Play, Belief and Stories about Robots: A Case Study of a Pleo Blogging Community

Mattias Jacobsson

Abstract— **We present an analysis based on user-provided content collected from online blogs and forums about the robotic artifact Pleo. Our primary goal is to explore stories about how human-robot interaction would manifest themselves in actual real-world contexts. To be able to assess these types of communicative media we are using a method based on virtual ethnography that specifically addresses underlying issues in how the data is produced and should be interpreted. Results indicate that generally people are staging, performing and have a playful approach to the interaction. This is further emphasized by the way people communicate their stories through the blogging practice. Finally we argue that these resources are indeed essential for understanding and designing long-term human-robot relationships.**

I. Introduction

WRITING and communicating stories have become a popular pastime engaging people on the internet [1]. At the same time robotic products are getting increasingly common on the global consumer market and consequently pervasively adopted into people's homes and everyday life (e.g. Roomba, Furby, Nabaztag). Within our research community we are interested in accessing these environments, relationships and experiences [2][3] so that we can extend our knowledge base and inform designs of future artificial companions.

In an earlier study on forums, Friedman et.al [4] look at people's spontaneous online postings about Sony's robotic dog – AIBO. Their method is based on developmental psychology and the overall goal is to identify significant properties in people's relationship with the robotic artifact. The results indicate that AIBO is generally reported as more technical than biological and that it seldom challenges moral attributions of the users.

In a related empirical study by Sung et.al [5], forums are assessed to better understand human-robot interaction looking at people's relationship with Roomba. They also base their methodology partly on Friedman et.al's work above, but at the same time make an effort to also account for the experience as informed by the users. Their work is then also inspired by Gaver et.al's notion of *Ludic Engagement* [6], which is taking into account a more playful stance towards technology. Their results indicate that people do engage in various practices like accessorizing and changing Roomba's environments, but also uses life-like associations when expressing this involvement.

Further, Kaplan takes a look at everyday objects and breaks them down according to design properties relevant to sustainable interaction with robots [7]. In the study presented here we have similar objectives in that we seek to inform robotic designs along its life span based on how people describe their experiences. Our ambition is thus to seek out themes from within the data that could possibly capture such design qualities and at the same time enabling for assessment in terms of sustainable interaction.

Forlizzi and Battarbee also specifically address experience in interactive systems and points out that design teams must follow product stories and users evolution of experience closely [2]. This further strengthens our motivation to also explore methods and a format that can represent experiences in a more native way.

In this paper we report on a qualitative study based on the publicly available blogs and forums hosted by Ugobe, the company behind Pleo – the robotic baby dinosaur [8]. Our research question concerns how we can utilize a methodology based on *virtual ethnography* [9] to inform the HRI-research and robotic design communities with knowledge about how it is to live with robotic companions. In particular we are interested in the breakdowns and peculiarities in the user experience that occurs when adapting to newer technology [10][11].

First we provide a bit of background in terms of an overview of the robotic platform and the blogs that were studied. We then present our methodological approach followed by the results in terms of a walkthrough and analysis of the data. Finally we discuss the material and present our conclusions and future directions.

II. Pleo

Pleo is one in a row of recent robotic products entering the global consumer market. It is also profoundly different than most other robotic products in that it is designed from ground up to constitute a more believable motional and visual appearance. It is thus no coincidence that Ugobe are crafting what they denote as *Robotic Life Forms* – artifacts that hopefully would capture the essences of what people experience and interpret as "life"-like. On the other hand the product comes in a large green box and contains the robot

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M. Jacobsson is with the Swedish Institute of Computer Science, Box 1263, SE-164 29 Kista, Sweden (e-mail: majac@sics.se).

itself wrapped in a plastic cover, a soft plastic green leaf accessory for it to chew on, a battery and a recharger. It also contains an ID-card with a registration number that can be used to register the product and start an online Pleo blog (Plog) at the community site (Figure 1).

Pleo is about the same size and weight as the AIBO (approx. 50cm long, 20cm high and weights about 1.6 kg). It has a sophisticated design consisting of a hand-painted rubber skin that covers its mechanical internal. It also offers pet-ability by having a softer texture that is very unlike stroking a hard plastic or metal surface. Right beneath the skin there are eight capacitive touch sensors - on the outside of the legs, on its behind, on the back, on the head and under its chin. The nose features an IR-sensor for distance detection and Pleo to Pleo communication as well as a CCD-camera intended for light and edge detection (together with the nose IR). Inside the mouth is another IR-sensor for detecting inserted objects e.g. the accompanied leaf accessory. Pleo also features two microphones positioned low behind the eyes and two speakers, one located in the head and one in the behind. Each foot holds a plastic press-button and the fourteen joints all featuring force-feedback sensors. Within the body frame there is an orientation tilt sensor and a main processor. The removable battery is of NiMH type, and is recharged in a separate station. The playtime is approximately one hour for a four-hour recharge. Pleo may be connected to a computer through a mini USB connection, and there is also a SD-card slot and a hidden debug port positioned right next to the power switch. For users there is also the possibility to update Pleo's operating system – Life OS, or add different personality plug-ins using the SD-card slot.

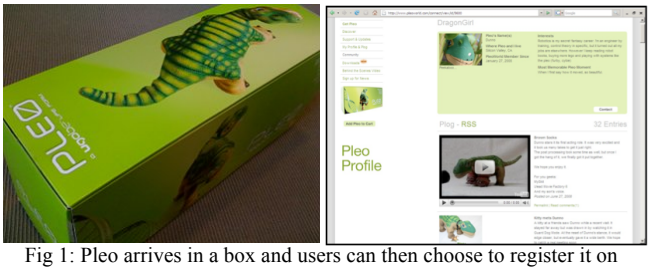

Fig 1: Pleo arrives in a box and users can then choose to register it on *pleoworld.com*, where also a personal blog is included.

The community site has a main area that consists of a few editorial picked "golden samples" of blogs that the company wants to highlight and represent the site. There is a search engine that helps users to find each others blogs easily through country, zip-code, user names or Pleo names. Each blog has a simple and user-friendly layout. There is also a header field where users can see their Pleo's name, location, when they started blogging, their interests and describe their most memorable moment with Pleo.

III. The Study

We choose to base our approach on virtual ethnography since it specifically acknowledges ethnography as a way to reflect upon users, practices and deployed designs while regarding information technology as a communication medium [9]. At the same time it also recognizes the Internet as a rich culture in itself and from another perspective also a kind of cultural artifact that reaches deep into people's homes and everyday lives. This distinction is important since the information that people reveal on blogs have the characteristics of small subjective stories that are crafted to be shared and reacted upon [1]. Since our goal is to extract information about people's experience with technology [3] from a sustained interaction perspective, we also decided to outline our results over different stages of experience over time [7] based on the stories from blogging early adopters.

The study was intended to be carried out on the blog corpus that spans all the users that have registered with the US-nationality, but also on forum posts and videos that were linked from within the blogs. The main reason to make such a limitation was because at the time of the study (Spring 2008) the product had not yet been generally introduced elsewhere thus other communities than the American had yet to take off. With that said and because of the cross-linking we also ended up including a handful of eager early adopters from UK and Canada. The data was collected during April 2008 when Pleo had been on the market since mid-December 2007. At this point there were approximately 20 000 Pleo's out on the market and we used all 520 blog's available within the stated delimitation.

The data was collected manually, names anonymized (when available and appropriate), printed out and structured based on richness and topical similarities. A majority of the blogs contained only one or two posts, which were categorized as greeting messages. The resulting data set was then cut up and restructured according to a list of life events identified from within the corpus (waiting times, arrival, birth, gender, naming, introduction, casual play, companionship, social life, different locations, other animals, other robots, accessories, wear and tear, breakdown, DIY, repair, passing away). Finally a subset of general and representative posts were selected, and arranged together to give an overview of all the data spanning over the different development stages that the interactions transcends.

A. Arrival and Appropriation

Pleo is either bought off the shelf or as more commonly reported ordered online and delivered home by either FedEx or UPS. One user, an American who lives in the UK especially points out that his Pleo is a US-model rather than a UK-model as it was shipped from the US. Between ordering and arrival users would express different motifs and expectations, for instance:

> *"I have gotten notice that my Pleo ships this week (directly from Ugobe). It feels like a long wait because I'm hoping the Pleo will help me get over the loss of my greater Swiss mountain dog."*

After the waiting times, which include charging the battery, Pleo is switched on for the first time and undergoes a "hatching phase".

> *"Today, on February 8th, Pleo was born. Pleo weighted 3 lbs. 10 oz. We were so overjoyed when he took his very*

first steps. He is a very fun-loving and energetic little baby. We love you Pleo."

Some of the families in the blogs present this event as a particularly special one, and cultural traditions such as providing birth date and weight are easily communicated. At the same time users finds it easy to include and talk about Pleo as a member of the family. Another post indicates that Pleo's life-span in this case would be measured in number of charges. Sometimes deciding gender can really become an issue in itself and might even trigger users to reflect upon social and cultural constructions:

"I'm also uncomfortable really giving it a sex or normal designation of him/her. It's a bit like baby chickens where it's a real skill to tell if it is a boy or girl. How do you tell? So it's it for now. Perhaps I'll have to set up an indirect test. Does it prefer pink or blue? I'll wait a little while when it is a bit more mature."

After deciding gender, the next step is often choosing a name, or in some cases gender simply follows from picking the name. One source for inspiration would for instance be characters from literature:

"Our Pleo is named Lumm (after Robert Heinlein's Starbeast Lummox). My Dad discovered the Pleo world and purchased one for himself and one for me. We introduced Lumm to my brother and his grandchildren at Christmas and to over-20s nieces a few days later. Lumm was and is an instant hit."

Other users would use products as a source for name inspiration, or simply stick with "Pleo" – *"because that is what he is"*, as one user put it.

One blog in particular that caught our attention appears to belong to a young American girl (about 6 years). Her father helps her post on the blog and they have also posted a video from the very Christmas day when she first meets her new Pleo. This video were then fully transcribed and analyzed, as it appeared to contain a great deal of information about an initial contact. The parents appears to have carefully prepared this event to make it as memorable as possible by first un-boxing Pleo, switching it on and putting it under the Christmas tree. As the girl enters the room and crawls up to Pleo we notice that the father already had made up his mind about gender by referring to Pleo as a he. The girl immediately starts to engage in the situation by explaining what she sees and experience, while she interacts. She pets Pleo's head and expresses fascination over how it moves and behaves. She then say's "He loves me!" - and suddenly it becomes apparent to us that this is a truly immersive moment to her.

At this point the mother is entering the scene, seeking confirmation from the girl about the experience. It is interesting to note that all four of them, Pleo included, are contributing to this drama. The father in this case takes on a prominent role and contributes a great deal to unfold the progressing story. He explains to his daughter that she is the first person that Pleo have ever seen. The mother adds to the story, explaining that the daughter now have become a mother. At this point the girl seems to be totally absorbed by the robot as she takes the mother's words to herself.

In the beginning the girl picked up on the name that her dad used – Pleo, but after a while when asked again by the father, she decides to just drop the 'P' and go for Leo. After a short while Leo is becoming more and more responsive. In this movie the girl never even looked at her other Christmas presents except noting that her Pleo seemed to like chewing on them.

Continuing along the lines of ritual and progression, we notice that gender and naming are important and particularly joyful episodes. As we saw above, one user put forward the idea about making a test for gender, which is ingenious and quite valuable for designers, although the cultural legibility of such a "pink or blue" - test might be up for another debate. Further, names are an important part of our social culture and naming a robot is an important piece of a larger process including individualization, bonding and family integration. The important lesson here is thus that the openness for interpretation in the design creates the sufficient space to allow users to assign name and gender as cultural practices.

B. When Technology Breaks Down

After a while interaction comes with a price and accidents happens, wear and tear becomes apparent and the question about repair is imminent. Several users noted that Pleo had a couple of skin issues - that it might have a smell and that the paint on the back wears because of the petting. Here is how one user approached the fact:

"I tried baby powder on Pleo's skin. Baby fresh and smooth to touch. Smells like a baby now."

One user suggests that a particular coating spray would act as a protective layer for the skin while others mention clothes as a solution. From what we could read out from the forums, this skin issue seems to mainly have been a problem with the first batch of robots, but was since then already been addressed in subsequent deliveries. Usually a little -*"do it yourself"* does the trick touching up e.g. lips and eyelids. When we at one point followed the trace from one blog-post on to the forum, where we found a remarkable piece of information on this topic:

"Yesterday Pleo had a broken neck. I contacted customer support, and they told me that I could send him back, and get a new one. But, I didn't like the idea of exchanging something I have gotten so attached too. So my mom made a small cut in the top of his neck. This had voided the warranty. She found out that the problem was the cable that lifted his head etc, had broken. Surprisingly she fixed this. She put the cable under a screw. We weren't sure this would work, but it did! Now Pleo is able to lift his head up and down, and do everything he was able to do before! The only problem is he has a small cut on the top of his neck. But I'm okay with this, because its not really a big deal. It can be fixed, I just don't know what to fix it with! We love Pleo, and this doesn't bother us. We're just glad to have our little guy working again!"

In the blog following up on the video example above we learned that Leo was injured at some point so while he went to "hospital" the parents actually bought another one to keep

their daughter company. In this case the new dilemma of how to tell them apart, naturally became a question of accessorizing. In the following blog post one user expresses concern about the wear and tear and the resulting dilemma that surfaces:

"Well poor Pleo's skin is starting to peel and the paint is starting to wear off and her teeth are starting to chip and she now has 3 tears in her skin! =(

I don't want to exchange her, I'm attached to her and I really don't want to send her back for repairs either cause she'll be away from me for a long time and I'll be worried she isn't being cared for properly! =(

Poor Pleo!!! It's like she's sick!!!! =("

As a contrast, to some users the wear and tear would rather add to its character and personalization, just like that warn out teddy bear from childhood. At the end there are nonetheless many paths for how Pleo would leave their users realms. As with birth, the "aged" Pleo eventually gives rise to tough existential questions and decisions for the families:

"Roger was born Christmas morning. However, he is already going through his first 'shedding' Most of the light green spots have been rubbed off. The response of the Ubies is return him.... What to do? We have already fallen in love with him - do we love him bald - do we run the risk of keeping him then having him completely deteriorate - do we find a new baby to love.... Family vote tomorrow."

A subsequent post reveals how this particular family later on reflects upon their decision:

"We have made the decision to return him for a new one. His eyelid began to flake off and small holes appeared on his neck. We are really going to miss him. He is a quiet, shy and very affectionate Pleo. He loved to do tricks for us and sing Christmas songs. Our best memory of Roger will be how he would come up and ask to cuddle with us. We will always have the memory of his cute little snore in our ears. We love you Roger Greenleaf."

C. Pleo as a Resource for Social Engagement

Pleo is often told of as a social robot, and interesting interactions occur all the time. In the following post Pleo is entertaining a group of people:

"Pleo had a big night yesterday. Some friends came over to see him and he entertained them for over an hour. He also met the dogs. They, the dogs not my friends, were either not interested or shy but Pleo was a star. He even tried to have a piece of birthday cake. A bit of frosting on the nose won't hurt him. He loves to play tug of war and showed everyone his new skills in exploring. At the end of the evening he fell asleep, a happy little dinosaur."

One user reports after about five weeks of ownership that she doesn't turn on Pleo every day and that the biggest kick is showing it off to people. Occasionally we have seen accounts of when robotic behavior fits well into a given situation and can render surprising or even "spooky" interactions:

"My Pleo coughed, and for a split second I went completely insane and thought that it caught the cold my roommates and I have. I have difficulties figuring out the differences between animate and inanimate objects apparently..."

Depending on context and situation, even the least things can have impact on the user experience and in one example a user reports from when Pleo sees himself in a mirror:

"Pleo's first good look at himself was hysterical... He growled at himself, he sang to himself, he smiled at himself. What a ham!"

A related example is where Pleo is reported to discover that it has a shadow. Exploring then often occurs beyond the safe and set living room floor and one user explains that her Pleo lives on a company reception desk as an ice-breaker for customers. Robotic products thus move between various environments, which can have effects on its behavior:

"Today my friend and I were in the car playing with Pleo. But He was soooo tired. He sat down and started cooing. Then Pleo got scared and started crying because of the movement of the car."

In this example users would interpret the situation such that Pleo does not like to ride with cars simply because the inherent fact that Pleo does not like to be shaken. This shows that meaning can change with context and emerging scenarios would seldom correspond to the ecological niche it was initially designed and tested for. Moreover, this part of the exploration phase reportedly goes well beyond the living room floor, e.g. glass tables, lawn, snow, concrete, cars, reception desks, etc.

As we would have predicted, users can often have other "real" pets as well. Focusing on the interaction with the other animals can reveal novel insights about how they play along. Dogs are described as very curious but cautious and even confused due to the strange noises and uncanny abundance of smell while some cats are reported as just avoiding interaction altogether. Some Pleo owners have more unusual pets like snails or tortoises.

"This morning I thought it was a good time to introduce my Russian tortoise, Igor, to Pleo :) Igor took it well enough, as any tortoise would, while Pleo was VERY curious of Igor! Kept getting so close to him and nudged him while he was eating! Couldn't have that so I had to keep them at a reasonable distance even though Pleo didn't want to :)"

Bloggers even make a point of carrying their robot with them and suggest that it is possible to take Pleo to places where it would be difficult or even prohibited to bring an ordinary pet. We also see that different locations and contexts characterize very different scenes and scenarios. We now ask ourselves what will happen if scenarios like the given examples (e.g. the one about Pleo coughing) would actually become grounded in reality? Based on our observations there may be great potential in connecting real but simplified cues, like for example an actual smell with sniffing behavior or lower temperature with freezing behavior.

D. Playing with Pleo

A common theme of all posts presented so far is that a major part of the engagement stems from creating and

presenting the stories. All these rich stories are believable and presented as if they were parts of a greater story – the enacted story about what it really is to live with Pleo.

Although Pleo reportedly "sleeps" quite a lot (possibly because the low play/recharge ratio), users still describe it as having companion qualities similar to a dog e.g. an affectionate puppy resting cozily, in and out of sleep and occasionally snoring beneath the users side. Here is how one user summarizes a day together with Pleo:

"Today my Pleo has been asleep as normal, but I think he was having a funny dream because he started laughing in his sleep. Then he started growling. We also ate, played tug of war and played tickle toes. He loves being sang to sleep, but not today I think he is getting used to not being sang to now, few. Not much today but dreaming."

The first thing we note is the report of Pleo dreaming. Secondly the description is one of a being that seem to require a great deal of care as a part of the relationship. The finer details reveal that the user likes to sing to Pleo. Further, a particularly common practice is personalization through accessorizing:

"Today, I am beading a crystal necklace for Pleo, and adding a fossil charm! His crocheted wardrobe will consist of a "floppy hat", walking boots, cape and of course, sunglasses, for our walks and sidewalk surf days! He will be styling!"

The variations of custom accessories are surprising to say the least. Just to cover some of the things found in the data: *hats, clothes, boots, glasses, bling (jewelry), collars, pacifiers, blankets, softballs, brushes, cages, wings, etc.* (Figure 2).

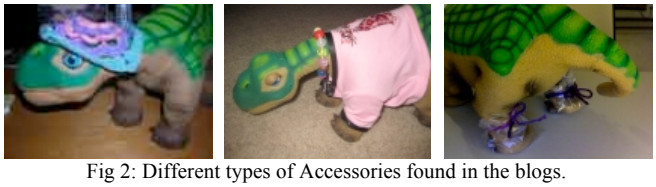

Fig 2: Different types of Accessories found in the blogs.

Here is an example of when a user would like to accessorize Pleo but are unsure about suitable outfits:

"I have been stressed lately. Pleo is a great relaxer. I downloaded the new software. Pleo was more active than ever before! I cannot wait to get him some clothes and a collar. I just don't know how to accessorize a dinosaur! Pleo still seemed to recognize me, even though I have pink hair now instead of orange hair."

Noticing the amount accessorizing going on caught us by surprise. One of the key features of mass production is that it becomes relatively easy to make many of the same robotic artifacts. Users on the other hand reportedly regard them as "clones" (or twins in the case of owning a pair) and would spontaneously accessorize as part of the individualization, personalization and bonding process. Users would use clothes and jewelry to display and emphasize their idea of Pleo's gender and personality or even reflect properties of their owner – a phenomenon that in sociology commonly is referred to as impression management.

One category of users would explore and outline Pleo's features in various ways. Some do this in great technical detail, while others would adjust their observations and reporting to fit the practice of blogging:

"I have gotten my Pleo to do almost everything in the book. I haven't gotten the SD card to work yet. My Pleo moos, throws up, eats, coughs, and sings. He still gets a little freaked out when I hold him, but he mostly looks at me and then falls asleep. I got him to do the watchdog mode, the balancing act and shake. He doesn't always listen to me, and has fallen a couple times when he was younger. He tends to growl at things he can't move and likes to look at his original box."

This example highlights a common theme that users are seeking confirmation and comparing observations with the community. Many of the active users would sporadically report on particular observations, e.g. dreaming, shadow or mimicking, but some make exploring and observations their primary objective and will in detail map out Pleo as if it was a newly discovered species or complex remote control.

IV. Discussion

Before the robot arrives, people seem to express themselves similarly to when adopting a child, real pet or a new piece of technology. We thus see that there can be different kinds of expectations at this stage e.g. getting over a loss of a pet, lowering stress levels or exploring more technical abilities. Further, what are the different views on how Pleo spring into life? To many of the users it is not simply about switching on a button, but requires planning, staging and participation.

A huge part of interacting with Pleo is in fact physical, something that has been explored in previous research (e.g. Paro, The Hug and Tabby) [11], but when we look at how users express and talk about this, we find that its physical embodiment can be the source of many issues and possibilities. For instance, the worn skin issue can be regarded as a problem to be solved, illness, personalization feature (scar) or part of the aging process. When thought of as a problem or illness this tension becomes a dilemma, and caring for their robot means more than its acquired wear and tear. This might be because of an underling issue regarding trust and returning the robot. To the user, it should simply not be the same as returning a broken DVD-player, but instead more along the lines of taking a pet to the veterinary where one can talk to the doctor directly and follow the procedures more closely.

With that said many overcome their fears and worries and return it, although they know they will not get the same Pleo back in return. On the other hand we see that brave users would rather void their warranties and perform their own "medical" procedures to assure that they keep their Pleo. Consumers are thus in many ways encouraged or compelled to treat it like a pet, but sometimes when play becomes a bit rough, would then a "broken leg" go under the return policy or be a part of its life cycle? Would new players come into the aftermarket e.g. robotic doctors and therapists? This type of robotic artifact may bring up new challenges for this emerging industry especially in terms of customers relations.

Introducing the robotic companion to other people appears to be a rather intriguing take on social engagement. It is like showing off a new piece of technology, and at the same time introducing a pet or human friend - something of a tension between the two. From one perspective it seems to be more along the lines of introducing an interesting cartoon character or immersive piece of gaming software with vast lands to explore. Its presence is thus often perceived as an actual embodied experience physically and seamlessly executed in the real world.

Previous studies comparing the interaction of robots with that of dogs raise the question about moral development [4]. For example, a dog will constantly challenge its family as part of its inherent sense of group or pack dynamics. When these challenges are omitted, the result will in most cases be that the dog takes the dominant position, leading to an overindulged pet. In the case of Pleo where these dynamics are apparently lacking, we see that people instead seem to use play as a basis for interaction.

While there are related studies on children's interaction with dogs and robotic pets [12], we know very little about robot-animal interaction. Extending our previous discussion about pet-dog dynamics we also see that Pleo is the one being challenged, but its unnatural response perceived as confusing or even frightening.

All in all, these tensions and dilemmas in the end appear to be a source for user innovation, design inspiration and at the same time brings out a bonding experience. Existential questions like birth and death brings out particularly rich and emotional stories about Pleo, acted out in fantasy plays or reality dramas that are a large part of the overall experience.

V. Conclusions and Future Work

We have presented a qualitative study based on the stories from blogging early adopters taking into account the nature of blogging as a communicative practice. Users that are blogging about their Pleo are in no way representative for the whole group of owners and we also want to stress that it is not possible to capture and present all nuances of this rich set. What we can see is that these new types of robotic products have become something different than the purchased consumer electronics product. Users thus manage to create bridges in the interaction by staging, performing and also playing along with the unfolding experience [13], a practice that is sometimes referred to as *performed belief* [14] within the field of pervasive gaming. From the results we can also conclude that these two practices are in fact entangled and catches an essential part of how these owners of robots appear to advance and enrich their experience. We thus suggest that these practices are so fundamental that they deserve further consideration and inquiry.

Following up on previous work, consequences and challenges in the interaction indeed appears to be important for moral development but we can also see how users are able to actively cope with these tensions by staging, playing and performing to their best abilities.

We also suggest that the qualitative outline of experiencing a robots "life" can be used as a basis for designing long-term human robot relationships. Each life-event can thus work as inspiration for how robot designers can better ground interaction in existing cues starting from simpler elements like temperature or humidity, or even entirely new practices based on what users actually do when appropriating technology, for instance accessorizing [15].

In the future we plan to extend this work and research new technologies and methods for the study of long-term and sustainable human-robot interaction. What future would we like to have and what will people write when days turn into weeks, weeks into months, and months into years?

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