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# How to hack your senses: from 'seeing' sound to 'hair GPS'

## WIRED meets the innovators at the Hack the Senses hackathon in London

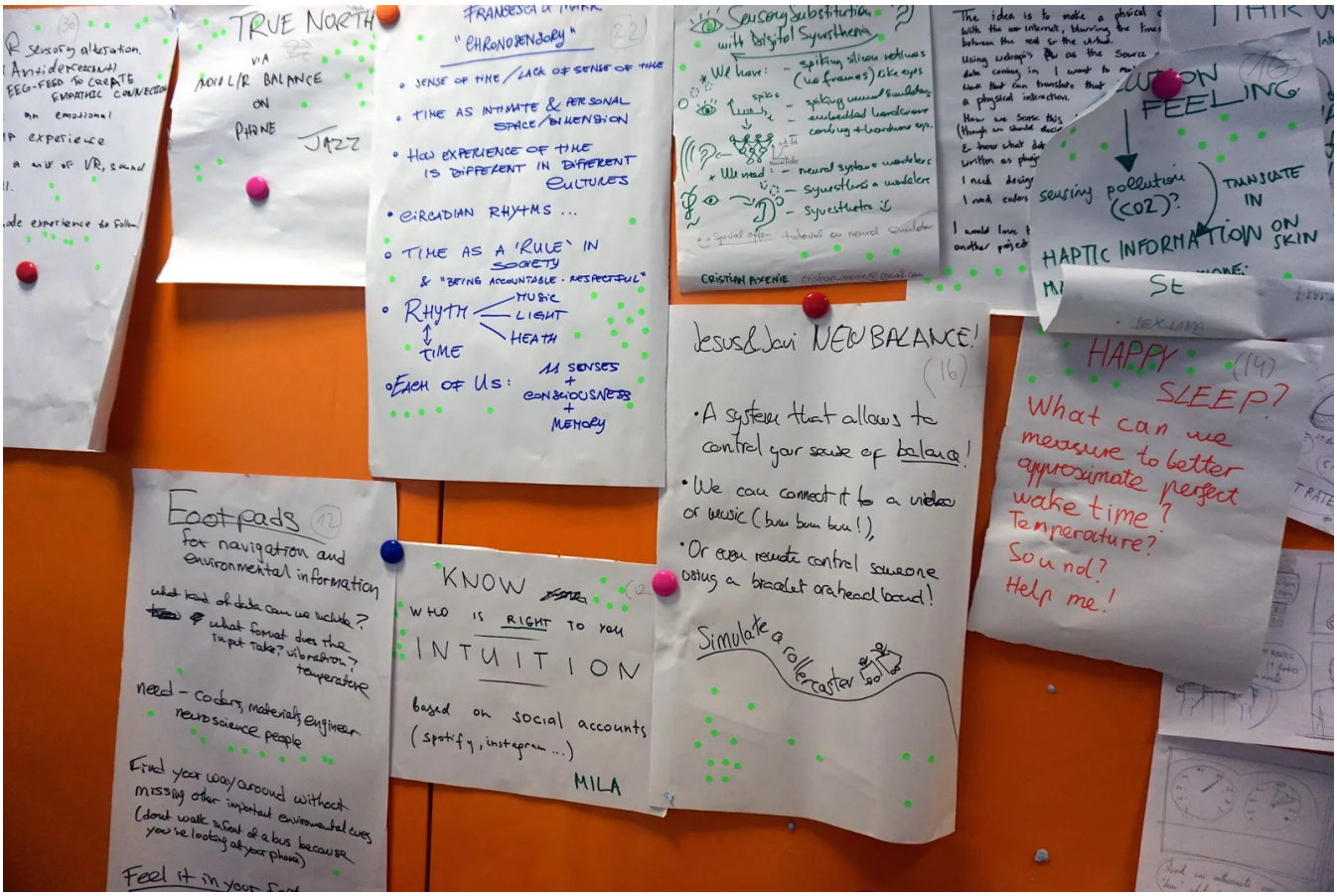
Giovanni Puntil and Christian Axenie try out their prototype for HearSee, which translates motion to sound NICOLE KOBIE

When the pizza is delivered at the Hack the Senses hackathon in London, few of the assembled shift from their seats, continuing to tap away at laptops, fiddle with wires, and noisily rework plans with their teammates. And no wonder: it's easy to work through lunch – and necessary – when you've got only two days to engineer a new sense; using sound to see, interpreting social media through your skin, or feeling vibrations in your hair to navigate.

That's the premise of the event: round up coders, neuroscientists, product designers and more, cram them into Fab Lab's maker-tool-filled workspace in London, and see – possibly via sound – what they come up with, combining the brain's neuroplasticity and technology to expand our senses beyond the standard five.

"By sensory augmentation, we mean trying to take some information from the environment...and make that perceptible," said the hackathon's organiser, Imre Bárd. "Sensory substitution would be to take one sensory modality and communicate that information through another modality."

Substitution could mean giving sound information to hearing impaired people via touch, while augmentation extends to any data – whatever you can imagine. We like the idea of Twitter sentiment analysis leaving a bad taste in the mouth.




Ideas for the hackathon were pitched by participants, with everyone voting on their favourites NICOLE KOBIE

"This kind of technology, translating one modality to another, can also be used to take new data streams – which can really be anything, from sentiment analysis of Twitter to movement of the stock exchange to seismic movement of the planet, and make those perceptible to an individual," Bárd continued.

The 40 participants – 40 per cent of which were women, and Bárd is proud to stress the event's diversity of backgrounds and ages, too – chose the eight projects via a vote at a brainstorming session on the Friday night. They then decamped to tables littered with Raspberry Pis, conductive paint, and other maker tools to get to work for the rest of the weekend.

Two-man team HearSee built a headband that taps into synaesthesia, translating changes in frameless video to sound allowing blind people or those with weak vision to see motion. Roboticist and neurologist Christian Axenie assembled the hardware in mere minutes – attaching a pair of cameras and wires to a terrycloth headband – to let it be photographed.

Elsewhere, the Follow Your Wings project navigates by "touch". Vibration pads on the wearer's shoulders indicate when to turn left, right or stop, letting them lift up their eyes from a smartphone screen. The original design called for the pads to be installed in shoes, noted UX expert Lisa Perez, but that turned out to be harder than it sounds due to the way we move our feet when we walk.

The hardware for Follow Your Wings, which buzzes your shoulders to help you navigate, is hidden inside an origami shape, but could be integrated into rucksack straps NICOLE KOBIE

Another project, called Sense the Match, analyses social media data and buzzes, warms up or thumps like a heartbeat when someone nearby shares similar interests, qualifications

and so on – handy at a speed dating night or job fair. The prototype was made in the form of a badge using Arduino, impressive given the team of social scientists, art students and neuroscientists hadn't used the computing board before.

One team built an app – it didn't get a name – that vibrates a smartphone whenever the user is facing true north, re-teaching people how to "feel that magnetic pull". The idea is that it trains the body to respond to this "pull" naturally, eventually making the app redundant. This idea has been explored with implants and wearables, but designer Jazz Rasool believes an app is all we need to "wake up neurons in the brain...and if you wake up one sense, you might wake up other senses too."

Meanwhile, Jellyfish is a platform to "democratise modern sensing", said creator Horace Ho. Feed in any data input and get physical feedback – in this case, using vibrating pads in arm bands. Of course, it's hard to interpret cycling speed or air pollution from a buzz on the arm, so Jellyfish trains the user to understand what the frequency or pressure means. "We allow users to control what data they want to map and what modality," Ho said.

And those were the projects that didn't win one of three prizes.

The judge on the left, wearing the headset, later swayed in motion to the movement of an arm band – even though he didn't realise he was moving NICOLE KOBIE

Rather than communicate data via vibrating pads on the skin, runner-up Hair Wear examined relaying data via vibrations via hair, through clips in braids and beards as the extra sensitivity should allow more precise communications. “We thought about using pubic regions, but haven’t tested it,” laughed team member Am Elemara.

The Belka project took the other runner-up prize for reading EEG brain wave data and visualising it in a VR environment. Practically, this means changes in a person's state of mind are shown in different colours in a virtual scene – wave coffee under someone’s nose, and the VR world turns red; punch someone in the arm, the colour changes again.

While we don’t need brain scanners and VR to know coffee sparks our brains and pain isn’t enjoyable, the Belka has “real-world potential”, team member Vlad Gorbuntsov told WIRED. Connect it to wearable devices and you can show your state of mind, for example. “If you want to alter that state, the VR can give you stimuli to lift your mood or give you more focus,” one team member claimed, suggesting it could battle stressful days, depression, and boost meditation.


Hair Wear vibrates a judge's beard – it must have felt good, as the team picked up one of three prizes NICOLE KOBIE

But the top prize went to Vestii – a headset with four points resting on your face above your ears and along your jaw. It “interferes with your perception of motion,” noted

neuroscientist Julie Lee, simply by running a current to the spot.

In theory, the headset can make a wearer feel like they're moving when they're not, or it can cancel out body motion in your mind. During a demonstration, one judge strapped on the headset, and started unknowingly swaying back and forth to the motion of a team-member's arm strapped into a Myo armband.

As much fun as that would be at a festival to make everyone sway in time, the team said its more likely use is "active motion cancellation" – similar to noise cancelling headsets but for movement. Get motion sickness? Strap on the headset, and it will fix the gap between your perception of movement and reality.

That "error correction" will fix your nausea, Lee said. The Vestii – so called because it's a galvanic vestibular stimulator – could also be used to reduce the urge to vomit created by intense virtual reality, or simply enhance games – when the jet you're sim-flying banks, you feel the motion.

When named the winner, one Vestii team member shouted: "We electrocuted ourselves and got rewarded for it!"

Alongside picking up prizes from Intel's Code for Good and Amazon Web Service, the winners went on on show at the Science Museum and will be displayed British Science Festival in September. The hackathon is the part of a wider project funded by a Wellcome Trust People Award, and has been running all year with a series of talks designed to inspire academics and industry thinkers alike into thinking about sensory augmentation in a different way.

In other words, if some of the projects sound silly, well, that's the point. "The whole discourse about human enhancement is mostly focused on productivity and trying to boost the effectiveness of people in a particular domain," Bárd said.

"I was thinking it would be really interesting if we could maybe not shift the whole discourse but add a nuance about using technology to expand the scope of human experience." And if vibrating pubic hairs isn't a welcome addition to sensory augmentation, we're not sure what could be.

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Nicole Kobie is a WIRED contributing editor. She writes Work Smarter, WIRED's weekly newsletter about the trends and technologies shaping the way you work.

CONTRIBUTING EDITOR

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