‘Merging man and machine doesn’t come without consequences’

Rhodri Marsden Oct 15, 2018

Once problems of speed and accuracy have been conquered, it could represent a gaming revolution where controllers are no longer needed, and experiences become fully immersive Illustration by Kareem Halfawi for The National.

We can see evidence of the phenomenal power of the human mind all around us, in literature, architecture, science and much else besides. But what if that power could be tapped into directly, in a way that lets us create and communicate by using thought alone? It may seem far-fetched, but the continued improvement of brain-computer interfaces (or BCIs), where brain signals are used as controllers, now makes this more than a theoretical possibility. Recent advances in the way signals are collected and interpreted may lead to changes in the way we type, play games and interact with the world. But merging man and machine does not come without consequences – indeed, it raises profound questions about the nature of humanity itself.

At the end of last month, researchers at the University of Washington in Seattle published a paper describing a network they had created named BrainNet, which allowed three people, communicating via electrodes attached to their heads, to play a simple Tetris-like game on a computer. The messages being sent between them were hardly rich in detail – effectively just "yes" or "no" – but the researchers' success in connecting several minds prompted a bold vision. "Our results," they said, "raise the possibility of future brain-to-brain interfaces that enable co-operative problem-solving by humans."

Experiments such as these largely rely on electroencephalography (EEG), which detects electrical activity in the brain either via implants or a headset. Those signals are then interpreted as closely as possible, processed and used to control external devices such as computers. EEGs were first used in consumer technology more than 10 years ago – the computer game *NeuroBoy* and a maze game called *Mindflex* both depended on EEGs to demonstrate a kind of "mind control". But a decade is a long time in technology, and experiments this year have demonstrated the speed of BCI development. In June, scientists at the Massachusetts Institute of Technology demonstrated the use of brain signals to guide a robot. Project leader Joseph DelPreto told website Engadget that it makes "communicating with a robot more like communicating with another person". Also this summer, researchers in Kyoto used EEGs to allow a person to control a robotic arm, effectively giving them a third limb.

Gerd Leonhard, author of the book *Technology vs Humanity*, has reservations about this kind of augmentation. "As soon as technology moves directly on to and inside the body," he says, "we cross the gap between humans and machines. It becomes very exciting, but it's also very difficult to say what's the right thing to do."

Historically, the focus of BCI research has been clinical, with the ultimate aim of helping disabled people regain their movement or sight. Successes in this field have generally been achieved by using cranial implants, known as invasive BCIs, which are deemed more likely to produce high quality,

accurate brain signals. Since the first computer cursor was controlled using an invasive BCI about 20 years ago, there have been some astounding innovations, with people gaining the ability to move limbs, feed themselves and even walk just by using the power of the mind.

But it is impossible to restrict scientific development to just one field, and now there's interest in using BCIs to augment healthy human bodies and minds. In 2015, Facebook boss Mark Zuckerberg mentioned that his company was working in the field of "thought transmission", and in recent weeks the company has revealed a more specific goal of enabling mouse-clicking and typing via human thoughts. Zuckerberg is not alone in his ambitions – in a notorious interview last month on *The Joe Rogan Experience* podcast, Tesla co-founder and serial entrepreneur Elon Musk talked about how one of his firms, Neuralink, would soon launch a product for "anyone who wants to have superhuman cognition. Your phone is already an extension of you", he said. "You're already a cyborg." He foresees the merging of human beings and artificial intelligence as a sensible option for mankind. "If you can't beat it," he said, "join it."

Google's director of engineering Ray Kurzweil is aligned with Mr Musk on this issue, and regularly enthuses about the possibility of man and machine combining to optimise our skills and extend our lifespans. Mr Leonhard, however, does not share this utopian vision. "I don't want to be faced with the challenge of becoming a cyborg," he says. "There are things we'd stop doing. Anything slow and inefficient, we wouldn't do any longer, and I think that's dehumanising. Also, it means that the rich can augment themselves and become superhuman, while the unaugmented will become useless in comparison."

But perhaps we're getting ahead of ourselves. Current experiments with non-invasive BCIs (ie, not implanted inside the skull) are still limited in their scope, and the technology would have to improve by several orders of magnitude before it could boost our lifespans (or, indeed, end up sowing divisions in society). But work is being done outside the field of EEGs that might speed up that journey. New York company CTRL-labs has produced

a wristband that senses electrical pulses in the arm, and according to chief executive Thomas Reardon, has all the capabilities of a cranial implant. “There’s nothing you can do with a chip in your brain that we can’t do better,” he boasted in interview with *The Verge* in June. In tests, CTRL-labs have successfully demonstrated the movement of virtual objects by the power of thought, and gaming enthusiasts have been fascinated. Once problems of speed and accuracy have been conquered, it could represent a gaming revolution where controllers are no longer needed, and experiences become fully immersive.

But while he acknowledges that it is the job of scientists and companies to build this kind of advanced technology, Mr Leonhard says that they also have a responsibility for unforeseen side-effects. “If we have a serious uptake in this kind of augmented reality, I believe we’re going to have a lot of issues with health, mental health and attention deficits.” So how far should we go with the convergence of man and machine? “I’m excited about the future,” he says. “But I’m a humanist. I don’t think we should use technology to leave humanity behind us.”

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