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Interspecies Playful Interaction: Towards the expansion of interaction design

In this work we explore a change of perspective on interaction design in favour of a nonhuman turn. We highlight animal studies, especially those that extend to them the notion of play, as well as studies on playful design and interspecies playful interaction, conducted in the context of animal-computer interaction. This discipline adopts an animal-centred approach and its research has been showing the benefits of enhancing interspecies relationships driven by the design of interactive technology. In this context, we propose to expand the field of interaction design as an approach to the connection with the nonhuman world by assuming an ecological perspective in which empathy is a key factor.

1 INTRODUCTION

The boundaries of the field of interaction design, whether they are cultural, technical, or methodological, are in a constant process of expansion. These changes started being more significant by the end of the 1990s, when designers began to encounter new challenges that resulted from the interest of exploring complex and ambiguous topics such as feelings, emotions, experiences, meaningful practices (Mattelmäki et al 2014). These led to the need of finding new approaches that could enable designers to deal with uncertainties resulting from the insertion of these issues into the design process, and to come up with possible design solutions.

The answers to this marked a design approach responsible for approximating designers and users in the context of the creative practice, a context where empathy appeared as a key factor. This happened with the introduction of the notion of *empathetic design* (Leonard and Rayport 1997), a set of techniques grounded in an observational approach, from which designers may potentially assess the needs of potential users by watching the course of their everyday routines in their own environment. Afterwards, around 2003, design culture began to change from products to one that includes a form of immaterial design, that is, to processes, systems, services, forms of communication and collaboration (Brown and Wyatt 2010).

The empathetic design perspective shifted to the notion of co-design (Rizzo 2010), enticing non-designers to express their ideas and take part in activities related to the design process. One thing to keep in mind is that when we talk about co-design or participatory design, we are also referring to empathy. The construction of empathy is established by an aesthetic relationship formed by learning the qualities and values of another. This dialogic and immersive process can take time until the designer is able to recognize behaviours and strategies that people use to cope with the complexities of the world. The perception of these behaviours is subsequently translated into designs for systems and services that can impact the lives of individuals. In this context, the designer appears as somewhat of a cultural intermediary.

It was also around the early 2000s that the term *design thinking* (Brown 2009) gained prominence. Emerging in a context where organizations were seeking for innovation, the principle behind this human-centred, creative, iterative, and practical approach (Brown 2009), was to spread the idea that the way in which designers deal with complex problems could be learned and employed by anyone (even by those who never imagined themselves as designers) in any context, to solve any type of problems.

More recently, terms such as design *fiction* (Sterling 2005, Bleecker 2009) and *speculative design* (Dunne and Raby 2013) also emerged. These practices critique the business role of design and set out a broader notion anchored in a cultural, social, and political context. Design fiction is related to speculative practices of looking far into the future towards better ways of living in society and culture. This is a fertile environment for interaction designers to dive into, since the future will likely be rich in computational devices and

technologies of intelligence. A fictional design does not necessarily develop solutions but through it designers can probe, question, critique, and explore scenarios of possible futures by using narrative, diegetic prototypes, and context (Levine 2016). However, the elements presented in a fictional scenario must follow certain rules in order to be effective (Tanenbaum 2014), thus the practice of future-making also demands an awareness of the present. Like as on the previously mentioned design practices, the human and social fundamental practices are among the main issues examined on the fictional scenarios (Bleecker 2009).

Despite the expansions of the field of interaction design in favour of a user-centred approach, we may say that its strategies are still largely based on principles that place the human at the centre of the design process and hence towards the understanding of human qualities and needs. In contrast of this human-centred design, there is an emergent perspective that has been brought by a movement engaged in a turn towards the *nonhuman*, that can be understood "in terms of animals, affectivity, bodies, organic and geophysical systems, materiality, or technologies" (Grusin 2015, Morton 2017).

In light of this, we look at interaction design seeking to raise awareness in favour of a nonhuman perspective that may benefit the field by expanding to other species. Thus, we discuss the repercussions of this perspective in the context of interspecies playful interaction conducted by the discipline of *animal-computer interaction*. We present insights into animal play and interspecies relations through empathetic connections. Then, we propose notes towards an expansion of the field of interaction design as an approach to connecting with the nonhuman world.

2   CHANGING PERSPECTIVE ON DESIGN

The concern towards nonhumans is not new, but it is gaining strength after the post-humanism studies of the 1980s. Grusin (2015) points out that the recent intellectual and theoretical studies engaged in the broad spectrum of the nonhuman are: actor-network theory, affect theory, animal studies, assemblage theory, new brain sciences, new materialism, new media theory, varieties of speculative realism (like object-oriented philosophy (Harman, 2018) and panpsychism), and systems theory.

Throughout these fields we emphasise animal studies, especially two approaches that extend to them the notion of play. Playful activities may be characterized by five criteria that can be summarized as: "play is repeated, seemingly non-functional behavior differing from more adaptive versions structurally, contextually, or developmentally, and initiated when the animal is in a relaxed, unstimulating, or low stress setting" (Burghardt 2014).

Considering that playful activities precede the idea of culture (Huizinga 1949), they are not exclusive to humans. Until recently, the idea of "true" play was only attributed to mammals and some birds (Burghardt 2014), while possible play manifestations in other species were dismissed as anecdotal, anthropomorphic conceits, misinterpreted functional instincts, or immature behaviour (Burghardt 2005). We have now evidence of play

behaviour in a wide range of animals, including turtles, lizards, fish, and invertebrates (Burghardt 2005).

Since playful activities are a common behaviour of several animals, it seems to be a potential way to facilitate the connections between inter-species animals. Moreover, the element of fun in playing may resist "all analysis, all logical interpretations" (Huizinga 1949). One example of the intensity of the interactional bonds created by a playful experience was captured by the lens of the nature photographer Norbert Rosing (see Fig. 1). He witnessed the uniqueness of the encounter of a polar bear playing with a dog in the sub-arctic wilderness of northern Canada. As improbable as it may seem, these play sessions happened for ten days in a row.

Fig. 1.
Images shown a polar bear playing with a dog captured by the nature photographer Norbert Rosing.

Second, the studies on interspecies playful design and interactions conducted in the context of Animal-Computer Interaction (ACI). The development of technology intended for animals is not recent (Mancini 2011), however, Mancini highlights that the design of most of these technologies is not necessarily led by user-centred principles, since animals may not have control over its interaction. Furthermore, "there is an underlying expectation that the animal will adapt to the technology rather than the other way around" (2013). ACI's efforts propose the application of design principles that place the animal at the centre of an iterative development process as a legitimate user and contributor of design.

Such approach is much more recent, and research has been exploring it in such distinct ways. A literature review (Hirskyj-Douglas et al. 2018) on the interactive technologies involved in the context of ACI presented the following classification: tangible and physical objects, haptic and wearable technologies, olfactory interfaces, screen interfaces, and tracking mechanisms. These technologies used several interfaces such as animal-robotic, button systems, biotelemetry and GPS collars, vibrotactile vest, smell, thermal cameras, and touchscreens; they aimed at control, communication, working, monitoring, enrichment, playful, among others; and involved several species, like chickens, pigs, dogs, elephants, cats, and horses.

Playful interactions are being increasingly explored in ACI. Its research has been showing benefits on enhancing interspecies relationships driven by the design of interactive technology. As a consequence, the practices of interaction design and game design are becoming recurrent (Cheok et al.

2011, Alfrink et al. 2013, Westerlaken and Gualeni 2014, Geurtsen et al. 2015, Baskin and Zamansky 2015, French et al. 2018).

Since the ludic aspect is intrinsically motivated, realized by the pleasure resulted from the activity itself, and only occurs at times when the individual is not subject to stress situations (Oliveira et al. 2010), it represents a welfare characteristic. In addition to this, Haraway (2008) argues that play activities make an opening for a pleasurable and voluntary encounter between human and animals where coevolution processes which characterize interspecies relationships can take place. "The taste of 'becoming with' in play lures its apprentice stoics of both species back into the open of a vivid sensory present" (2008). We believe that these encounters may also be a way to empathy promotion and facilitate a perspective changing on design.

3 INTERSPECIES PLAYFUL DESIGN AND EMPATHY

Related to the communicative, collaborative and creative process that unfolds in the relations between designers and users, empathy can be observed as the effort to connect with other on a fundamental level. Design interactions and/or games are activities that may be seen as possible ways to encourage the development of empathic forms. Those are activities that presuppose the engagement of their actors and provide immersive diving into unknown experiences and contexts.

These qualities, even though commonly seen from the human point of view, may play an important role in the context of interspecies interactions. The development of empathy may promote, among other positive characteristics, the interest in another, the apprehension of different perspectives and experiences, the expansion of communication and the tendency to make ethical decisions. Empathetic people demonstrate, for example, stronger feelings of moral obligation to help animals, plants and nature (Berenguer 2007).

In a study conducted at the Melbourne Zoo in Australia, Sarah Webber and her colleagues (2017) designed a set of interactive installations to understand the forms of empathy experienced by humans when observing animals (orangutans, in this particular case) interacting with technology. The research team identified three specific strategies to evoke empathic responses from visitors: (1) enable visitors to observe animals' natural behaviours in close proximity; (2) make the orangutans' cognitive capabilities visible to visitors; and (3) allow visitors to observe differences between behaviours and preferences of individual animals. For four weeks they conducted semi-structured interviews with zoo's visitors to discuss aspects of the interaction, such as what they learned from the experience, how their perception of animals was affected, and what were their impressions about the facility.

This research showed that distinct forms of empathy were manifested. These were revealed through humans' reflection on the animals' intention, on desire, on learning aspects and forms of intelligence, and on similarities

between orangutans and humans. These results demonstrate that interspecies empathy can be evoked through interaction design from an observatory point of view. The act of observing animals while they interact with technology can be a way of triggering perspective-taking and identity that may establish reflective thinking and different forms of connection with animals.

Patricia Pons and Javier Jaen (2017), on their turn, carried out research that allows us to observe these manifestations in the context of the design activity. Pons and Jaen conducted an experiment where children aged from 5 to 13 years, and patients in a hospital in Spain, assumed the role of game designers to create interspecies games between humans and animals. The children worked individually with the researchers in order to create scenarios for two games, each one for a different animal. Despite the fact that the animals were the focus of the project, their absence in the design activity limited and conditioned the results to the children's previous knowledge of both species and the use of technology. The results showed that many of the solutions were centred on human aspects without considering the implications of the game to the animal.

On the other hand, the experience was significant to stimulate the kids' attention to animals and positively impact their opinions related to them. At the end of the process, they showed interest in knowing more about animals, especially the wild ones. They also considered the game as a tool to increase animal skills such as speed, dexterity, and development of smell. These perceptions highlight several aspects of design and games: the importance of involving animals as part of the design process; the potential games have for learning; a potential to empathy sensitization by the stimulus of perspective-taking, reflection and relationship-building.

In another project, Hanna Wirman (2014) conducted an exploratory game design activity with two orangutans at a rescue and rehabilitation centre in Indonesia. The researcher introduced computer technologies — particularly touchscreen interfaces — and experimented with different games in which the orangutans could perform a set of simple interactions such as moving objects, making items disappear by touching, drawing, selecting and watching videos. Among the objectives of the study were the improvement of the quality of life of orangutans in captivity and the discussion about how games can be used as a way of facilitating interspecies interaction.

Although physical similarities between orangutans and humans suggested a human-like interaction experience, Wirman's studies revealed limitations of such a pre-conception in at least four aspects: input mechanisms, as games were not designed to respond to the modes of interaction used by animals, such as the palm of the hands, wrist, licks, legs, feet and applied force; viewing angle, as the orangutans may interact too closely or too far from the screen, or upside down, and the interaction was generally dispersed; software/hardware, as the screens were licked, touched and often destroyed; and continuum of play practices, as the animals' interaction with technology was always competing with other forms of play, and in general, could not be determined when one game started and another ended.

Fig. 2.
Orangutan using index finger to interact with a touchscreen device (left) and observing an orangutan-proof touch screen 'too close' with his keeper (right).

4   THE NONHUMAN TURN: NOTES TOWARD THE EXPANSION OF THE INTERACTION DESIGN FIELD

The integration of nonhuman animals as participants in the design process places a series of challenges and constraints to the field of interaction design. In the context of designing playful nonhuman-centred experiences that we propose, interaction design emerges as a potential field to be explored. This scenario exposes opportunities for developing theoretical, technical, methodological, ethical, affective, technological aspects of the practice of interaction design itself.

Despite being multidisciplinary, the methods of interaction design are largely human-focused. The question that arises here is then whether this is a practicable approach when dealing with nonhumans? Zamansky argues that in order for Human-Computer Interaction methods "to be usefully applied, it is important that animals are enabled to express their needs and wants; this implies not only the possibility of freely providing feedback to what human designers might propose, but also crucially the possibility of 'suggesting' design solutions of their own" (2017). Accepting animals as creative agents in the design process, offers new possibilities for communicational interactions (Jorgensen and Wirman 2016).

As Pons and her colleagues (2015) point, studies with humans generally rely on verbal or written communication. These are the main ways for giving instructions and gathering informational feedback about the systems being evaluated. Because of these limitations, some researchers claim that animals do not qualify as research participants (Resner 2001), or even that it is not possible to involve them in the design process (Lawson et al. 2016). The impossibility of verbal or written communication with animals demands new ways of literacy that may potentially build new communicative bridges among species.

Dealing with non-verbal communication is already part of the interaction design practice. Cross (2006) argues that non-verbal communication is used during the creative thinking process as well as aids to communicating ideas and instructions to others. In addition to that, designers manipulate non-verbal communication as they translate abstract requirements into concrete objects. One of the ways to apprehend these codes is through observation. Designers are therefore specialists in watching what people do (and do not do) and listening to what they say (and do not say) (Brown 2009).

In favour of a nonhuman approach, Westerlaken and Gualeni (2016) explore the notion of "becoming with" (Haraway 2008) as a way to achieve some non-verbal mutual understanding. The authors suggest taking part in the playful interactions and explore the possibilities together with the animal rather than observing them and their interaction. The integration of nonhuman animals as participants in the design process has the potential to change the designer's own ideas and point of views. In this context, empathy becomes a potential approach for learning the languages of nonhumans.

To empathize with animals involves recognizing that they have the ability to feel, perceive, experience subjectivity, but without expecting that their experiences are similar to humans'. An empathetic connection suggests predisposition and an open-minded posture for it to occur. As Wirman (2014), the lead researcher of the study with orangutans presented on the previous section, said: "Sometimes, I assume, I have been trying to teach them to be what they cannot be. This has occasionally led to feelings of great incompetency, which I am little by little learning to let go and allow control from my side to theirs". And adds: "If I had taken the route to really teach (read: condition) the apes to 'correctly' use and play the games I made, this would have been a step away from my very understanding of play itself".

The interaction with technologies does not always involve humans. Animals engage in computer interactions in farms, research laboratories or open fields on a daily basis and may be a user base for interaction designers to engage with and potentially improve the processes and living conditions of those nonhuman individuals (Mancini 2011, 2013). Machine learning algorithms and computer vision techniques, for example, are being explored as a way to distinguish locations and body postures of animals (Pons et al. 2016). Those technologies seem to be more efficient since they are less invasive for the animal than wearable devices, such as collars with attached gyroscopes and accelerometers (Ladha et al. 2013) or even IR emitters (Bozkurt 2014). Furthermore, projects like this have the potential to bring useful insights for the possible observation and identification of playful behaviour and signs.

It is not new that humans have been studied as part of a biological continuum. Mancini (2013) argues that biologists seek "to better understand human cognition and emotions by comparison to those of other species". Understanding animal behaviors and nonhuman applications may benefit both humans and interaction design in return. The knowledge coming from understanding insects' behavior, for example, has been impacting design practices and technologies of areas like artificial intelligence and robotics (Parikka 2010). Rover@Home (Resner 2001), a remote human-dog interaction system for training, could be used by remotely located parents to teach pre-verbal children. Moreover, tablets and fixed screen interfaces are continuously used in a research program on language acquisition by nonhuman species (Schweller 2012). Those kinds of studies, as Mancini (2013) points out, may trigger insights for designing and improving interfaces to, for example, "help pre-verbal or dyslexic children learn language".

Designers know how to explore existing traditions, practices, and goals, and by a movement of framing and reframing social activities and contexts, know how to come up with innovative solutions (Murray 2012). This movement applied to interaction design positions the field before a movement towards its own expansion as an approach to the connection with the nonhuman world. With this paper we intended to reflect on this, raising awareness and sparking debate about studying interspecies interaction. This approach is, in a way, a political act, an attitude to look at interaction design as an effort towards interspecies ecologies.

REFERENCES

Alfrink , Kars, Irene van Peer, Marinka Copier, Clemens Driessen, and Marc Bracke.
Pig Chase. Playing with Pigs Project, 2013.

Baskin, Sofia, and Anna Zamansky.
The Player is Chewing the Tablet! In Proceedings of the CHI PLAY '15, London, UK, 5–7 October 2015: 463–468, 2015.

Berenguer, Jaime.
The Effect of Empathy in Proenvironmental Attitudes and Behaviors. Environment and Behavior, 39(2), 269-283, 2007

Bleecker, Julian.
Design Fiction: A Short Essay on Design, Science, Fact And Fiction. Near Future Laboratory, 2009.

Bozkurt, Alper, David L. Roberts, Barbara L. Sherman, Rita Brugarolas, Sean Mealin, John Majikes, Pu Yang, and Robert Loftin.
Toward Cyber Enhanced Working Dogs for Search and Rescue. IEEE Intelligent Systems 29(6), 32–39,2014.

Brown, Tim, and Jocelyn Wyatt.
Design Thinking and Social Innovation. Stanford Social Review, 2010.

Brown, Tim.
Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation. New York: Harper Collings, 2009.

Burghardt, Gordon M.
A Brief Glimpse at the Long Evolutionary History of Play. ABC 2014, 1(2): 90-98, 2014.

Burghardt, Gordon M.
The Genesis of Animal Play: Testing the Limits. Cambridge: MIT Press, 2005.

Cheok, Adrian, Roger Tan, Roshan Peiris, Fernando Owen, James Soon, Imiyage Wijesena, and Janyn Sen.
Metazoa Ludens: Mixed-Reality Interaction and Play for Small Pets and Humans. Systems, Man and Cybernetics, Part A: Systems and Humans, IEEE Transactions on 41.5: 876-891, 2011.

Dunne, Anthony, and Fiona Raby.
Speculative Everything: Design, Fiction and Social Dreaming. Cambridge, MA: The MIT Press, 2013.

French, Fiona, Clara Mancini, and Helen Sharp.
High Tech Cognitive and Acoustic Enrichment for Captive Elephants. J. Neurosci. Methods, 300, 173–183, 2018.

Geurtsen, Annika, Marteen H. Lamers, and Marcel J. M. Schaaf.
Interactive Digital Gameplay Can Lower Stress Hormone Levels in Home Alone Dogs: A Case for Animal Welfare Informatics. In 14th International Conference on Entertainment Computing (ICEC 2015) Switzerland, 9353, pp. 238–251, 2015.

Grusin, Richard.
(ed.). *The Nonhuman Turn.* Minneapolis: The University of Minnesota Press, 2015.

Haraway, Donna J.
When Species Meet. Minneapolis:
University of Minnesota Press, 2008.

Hirskyj-Douglas, Ilyena, Patricia Pons, Janet C. Read, and Javier Jaen.
Seven Years After the Manifesto: Literature Review and Research Directions for Technologies in Animal Computer Interaction. Multimodal Technologies and Interact, 2 30, 2018.

Jorgensen, Ida K. H., and Hanna Wirman.
Multispecies Methods, Technologies for Play. Digital Creativity, 27(1), 37-51, 2016.

Leonard, Dorothy, and Jeffrey F. Rayport.
Spark Innovation Through Empathic Design. Harvard Business Review, nov-dec, 1997.

Mancini, Clara.
Animal-Computer Interaction (ACI): A Manifesto. Interactions, 18 (4): 69–73, 2011.

Mattelmäki, Tuuli, Kirsikka Vaajakallio, and Ilpo Koskinen.
What Happened to Empathic Design? Design Issues, 30 (1): p.67-77, 2014.

Murray, Janet H.
Inventing the Medium: Principles of Interaction Design as a Cultural Practice. Cambridge, MA: The MIT Press, 2012.

Parikka, Jussi.
Insect Media: An Archaeology of Animals and Technology. University of Minnesota Press, 2010.

Pons, Patricia, Javier Jaen, Alejandro Catala.
Detecting Animals' Body Postures Using Depth-Based Tracking Systems. Proceedings of Measuring Behavior, Dublin, Ireland, 25-27 May, 2016.

Rizzo, Francesca.
Co-Design Versus User Centred Design: Framing the Differences. In Notes on Design Doctoral Research; Guerrini, L., Ed.; Franco Angeli: Milano, Italy, 2010.

Schweller, Ken.
Apes with Apps: Using Tablets and Customised Keyboards, Bonobos Can Become Great Communicators. IEEE Spectrum, 49(7), pp.37-43, 2012.

Harman, Graham.
Object-Oriented Ontology: A New Theory of Everything. London: Pelican Books, 2018.

Huizinga, Johan.
Homo Ludens. A Study of the Play Element in Culture. London: Routledge and Kegan Paul Ltd, 1949.

Ladha, Cassim, Nils Hammerla, Emma Hughs, Patrick Olivier, and Thomas Plotz.
Dog's Life: Wearable Activity Recognition for Dogs. Proceedings of the 2013 ACM international joint conference on Pervasive and ubiquitous computing -UbiComp '13, 415, 2013.

Levine, Davis.
Design Fiction. Available at: <https://medium.com/digital-experience-design/design-fiction-32094e035cd7>, 2016

Mancini, Clara.
Animal-Computer Interaction (ACI): Changing Perspective on HCI, Participation and Sustainability. CHI 2013 Extended Abstracts, 2013.

Morton, Timothy.
Humankind: Solidarity with Non-Human People. Verso Books, 2017.

Oliveira, Ana Flora S., André O. Rossi, Luana F. R. Silva, Michele C. Lau, and Rodrigo E. Barreto.
Play Behaviour in Nonhuman Animals and the Animal Welfare Issue. J Ethol, 28:1–5, 2010.

Pons, Patricia, and Javier Jaen.
Designing Interspecies Playful Interactions: Studying Children Perceptions of Games with Animals. Proceedings of the Fourth International Congress on Animal Computer Interaction, 2017.

Resner, Benjamin I.
Rover@Home: Computer Mediated Remote Interaction for Dogs. Media Arts and Sciences MS, Cambridge, Massachusetts Institute of Technology, 2001.

Sterling, Bruce.
Shaping Things. The MIT Press, 2005.

Tanenbaum, Joshua.
Design Fictional Interactions: Why HCI Should Care About Stories. Interactions (September), pp. 22–23, 2014.

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Westerlaken, Michelle, and Stefano Gualeni.
Becoming With: Towards the Inclusion of Animals as Participants in Design Processes. In Proceedings of the Third International Conference on Animal-Computer Interaction (ACI '16). ACM, New York, NY, USA, Article 1, 10, 2016.

Wirman, Hanna.
Games for/with Strangers—Captive Orangutan (Pongo Pygmaeus) Touch Screen Play. Antennae, 30: 105–115, 2014.

Westerlaken, Michelle, and Stefano Gualeni.
Felino: The Philosophical Practice of Making an Interspecies Videogame. Proc. of the Philosophy of Computer Games, 2014.

Zamansk, Anna, Amanda Roshier, Clara Mancini, Emily C. Collins, Carol Hall, Katie Grillaert, Ann Morrison, Steve North, Hanna Wirman.
A Report on the First International Workshop on Research Methods in Animal-Computer Interaction. CHI'17 Extended Abstracts, May 06-11, 2017, Denver, CO, USA, 2017.