Sensory Augmentation in the E-Sense Project
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In the e-sense project[1] we build novel augmentation devices to explore sensory, bodily and cognitive extension (Bird et al, 2008). In the first 6 months of this project we have rapidly prototyped a number of sensory augmentation devices, including a minimal tactile vision sensory substitution (TVSS) system, and a Third Eye – a camera worn as a ring.

We conduct interdisciplinary research where philosophy and art combine with various flavours of computing: ubiquitous; wearable; and physical. We work closely with philosopher Andy Clark (Edinburgh), who has developed the extended mind framework (Clark, 2008) and is one of the principal investigators on the project. We are currently collaborating with artist Danielle Wilde on *vibroBod*, a system that tracks core body motion using stretch sensors and provides vibrotactile feedback to guide participants' movement. We are also beginning to explore how we might apply feedback to learning to play stringed instruments like the violin with colleagues at the Open University (Janet van der Linden and Simon Holland)

All three of the workshop questions are pertinent to our research:

Are there rigorous techniques that can characterise the subjective experience of using sensory augmentation technology?

Can subjective reports complement the behavioural and neuroscientific data on tool use? Animal experiments have clearly demonstrated the structural changes that occur in the brains of monkeys when they use tools, for example, utilizing a rake to reach food (Maravita and Iriki, 2004). From human studies and personal experience we know the behavioural changes that occur through regular tool use: generally, we become more expert and our performance improves.

We are interested in trying out any tools that might enable us to record and analyse people's verbal reports of their subjective experience of using tools, specifically sensory augmentation devices. Can we identify any commonalities in the way different people describe their experiences of two distinct modes of tool use, sometimes distinguished as transparent and opaque (Clark, 2003)

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[1] http://www.esenseproject.org

or ready-to-hand and present-at-hand (Heidegger, 1962). As people shift from opaque to transparent tool use, is there a recognizable change in their subjective experience?

How can empirical experiments with sensory augmentation devices be used to further philosophical and psychological enquiry into cognition and perception?

This question is at the heart of the e-sense project: specifically, can our prototype sensory augmentation systems be used to generate insights into the extended mind framework? In what ways does building systems further philosophical research?

What technologies are available for building sensory augmentation devices?

We use a rapid prototyping approach to building sensory augmentation devices and we are keen to explore the potential of a wide range of technologies. We see the workshop as an opportunity for both demonstrating the systems we have built so far and also for gaining insights from other researchers building sensory augmentation devices.

References

Bird, J., Holland, S., Marshall, P., Rogers, Y. and Clark, A. (2008) Feel the Force: Using Tactile Technologies to Investigate the Extended Mind. *Proceedings of Devices that Alter Perception (DAP08)*, 1-4.

Clark, A. *Natural-Born Cyborgs: Minds, Technologies and the Future of Human Intelligence.* Oxford University Press, 2003.

Clark, A. Supersizing the Mind: Embodiment, Action, and Cognitive Extension, Oxford University Press, 2008.

Heidegger, M. Being and Time. Harper and Row, 1962.

Maravita, A. and Iriki, A. Tools for the Body (Schema). *Trends in Cognitive Sciences*, 8, (2004), 79–86.