cat's congenital deformation is reminiscent of a complex human emotion.

Animals are increasingly becoming users of everyday human technologies, and this presents a problem for designers. Where the designer of rubber dog toys can clearly define the core requirements of the toy and use appropriate materials and shapes, the designer of an iPad game for dogs (e.g., Airship Software, 2012) find themselves appropriating specifically human technology such as screens and game mechanics for use by another species. To address these challenges, the emerging field of "Animal-Computer Interaction" is pioneering the study of non-human-centred design. For example, various projects are designing and

evaluating canine-accessible interfaces for assistance dogs (Robinson et al., 2014; Mancini et al., 2015). At Melbourne Zoo, ACI researchers are improving welfare by building interactive systems for Orangutans (Webber et al., 2016). In each of these cases, research focuses on a tightly defined problem area in a very specific context, with careful consideration for animal welfare, and well defined human-measurable outcomes of

Figure 2. FitBark and Flipaw are both examples of crowdfunded wearable technology aimed at pets. Both are at the centre of the critical design work presented in this paper. Photographs ©FitBark & ©Flipaw.

success. In the wider world of consumer-level products for domestic animals with which we are concerned in the current project, this careful consideration for context and autonomy of the user appear absent, and utility is instead measured in terms of sales to non-expert owners relying purely on intuition.

To explore the issue of animal autonomy in an increasingly technologically mediated world, we have developed a long-term Research through Design project we refer to as the “Dog Internet”. The central aims of this project are to problematise technology designed by humans for use by domestic dogs, by working through (Frayling, 1993) a series of critical and speculative designs that uncover and expose the challenges of performing inter-species design. Importantly, this design work is specifically in the context of technology for pets that have some autonomy in their leisure

behaviour, as opposed to working contexts such as assistance, security or agriculture. This situates the project in parallel to mass-market consumer devices aimed at companion animals and their owners, where the relationship is more informal and humans may not have an expert understanding of the needs and capabilities of their pets.

Process

The Dog Internet is a reactionary project, situated explicitly in contrast to prevailing attitudes to pet technology. As such it is an example of adversarial design (DiSalvo, 2012). Our approach is to use the tools of critical and speculative design to problematise and uncover issues through design work. Critical and speculative design are part of a related set of approaches that aim to prioritise and communicate different values through design. Although the terminology often seems confusing and interchangeable, to put it coarsely, speculative design is concerned with demonstrating possible futures through plausible systems (Lindley & Coulton, 2015), and critical design is grounded in the present, concerned with challenging existing design ideas in order to “break the actual” (Tonkinwise, 2015), rather than the speculative. At the centre of both approaches is usually some form of “diegetic prototype” (Sterling, 2013), a designed object or system that embodies an argument or viewpoint. In critical design, the form and function of this artefact is an embodied criticism of the practice of designing those kinds of objects.

Figure 3. Rear view of DOG CAPTCHA, showing vials of anal secretions used to determine dog users from humans. Photo: Kirman, Lawson and Linehan.

Speculative and Critical designs are useful tools for research through design in that they are also orientated around the language of objects and interactions, and as such are accessible to a broader audience, than, for example, a traditional academic paper might be. In our project, we use these tools to develop a series of critical and speculative prototypes that explore different aspects of dog technology. These prototypes are speculative in that they are situated in the very near future, but are also plausible and seem imminent. We are inspired by the way consumer technology uses the language of near-future speculation through crowdfunding sites like Kickstarter. On these sites, projects focus on the promise of the near-future (Mitra & Gilbert, 2014) rather than the current

capabilities of the devices, supported by shiny product renderings and the use of scientific language as a “magic wand, that will conjure up marvels” (J.G. Ballard, in Sellars & O’Hara, 2012, p16). This is important to us as designers since these projects are specifically consumer focussed, and the descriptions of the technology are intended to be understood by lay people. This becomes a guiding principle in our own work as we want the arguments embodied in our designs to be understandable by consumers.

We use the same future-alignment of these speculative products to build our own diegetic prototypes. Many details of the implementation are intentionally vague and elusive, and the line between actual and future functionality is unclear. These doubts of functionality are pre-emptively dispelled through the “magic wand” of scientific promise, in the same way as a Kickstarter project might wave away the workings of some promised fanciful feature through claiming the use of “clever AI”. Our designs therefore sit in the same space of plausibility and understandability as people encounter all emerging consumer technology.

DOG CAPTCHA

A primary concern of the project is around autonomy of dogs as users, who are often subjected to technology rather than engaging with it in their own terms. Our starting point is to engage this issue by designing technology that explicitly resists human scrutiny or access. To do this we consider how the sensory and cognitive differences between canines and

Figure 4. Participant H2 interacting with DOG CAPTCHA. Photo: Kirman, Lawson and Linehan.

humans might be used to exclude humans from the user-technology relationship.

We started with the CAPTCHA as a human analogue. Web users will be very familiar with these boxes of distorted text and images that challenge the reader to “prove they are not a robot” by doing transcription tasks that are simple for humans to understand, but difficult for computers (Von Ahn, et al., 2003). In this way, web services can automatically distinguish between humans and computers based on the capabilities of each. In the same way, DOG CAPTCHA represents a system that enables dogs and humans to be distinguished, by asking the user to perform a task that is trivial for a dog but difficult for humans.

We chose to focus on the sense of smell. Compared to many animals, humans have relatively poor olfactory capabilities, with only 5 million scent receptors in their olfactory epithelium compared to dogs’ 125-300 million (Hankins, 2015). Dogs can sense smell with much greater detail and complexity and at much lower concentrations, and as such smell is one of the most important ways in which dogs understand and negotiate the world and each other (Aspling et al. 2015).

DOG CAPTCHA is a gateway authentication interface to the Dog Internet, and takes the form of a modified wooden dog kennel, connected to a network switch via an Ethernet cable. The interior interface is comprised of a synthetic dog’s arse, roughly modelled on the hindquarters of a golden retriever, that is connected by a series of vinyl hoses to a

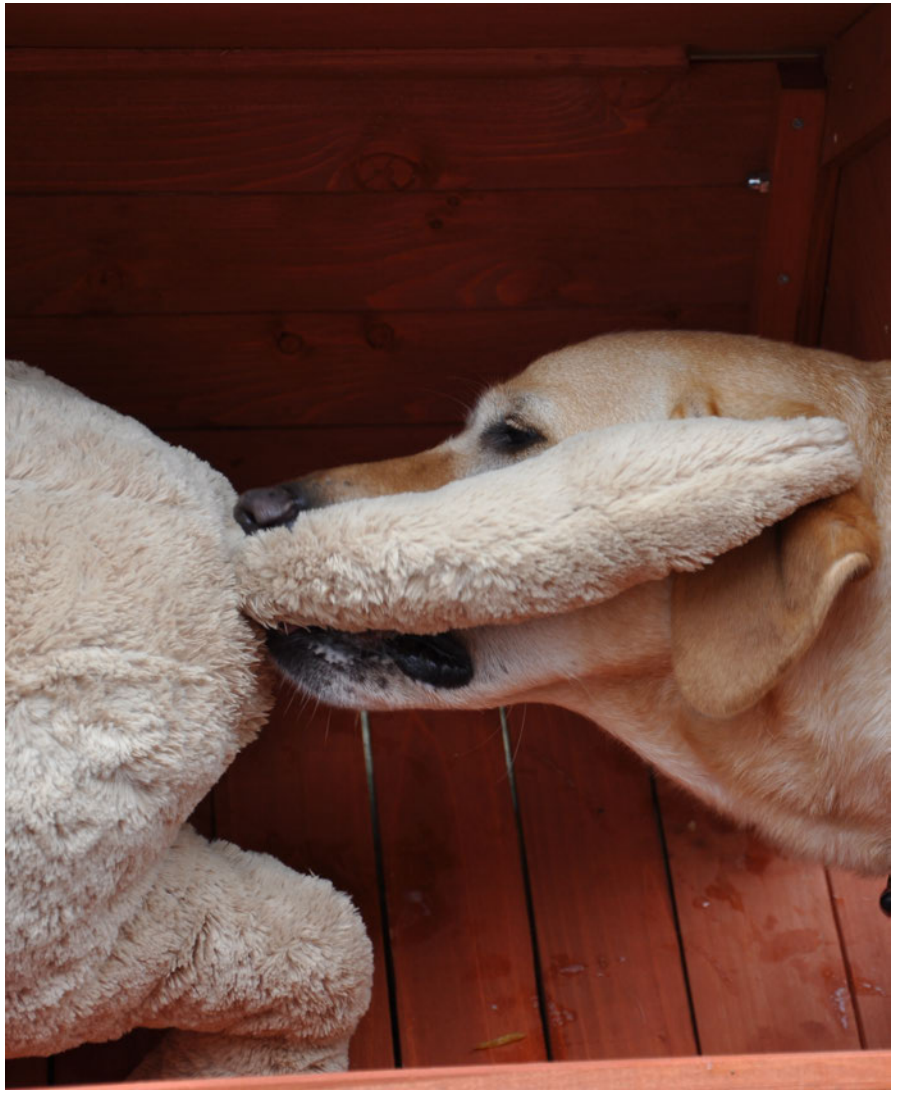

Figure 5. Exposed view showing H3 interacting with DOG CAPTCHA. Note that in normal use the lid is screwed shut for privacy. Photo: Kirman, Lawson and Linehan.

collection of sealed test tubes containing samples of anal secretions from various mammals. When a user enters the kennel, the system randomly selects a sample to be squirted as a fine mist from the synthetic anus. An array of sensitive motion sensors concealed within the tail and arse pick up a detailed signature of the user's behaviour following the release of the odour. A machine learning system, trained on thousands of dogs of various breeds, can reliably and accurately determine if this signature is appropriate. Therefore, based on the reaction of the user to the arse, the system can reliably detect the difference between dogs and humans, and thereby prevent access to the network in case of a failed challenge attempt, for example by a human pretending to be a dog.

The small size of the opening to the kennel, and its proximity to the ground, act as additional challenges, since they are adapted to the height and body shape of the dogs and have proven extremely uncomfortable for humans to replicate. Note that the DOG CAPTCHA merely serves as the means of species authentication for the Dog Internet, and does not necessarily represent the interface to applications of the Dog Internet (e.g. Dog Web, Dog FTP) itself (e.g. see Lawson, et al. 2016), which are out of the scope of the current project. However, the design of the DOG CAPTCHA kennel enclosure does contain enough room for other devices should they be required.

Figure 6. DOG RADAR in situ, amongst non-enhanced dog furniture. Photo: Kirman.

DOG RADAR

Where humans have regular patterns of behaviour, dogs are readily able to learn their routines, but a dog whose owner has less predictable patterns may be at a disadvantage. We designed DOG RADAR to help deal with this issue. Building on the themes of dogs needing privacy from humans in DOG CAPTCHA, DOG RADAR speculates on digital tools enabled by the Dog Internet that can support this. We are inspired, somewhat, by Sheldrake (1999), who argues that dogs have a supernatural ability to telepathically connect to humans via 'morphic

fields', which explains why dogs seem to know when their owners are returning home. Although there is little empirical evidence to support these claims, and such intuition can be largely explained by the predictable and repetitive patterns in human behaviour, we felt that the idea that dogs need to know when their owners are nearby is one worth investigating. What dogs do with this information is out of scope of our speculation, but presumably it involves things like tidying up empty dog beer cans, and deleting their web browsing history.

To humans, DOG RADAR takes the form of a seemingly ordinary squeaky dog toy, however, it has been enhanced with a microcomputer that connects to the Dog Internet. Once the device is discreetly paired with the mobile phones of the humans, it can coarsely determine proximity of the owner up to a maximum range of 1km (depending on local urban density). DOG RADAR remains inert until the owner's device is detected between the maximum range and a minimum of 500m from the device. At this point, a series of LED lights concealed in the toy flash rapidly, along with a high-pitched whistle in the 25-30kHz range (outside of human perception), to serve as a warning to the dogs that their owners are in the area. Importantly, once within the minimum range of ~500m, DOG RADAR reverts to its inert state. In this way, its utility remains concealed from the humans when they are present, since it has no value or concern for them anyway.

Figure 7. User H1 is alerted to the proximity of owners through high frequency audio and visual feedback. Photo: Kirman, Lawson and Linehan.

Figure 8. The rest of the pack, comprising H2 and H3, is warned to prepare for the return of the humans. Photo: Kirman, Lawson and Linehan.

Discussion

Through the design and construction of DOG CAPTCHA and DOG RADAR, as the first "products" of our investigation of the Dog Internet, we have focussed on the issue of autonomy. Central to this is the intention that these designs are aimed so that the pet is the main beneficiary of the new technology. We have pushed this further by attempting to deliver power to the dog at the expense of human companions, and in both prototypes the devices have no direct value to the humans in the pet-owner relationship. Through this frame, we found a stark contrast to the mode in which commercial pet technology appears to operate, which is much more human-centric. These technologies are potentially disempowering to animals who, rather than being treated as users, are better described as 'usees' (Baumer, 2015) in that they are subjected to technology that is enforced upon them by their owners. Our designs, by purposefully excluding humans, quietly expose these troubling values.

A core emergent argument of the Dog Internet is that inter-species design is simultaneously appealing to designers and pet owners, but is filled with ontological and ethical 'traps' that happen when designing for those with radically different perspectives (Vandenberghe, 2016). In this way, we can consider the Dog Internet as a performance of inter-species design that uncovers and illustrates these challenges in practice, especially around issues such as autonomy and privacy.

However, even in our own work it should be clear that the intended audience of both designs, as performances, are actually humans. This illustrates the core challenge of interspecies design, since we needed to design something for dog users that has critical value for human viewers. For example, the visual and material aspects of both prototypes carry features that communicate utility for human viewers that may not necessarily be understood by dogs. The DOG CAPTCHA uses the familiar shape of the dog kennel as its basis, where really any deep container with an opening too small for humans would be adequate. Similarly, the use of test tubes has strong symbolic associations with medical and scientific work that supports our assertions about their contents. In the DOG RADAR the placement of the aerial, and use of flashing red LEDs in the eyes of the toy is again a cue for the human reading the design rather than the dog user themselves. A real production for dogs would not follow these tropes, in the same way that rubber dog toys are shaped like bones and chickens so the owner will buy them, not because dogs believe they are real bones and chickens. Human designs for cross-species use are often skeuomorphic in that they carry vestigial features that have historical utility, but now have no value for the user – our DOG RADAR is made of limp synthetic fur that looks and feels like the corpse of a prey animal to humans, and has associations with hunting in our culture, but it contains none of the biological components (e.g. meat) that makes these visual and material features useful or relevant to a dog.

One of the central objectives of the designs from our perspective, was to stay just within the realms of plausibility. The Dog Internet is only a useful

as a discursive tool if it remains within the sphere of real technologies designed for pets. As critical design, we were extremely mindful of Dunne & Raby's warnings (p.43, 2013) that "if it is too weird it will be dismissed as art, and if too normal, it will be effortlessly assimilated". It flirts with farce, but never strays too far from the promises of technology that appears on crowdfunding sites. In the Dog Internet, we wield scientific promise, as Ballard's "magic wand", in the same way as the marketing material for other consumer pet technology. Vague promises of capabilities and hints at complexity give the illusion of technological advancement. Cynically, we could argue that this approach exploits the human tendency of anthropomorphism. The value of the device to the dog is only interpreted through the perspective of the human, who is quick to ascribe complex (human) emotions to an animal interacting with a computer, in ways they do not understand. This is illustrated in the use of figure captions in this paper which propose motivations in our animal participants that, as human designers, we could not possibly know.

In contrast to the smooth and shiny, speculative, and vaporous technologies we see featured in crowdfunding campaigns (see the examples in figure 1), the Dog Internet projects are strongly physical. The crude roughness in construction quality is intended to convey a sense of "prototype" in a way that a 3d render does not. In his critique of speculative and critical design work, Tonkinwise (2015) argues that "The more polished your aesthetic, the less speculative and/or critical it is... it normalizes a pretentious taste regime." This reflects a concern about speculative projects that drift too loose from the anchor of reality,

Figure 9. DOG CAPTCHA and DOG RADAR in domestic context. Photo: Kirman, Lawson and Linehan.

designed more for the white space of a gallery than for actual utility. We were keen to avoid this and worked to prevent the Dog Internet becoming too conceptual in nature. Our approach was to make it "more real" by using heavy wood, exposed wiring and fur in the construction that also serves to lend credence to the claims we make about the functionality. It confronts the viewer with the need to reconcile something that sounds as outlandish as the Dog Internet, with the evidence provided by the sizeable, real, objects that seem to plausibly perform those functions.

Conclusion

"What is the Dog Internet?" is a question that we have found fruitful in engaging the public with our critical design practice. Although the term "Dog Internet" began as something of an inside joke as we considered inter-species design from a critical perspective, it has proven a very sharp hook for drawing people into conversations about design. Pets - dogs especially - are a topic that everybody seems to have some knowledge and experience of, and as such, the Dog Internet is perhaps more accessible than a more conceptual academic project. The project supports critical reflection on consumer pet technology and deeper thinking not only about the cognitive capabilities of animals, but the effect of anthropomorphism on design. Just as Wittgenstein (1953) argued that 'if a lion could speak, we could not understand him', then similarly we propose that if a dog could design, we could not understand what she creates.

Although we feel the main contribution is in engaging consumers with the ongoing discussions around the emergence of technology designed for use by animals, especially in the domestic context where there is relatively little oversight and regulation around technology, we also find that the Dog Internet opens wider questions for designers, some of which we have touched on in this paper. For example, the potential value in using sensations of smell and flavour, and how experiences of design change based on the sensory capabilities of different individuals and different species. Moreover, through the alignment of the work against the crowdfunding product cycles, where solutions are sold for problems that don't exist (Morozov, 2013), we also highlight again how speculative design, fictional products, and magical functionality, are a key part of today's consumer gadget ecosystem, and wild promises of dubious futuristic-sounding functionality concealed by stock photos and shiny 3d renderings are more commonplace than one might expect. As such, the project reinforces the value in speculative/critical design research that engages with contemporary design context, and experiments with user expectations around emerging technology both within and across species.

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