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Towards an animal-centred ethics for Animal–Computer Interaction

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ABSTRACT

The emerging discipline of Animal–Computer Interaction (ACI) aims to take what in Interaction Design is known as a *user-centred* approach to the design of technology intended for animals, placing them at the centre of the design process as stakeholders, users, and contributors. However, current regulatory frameworks for the involvement of animals in research are not animal-centred, regarding them as research instruments, unable to consent to procedures that may harm them, rather than consenting research participants and design contributors. Such frameworks aim to minimise the impacts of research procedures on the welfare of individual animals, but this minimisation is subordinated to specific scientific and societal interests, and to the integrity of the procedures required to serve those interests. From this standpoint, the universally advocated principles of replacement, reduction and refinement aim to address the ethical conflicts arising from the assumed inability of individual animals to consent to potentially harmful procedures, but such principles in fact reflect a lack of individual centrality.

This paper makes the case for moving beyond existing regulations and guidelines towards an animal-centred framework that can better support the development of ACI as a discipline. Firstly, recognising animal welfare as a fundamental requirement for users and research participants alike, the paper articulates the implications of a *welfare-centred ethics framework*. Secondly, recognising consent as an essential requirement of participation, the paper also defines criteria for obtaining animals' *mediated* and *contingent consent* to engaging with research procedures. Further, the paper argues for the methodological necessity, as well as the ethical desirability, of such an animal-centred framework, examining the boundaries of its applicability as well as the benefits of its application. Finally, the paper puts forward a series of practical principles for conducting ACI research, which imply but also essentially exceed the welfare and ethics requirements of current regulatory frameworks.

1. Introduction

We live in a society where computing technology has become ubiquitous and interacting with computers no longer means using keyboard and mouse. Embedded in the fabric of our cities, workplaces, homes, vehicles, clothes and even bodies, 'smart' technologies now allow us to relate to the world around us, one another and even ourselves in unprecedented ways (Nakashima et al., 2010; Xia et al., 2012). These achievements have been driven by what interaction designers call *user-centred design* in computing systems, which has shaped the field of Interaction Design (ID) (Preece et al., 2015).

Although ID as a discipline has so far focussed on humans as technology users, humans are not the only species to engage with interactive systems. Being directly or indirectly involved in every aspect of human life and inhabiting increasingly technologised environments, nonhuman animals (referred to as animals hereforth) too interact with technology, such as touch-screen operant chambers, robotic milking systems, or wearable telemetric devices. However, historically the development of animal technology has mostly been driven by disciplines other than Interaction Design and efforts to systematically develop user-centred approaches to the design of interactive technology for animals are still relatively very recent.

Consistent with this state of affairs, currently the involvement of animals in the development of technology intended for them still falls under the ethical frameworks that regulate their use according to national and international legislation (e.g. European Directive, 2010/63/EU). Within these frameworks animals are essentially viewed as research instruments, unable to understand and consent to procedures that may harm them, rather than research participants and design contributors with their own interests. The aim of current frameworks is to minimise any negative impact of the research on the welfare of the individual animals involved (typically through the implementation of the principles of replacement, reduction and refinement (Russell et al., 1959); however, this minimisation is subordinated to specific

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scientific interests and to the integrity of the procedures required to serve those interests, provided that the interests in question are deemed of sufficient societal significance. This approach is essentially different from that taken by ethical frameworks regulating the involvement of humans in research, including within ID (Association for Computing Machinery, 1992), where the interests of the individual participant are prioritised over the interests of science and society. In other words, while ethics protocols that regulate research aiming to develop technology for humans are essentially user-and participant-centred, to date there is no legally established user- and participant-centred ethics protocol to regulate the involvement of animals in research aiming to develop technology intended for them.

In ID, *user-centred* means that an interactive technology is designed 'around' its intended users in order to best support them in their activities and daily lives. Here the term *user* is adopted in a broader sense and denotes anyone who interacts with a system, an *interactor* as referred to by North (North, 2016), whether the interaction is active and intentional (Robinson et al., 2014), active and unintentional (Mancini et al., 2015), passive and intentional (Cheok et al., 2011) or passive and unintentional (Mancini et al., 2012). The established view in ID (Preece et al., 2015) is that, in order to best support users, interactive technology needs to be informed by their characteristics, as well as the characteristics of the activities for which it is used, or which it enables, and the environment in which said activities take place. It also needs to afford good *usability* (e.g., it should be safe to use, it should be easy to learn how to use, it should help users to perform a task efficiently) and *user-experience* (e.g., it should be motivating and stimulating to use). To achieve this, *requirements* about what a technology should do, and how, need to be elicited from those who have a stake in its development (primarily those who will use it), in order to inform alternative designs, which then need to be prototyped and evaluated, through an iterative process of incremental improvement. To this effect, ID researchers have long recognised the importance of involving prospective users in the design process and, since the advent of the Participatory Design movement (Schuler and Namioka, 1993), an increasing range of methodological approaches aiming to support user involvement have been developed or adopted in ID, allowing users to take the role of active research collaborators and design contributors.

If Animal–Computer Interaction (ACI) aims to expand the boundaries of Interaction Design by developing a user-centred approach to the design of technology intended for animals (Mancini, 2013, 2011; Resner, 2001), then arguably ACI's ethical approach to research needs to be consistent with this fundamental aim, placing animals - as individuals and technology users, legitimate stakeholders and design contributors – and their interests at the centre of the design process. Such an ethical perspective is not only desirable on the grounds that animals have intrinsic value, as acknowledged by international legislation such as the European Constitution (TEFU) and Directive on the use of animals in research (European Directive, 2010); an animal-centred ethical perspective is a methodological requirement (Ritvo and Allison, 2014) the fulfilment of which is necessary to foster the conditions for animal-centred design.

This paper is composed of two parts. Part 1 introduces ACI and the requirements that its proposed aims place on its research outcomes, processes and ethics. Having considered frameworks currently regulating the involvement of animals in research, the paper then makes the case that ACI's user-centred and participant-centred approach to interaction design and research requires a new, animal-centred framework. The paper discusses the relation of such a framework to current principles of best practice in animal research, highlighting its benefits for research participants, researchers and ACI as a discipline. Part 1 concludes by discussing the role of ACI research and ethics in the real world and the space it opens for animals as co-designers of shared futures. Part 2 then articulates a series of practical principles grounded in the proposed animal-centred framework.

PART 1

2. ACI as an emerging discipline

Animal technology has existed for a long time, to be found in research laboratories, in modern farms or in the field settings of conservation studies. For example, within conservation research, animals have been wearing all kinds of tracking devices since the '60s (Samuel and Fuller, 1994). Since more or less the same period, psychologists have been running behavioural experiments requiring animals to interact with the interfaces of operant conditioning chambers (Carlson, 2009; Skinner, 1959). Touch-screen computers allowing great apes to learn and use lexigrams to communicate with human researchers have been around since the '80s (Rose et al.,1987); while underwater keyboards for dolphins were initially prototyped in the early '90s (Reiss and McCowan, 1993). Roughly at the same time, automatic robotic milking systems, which allow dairy cows to choose when to be milked, made their appearance (Rossing and Hogewerf, 1997).

For a long time, the development of these technologies has mostly been driven by disciplines other than Interaction Design (e.g. biology, psychology, engineering), as evidenced by the narratives and venues within which these contributions are reported, and – crucially - by the fact that the details of the design process are seldom published. With few exceptions (Rose et al.,1987), in these narratives design aspects relative to the devices themselves receive little attention compared, for example, to aspects of the research in which the devices are used; therefore, although user characteristics are taken into account, it is unclear to what extent the design process is informed by the requirements and the participation of the animal users.

At the turn of the millennium, however, there appears to be a change in the discourse. Computer scientists themselves start to take an interest in the design of interactive systems for animals and the design process itself begins to receive attention with direct reference to ID theories and frameworks (Resner, 2001). Additionally, researchers attempt to evaluate not merely *usability* aspects (i.e. can the animal use this device at all and how easily can they use it?) but also potential *user experience* aspects (i.e. does the interaction with the device appear to be motivating and enjoyable for them?) of technology designed for animals (Cheok et al., 2011; Lee et al., 2006; Robinson et al., 2014). Researchers also begin to propose methodological and theoretical frameworks to better understand, study and explain animal interactions with technology (Mancini et al., 2012; Weilenmann and Juhlin, 2011; Westerlaken and Gualeni, 2013). In an ACI Manifesto, Mancini (2011) called for a concerted effort towards the systematic development of ACI as a discipline around specific aims. The ethics framework proposed in this paper assumes these aims, which are therefore reported here in full:

1) ***Understanding the interaction between animals and computing technology*** within the contexts in which animals habitually live, are active, and socialise with members of their own or other species, including humans. Contexts, activities, and relationships will differ considerably between species, and between free living, companion, working, farm, or laboratory animals. In each case, the interplay between animal, technology, and contextual elements is of interest to the ACI researcher.
2) ***Informing the development of interactive technology*** to:

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