# Do Androids Dream of Electric Steeds? The Allure of Horse-Computer Interaction

Steve North, University of Nottingham

*But, when you desire to ride anywhere,*
*You must turn a peg, which stands in his ear,*
*Which I shall you tell between us two (secretly).*
*You must name him to what place also,*
*Or to what country, that you want to ride.*
*And when you come where you desire to abide,*
*Bid him descend, and turn another peg,*
*For therein lies the essence of working the device,*
*And he will down descend and do your will,*
*And in that place he will abide still.*
—Geoffrey Chaucer's "horse of brass" from "The Squire's Tale" [1]

Chaucer's "horse of brass" perfectly illustrates how humans tend to see a property in nature that we admire and immediately want to control it. In this case, the horse's "free will" is seen as an obstacle between the animal's fast-paced athleticism and our desire to master it. The implied goal: the robot horse.

Such is our joint history with horses. We have usually required horses to interact with us (through our technology), without regard for their opinions on the matter. After all, a brass horse has no opinions. So how does this relate to horse-computer interaction?

I am a guardian to four horses. I train them using evidence-based principles of good horse(wo)manship. I often spend time simply observing them, and ultimately I regard them as members of my family.

Wearing my HCI researcher hat (or more likely my baseball cap), I frequently think about human interaction environments. In HCI, our use of ethnomethodology and its focus on culture and practice require us to look further than a mythical, homogeneous user. I no longer believe it is acceptable for us to focus on user groups that exclude the nonhuman animal. Our current anthropocentric bias denies the reality that human animals are just one species in the family of animals. Interaction environments are rarely limited to just the human species. Nonhuman animals at varying scales (including microbes, mosquitoes, and horses) influence many aspects of our culture, practice, and behavior.

Research into these considerations usually falls under the heading animal-computer interaction (ACI) [2]. Studying the horse expands ACI's current focus on smaller companion-animal species (predators, such as cats and dogs) to include a larger,

domesticated prey animal. The horse is a species that shares environments with human animals but does not (at least usually!) live in our houses. The horse is also important because of its crucial role in the development of human technology and civilization. I will say more about this shortly.

Returning to where we started, Chaucer's horse of brass is relevant because it reflects a specific human inclination. We sometimes choose to believe that both our current "plan" and the technology used to achieve it are unassailable. We do not stop to wonder how the sentient animal involved (the horse) responds to our technologically mediated interactions (historically via bridle, saddle, and whip). Taken to its extreme, we wish that the horse's opinion would conveniently become an impossibility; that the horse would simply become "mecha."

And, I wonder, is this what we would wish for—"unaware interactors" that also happen to be human animals? For example: infants, individuals with Alzheimer's disease (and other forms of dementia), people with cognitive challenges, or those who may be on the autism spectrum? They may also be unaware of interactions with computers (and other technology), but, as with the horse, would we wish to simply ignore their opinions?

## The New Biocentrism

Recently, I have encountered many references to the "more-than-human," "transhumanism," and the "posthuman future." All of these ideas encompass (sometimes extremely fuzzy) notions of transforming humanity (often using technology) into something radically better. In this mix of new ideas, anthropocentrism is frequently seen as "old human" and unenlightened. In contrast, biocentrism—particularly its ethical stance on the inherent value of all living things and their interdependence within the ecosystem—is consistent with thinking in animal-computer interaction. For example, there is a general ACI view that all interactions take place across the canvas of a multispecies world. Applying these principles to ACI design should, in theory, help us to move from exploitation to enrichment.

Of course, biocentrism is not always ethically convenient for humans, who may wish to exploit the capabilities and properties of other species. This is still true in the 21st century, but it was certainly the case for most of the (approximately) 6,000 years that the horse has spent in human company.

## Historical Horse-Technology Interaction

It is generally agreed that it was between 4000 and 3000 BCE that humans transitioned from using horses only as a source of food to appreciating their renewable "secondary" products, such as traction and transport (both ridden and carrying packs). This changeover, known as the Secondary Product Revolution (SPR) [3], marks the start of human expectations that horses would interact with our technology.

Prior to the Information Age and the transition from traditional industries to computerization, the “hard” technologies used to interact with horses included saddle, bridle, reins, bit, halter, whip, working collar, harness, chariot, cart, and plough. Perhaps one of the most significant horse interaction technologies was the “hot shod” metal shoe. On the face of it, one might assume that shoes enriched the horse’s life by protecting it from injury. However, there are many 21st-century horse people who now entirely reject metal shoes, choosing instead to ride their horses “barefoot.”

For much of our history spent with horses, it has been a case of us telling but not listening. The horse was a primary driver of human technological development. It is likely that this was motivated by our ancestors’ desire to control horses, literally harnessing the advantages of their physical strength and speed. Humans used their technology to communicate with horses, but this was largely a one-way conversation. The motivation was control, and both the means of communication and its content were usually unsubtle and brutal.

Through human exploitation of the horse, small tribes became empires. Domestication of the horse (and the combining of its abilities with our own hard technologies) enabled humans to travel great distances, trade, carry cargo, and share both languages and culture.

## Horse-Computer Interaction in the Information Age

For the first time since the Secondary Product Revolution, humans are now technically able to monitor horses for pain, stress, relaxation, and behavioral abnormality. In fact, this is exactly the purpose of many new computer systems for horses. We are able to check for comfort and stress using sensors and monitors. It is even possible to evaluate the old hardware interfaces we have used for millennia, for example, the saddle, looking for the most comfortable and efficient models.

But are these new systems leading to exploitation, enrichment, or perhaps something in between? The types of computer-based systems available for horses may be broadly categorized into environmental, physical training, health, and sport-performance analysis.

For example, there are group housing systems such as the commercially available Active Stable. With this system, horses are identified by microchips clipped to their mane hair. Access to housing zones, automatic feeders (with personalised diets), automatic waterers and areas for social interaction is all controlled by the Active Stable system. In many ways, such systems allow horses to lead a more natural life. They are able to have free movement and socialize in a manner approximating feral herds. However, the potential for exploitation lies in the lack of human intervention required to monitor the horses. This might encourage humans to further view horses as machines (the brass horse, once again!) to be taken out of the box and played with as desired.

There is one type of system that possibly offers the best chance of usage that improves the horse's welfare: physiological monitoring. Common ways to track a horse's level of stress include measuring heart frequency variability and salivary cortisol levels. This type of monitoring allows humans to understand when a horse is relaxed and therefore likely to be within its comfortable repertoire of behaviors. However, the expense and required expertise tends to limit the use of such systems to competitive (and financially lucrative) environments.

## Implicit vs. Explicit Horse-Computer Interaction

Every time an animal (either human or nonhuman) interacts with a system, that interaction may be explicit or implicit. By implicit interactions, I am describing "those that occur without the explicit behest or awareness of the user" [4]. Most (but not all) humans are aware of an interaction having taken place, even if they do not fully understand its purpose or underlying mechanics. Therefore, most human-computer interactions are explicit.

However, as with other nonhuman animals, the majority of horse-system interactions will be implicit. Even where horses understand that their behavior triggers a desired outcome, they are incapable of understanding that a human-designed computer system is responding to their interaction. If a prototype food-delivery system were introduced into their environment, horses would be unable to provide feedback on its function, ease of use, and behavioral impact on the group of horses.

Many computer-based systems for horses will rely on "implicit interaction through context." For example: A pregnant horse experiences increased levels of perspiration, triggering a birthing-alarm email to a human guardian. The horse-user does not intend to interact with the system, but its contextual actions are considered input by the observing computer system.

Systems using implicit interactions are very useful for interfacing with unaware interactors. By this, I mean those who are not only unaware of their current interaction but also unaware of the underlying system and its purpose.

Horses are unaware interactors, but, as previously mentioned, so are some humans. For example: infants and cognitively challenged individuals. It is recognizing the presence of unaware interactors that has inspired me to explore new methodologies and tools for interaction design.

## Interaction Design in a Multispecies World

In multispecies environments, or those that include interspecies interactions, I suggest there is a need for new methodologies. As described earlier, this need comes about because nonhuman animals are generally also unaware interactors. Their interactions, which are

mainly implicit, deserve methodologies that can detect their nonverbal behavioral responses to technological interventions.

These might initially start off as animal-computer interaction methodologies, but ultimately I would like to see changes in the broader HCI field. When we are designing systems for the horse (and his human guardians) or any other class of unaware interactor, new approaches are required. So where should interaction designers look for inspiration?

On a recent HCI project, I was considering the best way to analyze observational data, consisting of humans interacting via a nonverbal video link. Recognizing that certain behavior patterns were being repeated, I was led to ethology and its well-established methodologies. I also began to wonder how the behavior observed from those interacting using our system differed from the repertoire of nonverbal behaviors seen when people interact face-to-face. How, if at all, was our system modifying the "normal" range of human behaviors?

In response to this, my co-researchers and I have now combined both ethnographic and ethology-based approaches into a hybrid methodology that we call *ethographology* [5]. We would define this as both describing *and* studying the fundamental behavior of a species.

The ethnographic elements of ethographology describe practices, reasons, cultures, and competencies. By way of contrast, the ethology components of ethographology are more concerned with behaviors, purposes, species, and strategies. Some advantages to ethographology as a methodology are: allowing narratives to be compared, reducing observer bias, and generalization of results across studies.

Of course, my proposal for ethographology is only one possible approach. There are many ways in which we could improve how we elicit requirements and evaluate systems, while retaining awareness that not all interactors have an equal voice. Perhaps we need to observe and respond to nonverbal behaviors, as we currently do with spoken language.

## New Tools to Help Human Animals Listen

To further our understanding of horses' behaviors and their implications both for welfare and ACI, our research group has initiated the Horse Automated Behavior Identification Tool (HABIT) project [6]. Our focus in this research is to automate the analysis and recognition of horse-to-horse and horse-to-human behaviors, as observed in unconstrained (ad-hoc) video.

We hope to answer important questions, such as: Are domesticated horses leading "natural" lives (within the normal behavioral range for their species)? Are horses interacting with their human companions as if they were other horses?

## Designing Systems for the Unaware Interactor

I believe that tools such as HABIT and new methodologies (borrowing observational approaches from the animal sciences) allow more accurate evaluation of systems for both multispecies and unaware-human-interactor environments.

Of course, the systems being designed need not be computer-based. They might also be systems of management for unaware interactors. For horses, this might mean systems that determine how they are handled, trained, housed, and fed. For human animals with challenges, this might be the systems used to provide their personal care or repairs to their homes. By understanding whether the behaviors we observe indicate, for example, relaxation or stress, we can refine our systems accordingly. Systems might also be purely hardware-based, such as the bricks and mortar of horse housing, determining the movement of equines and thereby impacting their behavior.

Ultimately, I feel drawn to study how horses interact with technology. I feel the allure of the horse not just because of any empathetic resonance. My study of them has helped me to understand our (collective human animal) responsibility to learn the nonverbal languages of all unaware interactors. We cannot expect the voiceless to inform us through unstructured surveys and purely qualitative methods. As interaction designers, I believe we have much to learn from the quantitative techniques of animal science.

As I watch my horses in the paddock, I find myself wishing for Chaucer's other gift from "The Squire's Tale," the animal translator ring. Then I would really know what my horses think about our millennia-long attempts to control them through technological interaction. If we start to listen, will they trust us to use technology for their benefit? Perhaps.

*There is no fowl that flies under the heaven*
*That she shall not well understand his speech,*
*And know his meaning openly and plain,*
*And answer him in his language in reply*

—Description of the squire's magic ring, a universal translator for all animal languages, in Chaucer's "The Squire's Tale"

**Acknowledgments**

I am indebted to my academic partners: Carol Hall, Mandy Roshier, and Clara Mancini.

The HABIT project is funded by the UK's Engineering and Physical Sciences Research Council (EPSRC) under Platform Grant 'Living with Digital Ubiquity' reference: EP/M000877/1.

**ENDNOTES**

1. Chaucer, G. The Squire's Tale. Fragment V (Group F). In *The Riverside Chaucer*. L.D. Benson and F.N Robinson, eds. Oxford University Press, 1989.
2. Mancini, C. Animal-computer interaction (ACI): A manifesto. *Interactions 18*, 4 (2011); DOI: http://dx.doi.org/ 10.1145/1978822.1978836
3. Sherratt, A. *Plough and Pastoralism: Aspects of the Secondary Products Revolution* Cambridge University Press, 1981.
4. Ju, W. and Leifer, L. The design of implicit interactions: Making interactive systems less obnoxious. *Design Issues 24* (2008), 72–84.
5. North, S., Hall, C., and Roshier, A. Multispecies ethographology: From ethnography to ethology via horses and video. *International Journal of Human Computer Studies. Special issue on Animal Computer Interaction.* (Submitted for publication).
6. North, S., Hall, C., Roshier, A., and Mancini, C. HABIT: Horse Automated Behaviour Identification Tool – a Position Paper. *Proc. of ACI@BHCI (Animal Computer Interaction Workshop), British HCI 2015*. DOI: http://dx.doi.org/ 10.13140/RG.2.1.3395.0881

**Steve North** is an HCI researcher in the Mixed Reality Laboratory at the University of Nottingham. His current focus is on animal-computer interaction with horses. He has worked for NASA on artificial intelligence in space craft. He is a "natural horsemanship" instructor, with animal behavior and horse-training experience.
steve.north@nottingham.ac.uk

**Insights**

- Anthropocentrism limits our understanding of human interaction in a multispecies world.
- Horses and all nonhuman animals are entitled to interaction technologies that enrich rather than exploit.
- Implicit and unaware interactors are also design process stakeholders.