



Sensory augmentation devices

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Yvonne Rogers:

The E-sense project is in particular investigating how we can extend the mind the senses and what it means to be human, by using a variety of technologies, in particular we're interested in how we can address some deep philosophical questions to do with our sense of self and our awareness through using technologies for example like vibro-tactile feedback .

Simon Holland:

So these are vibro-tactile devices and I've got one attached to each limb, which is absolutely crucial so what this means is when the computer plays back a rhythm to me that I want to learn then I am feeling it in my body and more to the point the appropriate limb is feeling the appropriate pattern.

Topi Hurtig:

These little vibro-tactile sensors they feel a bit like the vibrating battery on your mobile phone. Basically each vibration should correspond to one hit on the drum.

Simon Holland:

There is a theory called sensory motor contingency which says that in order to learn how to sense something properly and to deal with - manipulate the thing that your sensing properly then you have to have been in situations where your body movements affect what it is your sensing. In the case of rhythms; polyphonic rhythms, rhythms that involve multiple instruments, for you, to have experience of generating them and controlling them you have got to use all of your limbs you have got use more than one limb. If you just sat there looking at bits of paper or if you're just listening to the sounds that are coming in to your ear your not getting this engagement of your whole body.

Certainly it's got applications for beginners learning to play drums but more widely than that its useful for people learning to play any kind of instrument where they have to use more than one hand,

Its also good for understanding music better, enjoying music better, analysing music better, composing music better because you have a deeper understanding of the rhythms because you felt them and have been able to reproduce them.

Jon Bird:

So we have got two goals the first one is to build useful devices - sensory augmentation devices and the second goal is to use these devices to inform philosophy.

One piece of work that we were really interested in was an experiment that was done over 40 years ago by Paul Bach-Y-Rita. So what he did was he took a camera image and he converted in to a vibration on the back of blind people and after tens of hours of training they learnt how interpret that vibration and recognise objects in the world around them and so we are looking at this idea at how the mind is extended and the body is extended using these technologies

So we thought a good starting place would be to build our own TVSS. So we use cheap off the shelf components with the idea that other people could take our designs and run with them.

So what happens is we have a webcam that looks down a table and our subject stands at one end, they're blindfolded and we put headphones on them as well, and what they can feel is an array of vibration on their belly and basically as the ball runs down the table they feel the

vibration roll down their abdomen and if its on the left side of the table they feel it come down here, on the right hand side of they feel it come down here.

Jon Bird:

Right, so now you have that array on your stomach is it nice and tight, 'Yes' So you shouldn't feel any vibration at the moment. I'm going to put the ball in this corner and it's going to make this motor buzz. So the computer programme has worked out where the ball its tracked it and made that motor buzz and now if I move it along one you'll feel the next motor vibrate, and if I move it along one more you'll feel the next motor vibrate and that should be the bottom corner and now if you move it a bit you' can get used to how that changes when you move the ball.

We also track where the subjects hand, we do that – they wear a bicycle glove which is day-glow yellow which is easy to track so as they move their hand they will feel a slightly gentler vibration moving across their abdomen and basically they're job is to get their hand vibration to coincide with the ball vibration and if they do that they can catch the ball, and people are remarkably good at it - so after only a few trials most people can do it very well .

Jon Bird:

The three philosophical issues that we think we can now explore wit the sensory substitution device are; firstly under what conditions can the technology become transparent so your focus is no longer on the vibration but on the objects around you. The second one is how important is movement to help learn how to use these devices and are there differences between different sorts of movement.

The third one is, why is that blind people didn't like these technologies and what can we do to make them see phenomenologically richer for want of a better a term, they found them a bit emotionally empty so we are going to explore how we can make them more significant for people.

Janet van der Linden:

In this project we are interested in working out whether through modern technologies people can be made more aware of their posture and their movement and this violin study is looking at children who are just learning to play the violin and in particular the bowing techniques they need to learn for that.

Erwin Schoonderwaldt:

You can see it is quite complex movement when you look at the upper arm because it first has to come backwards and then it has to go back again.

What we are doing then is we are measuring the motion in real time , and to give them the feedback we are using the vibro-tactile feedback motors to give vibrations when they go off the trajectory or when they hold the violin the wrong position.

Jon Bird:

So for me one of the really interesting things about this project is that we got funded by the AHRC to do speculative research to work with philosophers to focus on the philosophical questions and that's where we started but interestingly out of the speculative research some very practical project have spun off so we are building these very useful technologies.