

An **imaginary** researcher and her imaginary colleagues
Working for an **imaginary** university
Pose an **imaginary** research question
In an **imaginary study**
Based on **imaginary** fieldwork
Reported in an **imaginary** presentation
At an **imaginary** conference
To **imaginary** attendees
Published in an **imaginary** publication
And included in the the syllabus of an **imaginary** course
Taught to an **imaginary** student
Who one day becomes an **imaginary** researcher [and repeat...] S.N.

"...an imaginary, quantitative study."

"...experiences and self-reflections are used to critique quantitative 'hard science'."

Imaginary Studies: a Science Fiction Autoethnography Concerning the Design, Implementation and Evaluation of a Fictional Quantitative Study to Evaluate the Umamimi Robotic Horse Ears

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ABSTRACT

In this paper, I use 'science fiction autoethnography' to reflect on conducting an imaginary, quantitative study. My fictional study is intended to evaluate a real-life artefact: the 'umamimi' robotic horse ears. This physical device provides a backdrop, against which my experiences and self-reflections are used to critique quantitative 'hard science'. My own cognitive bias, rigid attachment to a viewpoint and presumptions (concerning anticipated results) all provide the real story. When I conduct an imaginary study, what does the process and its speculative results say about my autobiographical story and both the object and subject's broader societal and cultural meanings?

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CCS CONCEPTS

• Human-centered computing → HCI design and evaluation methods; Interaction design process and methods; Interaction design theory, concepts and paradigms; • Applied computing → Ethnography; • Computer systems organization → Robotics.

KEYWORDS

science fiction autoethnography; imaginary studies; animal-computer interaction; speculative; robotic ears; horse.

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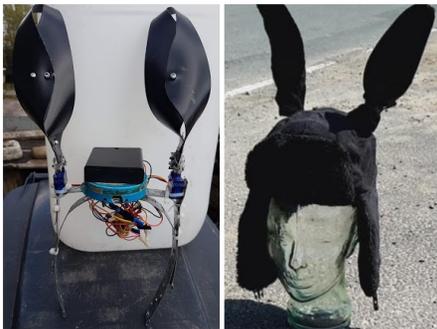


Figure 1: The Umamimi robotic horse ears - interior mechanism (left) and with cover on (right) ©Steve North

INTRODUCTION

As with most academic publications, the author of this paper starts by speaking in the conventional third person. However, you will notice that I've immediately abandoned this and I'm now speaking to you in the first person. That's because this paper is written as an 'autoethnography'. I will tell you more about this in a later section. For now, it is sufficient to explain this is my story and my reflections on the process of designing and implementing a completely imaginary, quantitative study.

I now look in the left sidebar at Figure 1. This shows the Umamimi robotic horse ears prototype [16][17][18]. As a researcher in both animal-computer interaction and computational anthrozoology, I developed this animatronic device in order to explore whether horses can recognise human attempts to communicate with them, using equine body language.

For horses, long, slender, dexterous ears are THE THING. When I watch my herd, their ears are so often in motion. There is literature (based on quantitative studies) describing how horses respond to another horse appearing to focus attention (as represented by, amongst other physical elements, ear positions) on one of two food sources [25][26]. I'm going to try and repeat this study ("the ears indicate which bucket has food in it"), but using my machine to provide the attentional cues.

As well as having a desire to evaluate my hardware prototype, I'm also driven to pursue my interest in design and speculative fiction. Tentatively, I want to take this in a new direction: 'imaginary studies'. So, this paper extends this 'real' work on horses and attentional cues, imagining how the same studies might be repeated to assess the Umamimi robotic prototype.

"...I was simultaneously typing and also **reflecting on how honest I was actually being**, going down and down in a spiral of introspection..."

"...ethnography (when focused on the stories of others), might be exploitative and damaging (so, **if you want to do it, take the risk yourself!**)"

WHY AUTOETHNOGRAPHY?

Why, oh why, have I chosen autoethnography [1][8][11][19]? When I became interested in extending design fiction into imaginary studies, I found this approach to offer intriguing opportunities. What better fit for a methodology that is all about telling stories? To bring in the author's personal voice, analysing my personal experiences, in order to understand how both my own life story and broader cultural, social and political experiences might relate back to my academic work.

Might it not be self-indulgent? Possibly, but I would argue that it might also be just a tad brave. I am doing it right now and it feels kind of scary. I can't hide behind a third-person, in the past tense. I am exposed and trying hard to be truthful in recounting my lived experience (including in the bit that I just wrote, where I was simultaneously typing and also reflecting on how honest I was actually being, going down and down in a spiral of introspection).

Just to pull this back into a semblance of formality, Holman Jones et al. say that autoethnography is: "...the use of personal experience to explore cultural practices..." [11]. The same authors also have a chapter discussing 'qualitative research and the limits of scientific knowledge' where they argue that quantitative research is good at describing the 'overarching facets' of things, but what it: "...is less adept at is accounting for or describing the particular, the micro and the situated elements of our lives" [11]. Holman Jones et al. also document the historic context in which autoethnography emerged as 'a thing'. This includes various factors, such as: an increasing interest in qualitative research, concerns that ethnography (when focused on the stories of others), might be exploitative and damaging (so, if you want to do it, take the risk yourself!) and the growing relevance of storytelling, narrative, the body and social identities [11].

So, now I have a voice and it's my voice... I have a lens and it's my back story and the world that I live in. Bring it on!

WHY SCIENCE FICTION?

I just introduced you to the methodology used in this paper: autoethnography. Or, is that the methodology, or is it really the transport protocol? The medium through which I conduit what it is that I have to say? The thing that I have to say also has a form. This is the actual container that I put my message inside and that object is a fictional science study.

As such, I am entering into the realms of a small, but growing body of work, known as: 'ethnographic science fiction'. Also known as fantastic, speculative or anticipatory ethnography, this is described by Anne Galloway as, "a story that could have been 'discovered' and told by an anthropologist" [9].

Ethnographic science fiction is closely related to 'design fiction' [7][15][22], which describes a methodology for both: (i) creating fictional worlds via design-based practices and (ii) exploring the social and cultural implications of design practice and technology. The speculative scenarios depicted

in design fiction / ethnographic science fiction and the fictional worlds (within which a story is recounted) may be rendered more tangible by the detailed technological artefacts that inhabit them. In my work, the artefacts are technologies (real or imagined) that have been designed for use by non-humans.

In David Kirby's 'The future is now: Diegetic prototypes and the role of popular films in generating real-world technological development' [12], he coins the term 'diegetic prototypes', where diegetic refers to their narrative attribute (a fictional place revealed through narrative), made to be self-explanatory of the universes that they originated in. Such fictional prototypes exist within a future context to which their operation is suited (and often patently obvious). They readily provide effective entry points into complex (and potentially controversial) socio-technological themes, such as the application of human technologies to disabled non-humans.

Anne Galloway defines her own variant of ethnographic fiction as: 'fantastic ethnography and speculative design' [9]. Galloway's use of 'fantastic' rather than 'science fiction' is intended (she explains) to reject a direct connection with scientific rationality, which (when considering feminist critiques of science) she argues is too linked to the practices and values of male-dominated culture [9]. However, I feel very rooted in 'science fiction'. In many ways, it where all of my imagination began. Without Ursula K. Le Guin, Issac Asimov and J.G Ballard, the very wiring loom of my brain would be very different.

Therefore, to write fictional ethnographies about the design, use and perception of technology, I would argue that it is totally appropriate and non-problematic to use 'science fiction' as a genre. If fact, it would seem desirable for science fiction to be reclaimed as a gender-neutral genre, that may then be utilised for studies featuring speculative ethnography.

In 2018, Kirman et al. describe the rationale behind a fictional conference [13]. From the abstract of this publication: "...HCI and design research has embraced the development and evaluation of make-believe technologies as a way to speculate and study the possible future effects of technological innovation, since it enables us to unpack and understand the implications of technology that does not yet exist. In this chapter we explore the weird relationship between fiction and technology research through the lens of a fictional conference, a playful project that gathered ideas about fiction in research through fictional research, and explore the fluid relationship between the real and unreal in HCI".

Perhaps there is scope to combine the fictional conference with the imaginary study and bring them together via a speculative university?

WHY IMAGINARY STUDIES?

Writing in the 1920s, Vaihinger proposed the philosophy of 'as if' [24]. Appiah explains Vaihinger's approach as: "very often we can reasonably proceed as if what we know to be false is true because

Kirman et al., 2018: "...HCI and design research has embraced the development and evaluation of make-believe technologies as a way to speculate and study the possible future effects of technological innovation, since it enables us to unpack and understand the implications of technology that does not yet exist." [13]

"Perhaps there is scope to combine the **fictional conference** with the **imaginary study** and bring them together via a **speculative university**?"

"**Imaginary studies** allow me to use my lived experience as a lens to consider how my non-human companions might respond and (possibly, more importantly) why I think they might respond in the manner that I am suggesting."

"My intention (in using **imaginary studies**) is to tell the story not only of building the physical artefact, but also the process of designing a quantitative study."

it is useful for some purpose to do so". [2]. Vaihinger believed that the application of imaginary rehearsal and scenario testing should not be limited in its scope. In fact, he "...came to apply the same strategy over and over again to one field after another, abandoning realism about a domain (atoms, infinitesimals, law, space, abstract objects, force, economics, freedom) but maintaining his 'esteem' for the corresponding ideas because of their utility" [2]. In a modern context, it is important to stress that Vaihinger was not advocating 'alternative facts' or such undesirable political practices. Rather, he was "...interested in the role of untruth in thinking about reality, not in the usefulness of speaking untruths" [2].

In her recent keynote Address to the Qual-World 2018 virtual conference, 'Nonsense and Play: Using Arts-Based Research as Disruption' [4], Kakali Bhattacharya describes how arts-based approaches (such as nonsense, play and absurdism) may be applied to qualitative research, disrupting traditional or dominant/privileged approaches. As an example of absurdism in qualitative research, Bhattacharya offers Saldaña's paper titled 'Blue-Collar Qualitative Research: A Rant' [20]. Saldaña describes his paper as "...a kick-ass article 'bout a pissed off qualitative researcher who feels that some of you higher ed profs out there got a lotta attitude and need to be brought down a notch" [20].

Imaginary studies also have a conceptual similarity with 'idealization', as found in the field of scientific philosophy. With idealization, theoretical models include facts about the modeled phenomenon that are observably false, but that help to make the models more intelligible, or easier to solve.

Imaginary studies allow me to use my lived experience as a lens to consider how my non-human companions might respond and (possibly, more importantly) why I think they might respond in the manner that I am suggesting.

My intention (in using imaginary studies) is to tell the story not only of building the physical artefact, but also the process of designing a quantitative study. The challenging part of this is to think through the study, without actually doing it (at least not yet!) and then to speculate about the results of that study. I see my framing of imaginary studies as similar to the 'thought experiments' popular with philosophers and ethicists. For example, 'the trolley problem' [23], where a trolley car is running out of control. You are the switchman at the points lever. You can choose to do nothing and multiple people tied to a track will die. Alternatively, you can pull the lever, divert the trolley car and one person on the track will die. Through your action, you chose to kill a person. Inaction leads to multiple deaths.

In fact, there are earlier versions of this thought experiment, where the person on the track is the switchman's child, causing a further layer of ethical complexity.

I see this philosophical use of thought experiments as being similar to my proposal in this paper. My fictional scenario is a quantitative experiment (evaluating the Umamimi robotic horse ears) and by its imaginary nature, I am able to rehearse and pick it apart. After all, no one actually expects a

philosopher to go out and find a branching trolley track, but it is still a designed study, which has been rerun countless times.

The entire point of a thought experiment is to think through its consequences. As with a thought experiment, an imaginary study may be impractical to perform. Alternatively, it may be perfectly possible to perform the study, but there is no intention (or necessity) to proceed with it in the short-term.

Of course, there is a darker side to imaginary studies. If they are not declared as such, it is possible that imaginary studies might actually be fraudulent (or conducted as the result of incompetence).

For example, there is the famous case of Sir Cyril Burt (1883-1971), a British educational psychologist, geneticist and (to a more limited degree) statistician. In, what has become known as, 'the Burt Affair' [10] this respected scientist was (almost universally) considered to have been caught out committing one of the largest scientific frauds of the twentieth century. Burt was desperate to prove that intelligence was a genetic trait. He spent much of his career trying to prove that twins raised in different environments would still present with similar intellectual abilities. Things came seriously unstuck when it was noticed that his IQ scores for twins, featuring in publications spread across several decades, were exactly the same, to three decimal places. This was the case, even though Burt had twice added new data to the sample of twins. Then it was revealed that two of Burt's supposed collaborators, Margaret Howard and J. Conway could not be traced and that he had most likely invented them. To all intents and purposes, Burt was conducting imaginary studies, just without the transparency or constructive intentions that I am suggesting. This makes me wonder how much of what we consider to be evidence-based is really imaginary, in all but name?

This is not a reason to abandon enlightenment principles. However, they can only be strengthened by permitting transparency. By allowing anyone and everyone to peer in, at the spinning cogs and wheels. It is this that attracts me to imaginary studies. A mechanism to explore the poetic nature of quantitative research, the literary criticism of the language used in the design of studies and the reflective deconstruction of everything that we are taught to believe is 100% objective.

Academic (activist) fields, such as Critical Animal Studies (CAS), recognise this need to question the nature of objectivity in academic study. One of the core CAS principles is: "Subjectivity: it questions the notion that academic analysis can be entirely objective, devoid of normative values and political commitments" [3]. In 2014, Blythe described a version of imaginary studies where speculative user feedback on design fiction prototypes forms a basis to rehearse possible criticism. He says: "In order to consider what might be learned from actually making such prototypes, imaginary field studies were also included in the abstracts. These imagined the prototypes being well and also badly received" [5].

"...how much of what we consider to be evidence-based is really **imaginary**, in all but name?"

Blythe, 2014: "...**imaginary field studies** were also included in the abstracts." [5]

Blythe and Encinas, 2018: "...fictional studies of prototypes might serve as a useful alternative to actually building them" [6]

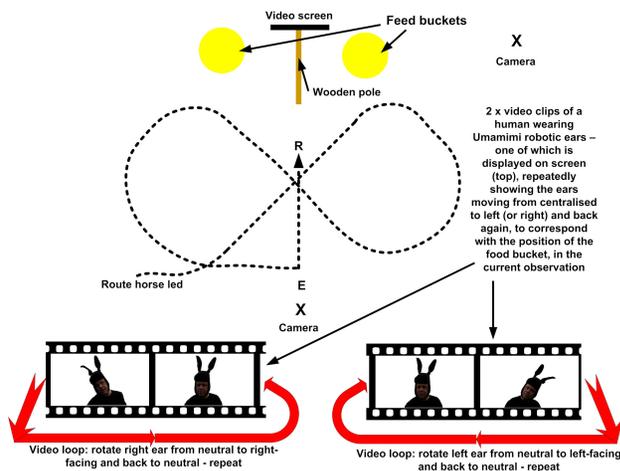


Figure 2: The imaginary experimental set up ©Steve North

Imaginary Study Design - Test trials

Figure 2 shows the imaginary testing area route taken to the release point (marked 'R' on Figure 2). Horses participated in one training trial in which a bucket containing feed was placed against the wall. Horses were brought into the area and led in a figure of eight before being released (at point 'R') to approach the bucket and eat the food. If the fictional horses were happy to approach the bucket they then participated in one test trial where a looping video clip was displayed on a flat screen attached to the wall above a dividing wooden pole (raised at one end on a plastic block) with a bucket containing feed on either side. Horses were again walked in a figure of eight before being released at point 'R'.

Each trial was captured with two video cameras filming from different perspectives (at points X in Figure 2). This was done in order to capture each horse's response to the video clips, for later review.

More recently, Blythe and Encinas referred back the former's 2014 paper, saying: "this paper went so far as to argue that fictional studies of prototypes might serve as a useful alternative to actually building them" [6].

Then there is the thorny topic of researcher (or experimenter) bias [14][21]. Where researchers influence the results, in order to portray a certain outcome. While still claiming to be evidence-based, it is possible to become attached to a certain viewpoint, jeopardising impartiality. In many areas of research, efforts are made to understand inherent biases and to take every effort to minimise the effects. For example: through using multiple, independent experts and then using an established statistical formula to test the level of agreement and the reliability in the original observations.

In order to understand the 'personal' in the quantitative study, imaginary rehearsal allows for all of these elements to be explored (bias, expectations, fears etc.).

IMAGINARY STUDY DESIGN

An imaginary study, needs an imaginary research question and mine is: 'Do the attentional cues of a video-recorded human wearing user-controllable animatronic robotic ears influence location-specific feeding decisions in horses?'

The design for my imaginary study is intended to closely replicate that used by Wathan and McComb in their paper: 'The eyes and ears are visual indicators of attention in domestic horses' [25].

The primary differences are:

- The use of looped video attentional cues, rather than still images.
- A human wearing robotic ears, rather than a real horse.
- Only considering the ears as an attentional cue, rather than covering up various parts of the horse's head, in order to evaluate the significance of ears, eyes and full face in the cue.
- Not considering how long horses looked at the video, before responding, or latency at approaching one of the buckets.

Beyond these differences, I have adapted many aspects of Wathan and McComb's original study [25] and their experimental methodology. See details of 'Test trials' in left-hand sidebar.

Non-humans participating in the study

The total number of horses used in the imaginary study varied from 20 to 100, depending on my confidence in being able to interest horse guardians in my research. A variable number of horses (let's say 8 to 92) were actually included in the final analysis. Perhaps, the best thing about my cohort of participants, is that they didn't actually have to do the experiment. Other than the promise (and positive reinforcement) of a feed bucket, I find myself struggling to understand why it would be OK

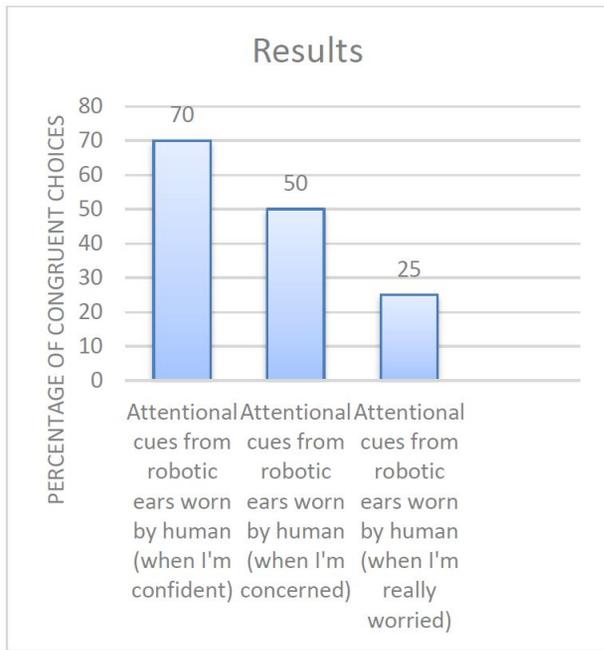


Figure 3: Percentage of horses choosing the congruent bucket - as an imaginary studies superposition ©Steve North

"...when I am feeling confident about the basis of my research, the results show that horses were sensitive to the attentional state of a human wearing robotic horse ears "

to conduct this study. I don't feel that I have any right to exploit horses, any more than it would be OK to assume that about a human animal.

IMAGINARY STUDY RESULTS

As I start to write this results section, I am wondering what I wanted and expected the results of my imaginary study to be? When I am feeling confident about the underlying ideas and validity of the project, then I anticipate that, when prompted by Umamini's attentional cues, 70% of the imaginary horses might have chosen the correct food bucket. If my mood becomes darker and I start to worry about the ethics and intentions of the study, then the results are closer to 50%. At a low point, I might even start to believe that the participant horses will be deterred (in some way - fear? rebellion?) from approaching the correct bucket.

In this version of the results, the horses choose the correct bucket less than half the time (as might be expected to occur by pure chance) - say, a congruent choice rate of: 25%.

Figure 3 shows these three co-existing results. In fact, these are just three data points in a continuum of possible imaginary outcomes, each determined by my confidence in the research. This might be considered as a 'quantum superposition' of result states, only collapsing into a single state, when (and only if) the real quantitative study is actually conducted.

The number of horses choosing not to participate varied between (i) zero (all of the horses loved it and I'm the best, most ethically perfect researcher, ever!) and (ii) the total number of participants (where a single horse staged an insurgency that spread to all horses, resulting in total non-participation and the eventual overthrow of the anthropocentric earth hegemony - also known as the 'Planet Of The Horses' timeline, but that's another story...).

The main behaviour studied was: which bucket the responding horse chose to feed from, and whether the bucket was congruent or incongruent with the bucket the robotic horse ears were indicating. With the help of my fantasy statistician, accuracy was assessed using two-tailed binomial tests. When participating horses viewed the video clip of a human wearing robotic horse ears (apparently turning an ear to indicate interest in one of two buckets containing food, they were - at least, when I feel confident about things - more likely to feed from the bucket congruent with the model: that horses will respond to an (apparent) conspecific's attentional ears cues, by going to the indicated bucket. In my imaginary study, when I am feeling confident about the basis of my research, the results show that horses were sensitive to the attentional state of a human wearing robotic horse ears (simulating a conspecific) and this influenced their decision concerning where to feed.

IMAGINARY STUDY ANALYSIS

At this point in the study, it's traditional to do some analysis... I've got the bar chart, where's the table? An imaginary study should be no different and so linear regression analysis was applied to the

Variable	Deviance (X ²)	df	P
Model	0.55	1	0.46
Model	3.055	19	0.046
Coat color	7.03	1	0.03
Stimuli direction	0.62	1	0.86
Centre	2.54	6	0.85
Stimuli direction	0.62	1	0.86
Age	0.754	1	0.64
Sex	0.33	1	0.87
Sex*Age	1.20	2	0.64
Sex	0.33	1	0.57
Sex*Age	1.20	2	0.55

Table 1: Linear regression analysis to determine the parameters affecting accuracy – as an imaginary studies superposition
©Steve North

"...the data is in an **imaginary studies** superposition."

"...attempting to simulate all the possible results of the regression occurring simultaneously."

"...don't waste your time trying to make sense of the values" (!)

Imaginary Studies: "...allows the artefact developer to rehearse the process of evaluation."

"**Imaginary studies** provide a way to consider the different outcomes that might emerge from your research. What underlies the way that you framed your research hypothesis? Has your own experiential learning and the influences of society and culture determined the 'hunch' that you have pursued as a research question?"

imaginary results. Whether inclusion or exclusion of parameters in the model significantly improved the fit was tested by comparing the difference between the deviance values of two models, which are distributed approximately as chi squared (χ^2) with degrees of freedom (df) equivalents to the difference in the number of parameters fitted in each model.

Looking at Table 1. (yes, it's intended to look 'all blurry like that!'), the first thing that you will notice is that (as with Figure 5) the data is in an imaginary studies superposition. Age, sex, testing centre (where the horse lives), stimuli direction and a selection of imaginary parameters (horse's star sign, coat colour, favourite boy band etc.) were entered as predictors in a logistic regression with feeding choice as the response variable (0 = choice incongruent with model; 1 = choice congruent with model).

The result is a superimposed illustration, attempting to simulate all the possible results of the regression occurring simultaneously. Of course, it is imaginary. So, don't waste your time trying to make sense of the values. It's just to demonstrate that any of the parameters might actually turn out (singularly or in combination) to be making a significant contribution to the observed results. As you may know, the deviance value of a model is a measure of the goodness of fit. Deviance values in Table 1 reflect the change in fit, when significant variables are dropped and non-significant variables are added to the final model.

CONCLUSIONS

Using speculative autoethnography to describe an imaginary study provides an interesting methodology to evaluate a technology prototype. In a similar manner to design fiction, it allows us to fully explore both the problem and solution spaces. It has commonalities with other methodologies proposed for HCI, such as using role-playing games or theatre as tools to conduct usability studies. However, unlike other approaches, it allows the artefact developer to rehearse the process of evaluation.

As shown in this paper, that might even include a quantitative assessment, where you can critique your own cognitive biases and expectations from the study. Imaginary studies provide a way to consider the different outcomes that might emerge from your research. What underlies the way that you framed your research hypothesis? Has your own experiential learning and the influences of society and culture determined the 'hunch' that you have pursued as a research question?

This doesn't necessarily mean that you will choose to evaluate your technology in a different manner, but at least you will be informed about the currents that are directing your research choices.

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