Kevin Warwick

Transhumanism: Some Practical Possibilities

In this article the author describes practical Transhuman experimentation including biohacking implants and neural implants. In all cases actual, practical results are presented for discussion. The overall impact and potential effect of such realisations is also considered. Based on these techniques, some realistic future scenarios involving the capabilities of Transhumans, over and above those of normal humans (as we know them today), is described. These include extended/extra sensory input, nervous system extended over networks and communication by thought.

Introduction

In this paper we consider a practical, realistic view to Transhumanism, involving the need for scientific experimentation today in order to move from our present position. The route under discussion is that of a biological and technological integration. The best, and most likely, example of this being the merging together into a new overall being of a human with a machine, or machine components at least. This raises issues as to the corresponding human/machine percentages which make up the novel creature. But the important issue is that a human and a machine become an integrated system with capabilities beyond the human norm.

We already have witnessed intrusions of technology into the human body. Cochlea implants and hip replacements are common and heart pacemakers, whilst not being so frequently employed, continue a trend in which technology is readily accepted by each individual as being a necessary to enable them to live a fuller life in the world.

In each case these examples, and there are many more of them such as deep brain stimulation for those affected by Parkinson's Disease (Camara et. al., 2015), represent modifications aimed at only compensating for deficiencies caused by a problem (Hayles, 1999). Even in these instances the establishment of conceptual limits and boundaries both by the individual themselves and those who interact with them become complex. Any surgeons, or other medical staff, involved, tend to reinforce concepts of the body due to their desire to implant all that can possibly be implanted and have no percutaneous wires, mainly to reduce the possibility of infection.

The situation is very different when technology is employed to enhance normal functioning rather than to repair an ineffective body part. Many examples of this already exist in terms of external devices, particularly in the military domain, such as infra-red night sight incorporated into weapon sighting systems or voice controlled firing mechanisms introduced into the helmet of a fighter pilot. However one cannot regard this as being anything to do with Transhumanism.

Where Transhumanism represents a particularly powerful dilemma is in the case when an individual's consciousness is modified by the merging of human and machine. It is not so much the physical enhancements or repairs that should be a cause for concern but where the nature of an individual is changed. In the case of a human this means linking technology directly with the human brain or nervous system, rather than by a connection which is either external to the nervous system but internal to the body or even one which is external to both.

The type of transhumans considered in this paper are ones in which a transhuman is formed by a human linking with technology in order to attain extra abilities beyond the human norm. This can mean a machine brain/nervous system coupling. The critical point is that the brain is involved in the transition rather than the transition merely being in the form of some physical addition, although that possibility we'll look at first.

Connections between technology and the human nervous system not only affect the individual, raising questions as to the meanings of 'I' and 'self' but they also directly influence autonomy. An individual human wearing a pair of glasses, whether they contain a computer or not, remains an autonomous human being. Meanwhile a human whose nervous system is linked to a computer not only puts forward their individuality for questioning but also, when the computer is part of a network or at least connected to a network, allows their autonomy to be compromised.

It is this latter class of transhuman that is the main subject of this paper. The question of substance arising from this article being: when an individual's consciousness is based on a part human part machine nervous system, in particular when they exhibit a transhuman form of consciousness, is it possible for them to still hold to traditional human morals, values and ethics? Also, as a consequence, will transhumans, acting as post humans, regard humans rather akin to how humans presently regard cows or chimpanzees? (Nietsche 1961)

Body Modification

The first idea to be considered here is the use of implant technology, the implantation of a radio frequency identification device (RFID) as a token of identity, for example. Such a device transmits by radio a sequence of pulses that represent a unique number. The number can be preprogrammed to function rather like a PIN number on a credit card. If someone has an implant of this type inserted and activated, the code can be checked by computer and the identity of the carrier determined.

Such implants have been used as a fashion item, to gain access to night clubs in Barcelona and Rotterdam (*The Baja Beach Club*), as a high security device for the Mexican Government or as a source of medical information (reportedly having been approved in 2004 by the US Food and Drug Administration, which regulates medical devices in the USA (Graafstra, 2007; Foster and Jaeger, 2007)). In the latter case, information about the medication an individual required for conditions such as diabetes can be stored on the implant. Because it is implanted, the details cannot be forgotten, the record cannot be lost, and it will not easily be stolen.

An RFID implant does not have its own battery. It incorporates an antenna and a microchip enclosed in a silicon or glass capsule. The antenna picks up power remotely when it passes close to a larger coil of wire that carries an electric current. The power picked up by the antenna in the implant is used to transmit the signal encoded on the microchip.

As there is no battery and it does not contain any moving parts, the implant requires no maintenance; once it has been implanted, it can be left in place (Warwick, 2013a). An RFID implant of this kind was put in place in a human for the first time on 24 August 1998 at Reading, England. It measured 22mm long with a 4-mm diameter cylinder. The body (arm) selected was that of the author. The doctor who carried out the procedure burrowed a hole in the upper left arm, pushed the implant into the hole and closed the incision with two stitches.

The reason for selecting the upper left arm for the implant was that we were not sure how well it would work. We reasoned that, if the implant was not working, it could be waved around until a stronger signal was transmitted. It is interesting that most present day RFID implants in humans are located in a similar place (the left arm or hand), even though they do not have to be. In the James Bond film Casino Royale (the 2006 remake), Bond himself has an implant in his left arm (Warwick, 2013a).

The RFID implant allowed the author to control lights, open doors and be welcomed with a 'Hello' whenever entering the front door (Warwick and Gasson, 2006). An implant of this kind could be used in humans for a variety of identification purposes, e.g. as a credit card, a car key or (as is already the case with some other animals) a passport.

The use of implant technology to monitor people opens up a considerable range of issues. It is now realistic to talk of tracking individuals by means of implants using the *Global Positioning System*, a wide area network or even a mobile telephone network. From an ethical point of view it raises considerable questions when it is children, the elderly (e.g. those with dementia) or prisoners who are subjected to tracking, even though this might be deemed to be beneficial for some people (Warwick and Gasson, 2006).

The use of implants to track people is still at the research stage. As such devices come onto the market, there will be numerous cases with distinct drivers. For example, there would have to be a potential gain for a person to be tracked and their position monitored in this way, especially if it could either save or considerably enhance their life—as possibly in the case of an individual with dementia (Warwick, 2013c).

Another piece of transhuman technology is described in the work of Neil Harbisson who is colourblind. This was originally referred to as the 'Eyeborg' project. The technology developed involved a head-mounted sensor that translates colour frequencies into sound frequencies (Ronchi, 2009). Initially, Harbisson memorised the frequencies related to each colour, but subsequently he decided to permanently attach the eyeborg to his head, effectively meaning a small camera faces forward from over his forehead and is connected to the back of his skull by a metal bar. Eventually, the project was developed further so that Harbisson was able to perceive colour saturation as well as colour hues. Software was then developed that enabled Harbisson to perceive up to 360 different hues through microtones and saturation through different volume levels (Harbisson, 2008).

Coincidentally, another project also referred to as the ‚Eyeborg' project has been carried out by Rob Spence, who replaced one of his eyes with an eyeball-shaped video camera. The prosthetic eye contains a wireless transmitter that sends real-time colour video to a remote display. Spence lost his original right eye when playing with a gun on his grandfather's farm at the age of 13. He therefore decided to build a miniature camera that could be fitted inside his false eye. Spence refers to himself as ‚the Eyeborg guy'.

The camera is not connected to his optic nerve and has not restored his vision in any way. Instead, it is used to record what is in his line of sight. The current model is low resolution, and the transmitter is weak, meaning that a receiving antenna has to be held against his cheek to get a good signal. A better-performance, higher-resolution model, complete with a stronger transmitter and receiver, is under development.

Kevin Warwick

Kevin Warwick is Emeritus Professor at Reading and Coventry Universities. His main research areas are artificial intelligence, biomedical systems, robotics and cyborgs. Kevin is a Chartered Engineer who has published over 600 research papers. His experiments into implant technology led to him being featured as the cover story on the US magazine, *Wired*. He achieved the world's first direct electronic communication between two human nervous systems, the basis for thought communication. He has been awarded higher doctorates (DSc) by Imperial College and the Czech Academy of Sciences, Prague and Honorary Doctorates by 8 UK Universities and one from Saints Cyril & Methodius University, Skopje. He received The IEE Senior Achievement Medal, the IET Mountbatten Medal and the Ellison-Cliffe Medal from the Royal Society of Medicine.

There are also subdermal magnetic implants (Hameed et. al., 2010). This involves the controlled stimulation of mechanoreceptors by an implanted magnet manipulated through an external electromagnetic coil. Issues such as magnetic field strength and sensitivity are important. Implantation means that implant durability is an important requirement. Only permanent magnets retain their magnetic strength over a long period of time and are robust to survive testing conditions. This restricts the type of magnet that can be considered for implantation. Hard ferrite, neodymium and alnico magnets are available, inexpensive and suitable for this purpose.

The magnetic strength contributes to the amount of agitation the implant undergoes in response to an external magnetic field and also determines the strength of the field that is present around the implant location. The skin on the human hand contains a large number of low threshold mechanoreceptors that allow humans to experience the shape, size and texture of objects in the physical world through touch. The highest density of mechanoreceptors is found in the fingertips, especially those of the index and middle fingers. They are most sensitive to frequencies in the 200–300 Hz range.

The pads of the middle and ring fingers are the preferred sites for magnet implantation in the experiments that have been reported (Hameed et. al., 2010). An interface containing a coil mounted on a wire frame and wrapped around each finger was designed for the generation of the magnetic fields to stimulate movement in the magnet within the finger. The general idea is that the output from an external sensor is used to control the current in the coil. As the signals detected by the external sensor change, they affect the amount of vibration experienced through the implanted magnet (Warwick, 2013a).

Experiments have been carried out in a number of application areas (Hameed et. al., 2010). The first, ultrasonic range information, involves an ultrasonic ranger for navigation assistance. Distance information from the ranger is encoded via the ultrasonic sensor as variations in the frequency of pulses. The mechanism constitutes a practical means of supplying accurate information about an individual's surroundings for navigational assistance.

BrainGate

The most relevant set of experiments into Transhumanism has been carried out using the microelectrode array known as the *Utah Array*, or more popularly the *BrainGate*. The individual electrodes are 1.5 mm long and taper to a tip diameter of less than 90 microns. A number of trials have been carried out that did not use humans as test subjects, human tests are limited to two groups of studies at the moment. In the second set of these, the array has been employed in a purely recording role for therapy.

Electrical activity from a few neurons monitored by the array electrodes is decoded into a signal that enables an individual to position a cursor on a computer screen using neural signals for control in combination with visual feedback. The same technique was later deployed to allow the individual recipient, who was paralysed, to operate a robot arm (Hochberg et. al., 2006; Hochberg et.al., 2012). Recently the same implant has been employed to enable a paralysed individual to regain some control over his own arm (Bouton et.al., 2016).

The first use of the microelectrode array (shown in Fig. 1) has though broader implications for attempts to extend the human recipient's capabilities.

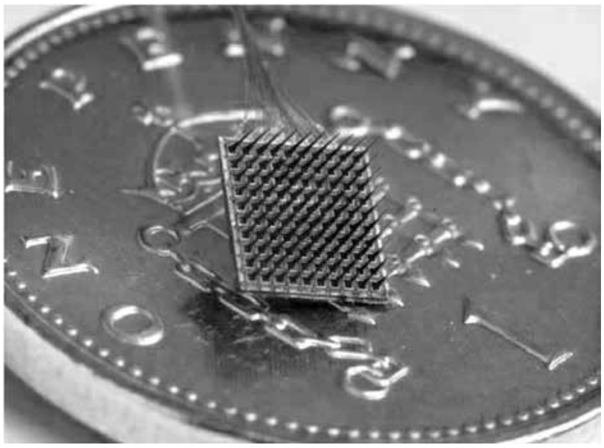

Fig. 1. A 100-electrode, 4×4 mm microelectrode array (BrainGate), shown on a UK one-pence piece for scale

The present human means of communication, essentially transferring a complex electrochemical signal from one brain to another via an intermediate, mechanical, slow medium (e.g. speech), are poor, particularly lacking in speed, power and precision. Using an implant to connect a human brain to a computer network could open up the distinct advantages of machine intelligence, communication and sensing abilities to the implanted individual (Warwick, 2013a).

As a step towards a broader concept of brain-computer interaction, a micro-electrode array (as shown in Fig. 1) was implanted into the median nerve fibres of a healthy human individual (the author) in the course of two hours of neurosurgery to test bidirectional functionality in a series of experiments. Stimulation current applied directly into the nervous system allowed information to be sent to the user, while control signals were decoded from neural activity in the region of the electrodes (Warwick et. al., 2003). A number of trials were undertaken successfully using this setup (Warwick et. al., 2004).

In particular (Warwick, 2013a; Warwick, 2013b):

1. Extra-sensory (ultrasonic) input was successfully implemented.

2. Extended control of a robotic hand across the internet was achieved, with feedback from the robotic fingertips being sent back as neural stimulation for a sense of force being applied to an object (achieved between Columbia University, New York (USA) and Reading University, England).

3. A form of telegraphic communication directly between the nervous systems of two humans (the author's wife assisted) was performed (Warwick et. al., 2004).

4. A wheelchair was successfully driven around by means of neural signals.

5. The colour of jewellery was changed as a result of neural signals – also the behaviour of a collection of small robots.

In the above cases, the trial could be described as useful for purely therapeutic reasons, e.g. the ultrasonic sensory input might be of use to an individual who is blind, while telegraphic communication might be beneficial to people with certain forms of motor neurone disease. Each trial can, however, also be seen as a potential form of enhancement beyond the human norm for an individual. The author did not need to have the implant for medical reasons in order to overcome a problem; the experimentation was carried out purely for the purposes of scientific exploration.

Transhumanist enhancement with the aid of brain-computer interfaces introduces all sorts of new technological and intellectual opportunities, but it also throws up different ethical concerns (Warwick, 2003). While the vast majority of present day humans are perfectly happy for interfaces, such as the BrainGate, to be used in therapy, the picture is not as clear when it comes to enhancement.

Conclusions

Linking technology with humankind can be seen as humans acting as eccentric living beings. The appearance of transhumans can be seen as being unwarranted ‚metaphysical' speculation (Coolen 2001). On the other hand it could be felt that humankind is itself at stake (Warwick 1998; Cerqui 2001). A viewpoint can be taken that either it is perfectly acceptable to upgrade humans, turning them into Transhumans, with all the enhanced capabilities that this offers (Warwick 2002), or conversely that humankind is just fine as it is and should not be tampered with (Cerqui 2001).

The important point here is that we are considering not only a physical extension of human capabilities but also a completely different basis on which the Transhuman brain operates in a mixed human, machine fashion. Physical extensions can give a human capabilities that they would not themselves normally possess, but when the nature of the brain itself is altered the situation is a very different one. Such a Transhuman would have a different foundation on which any thoughts would be conceived in the first place. From an individualistic viewpoint therefore, as long as I am myself a Transhuman I am happy with the situation. Those who wish to remain human however may not be so happy.

It could be argued that humans are already digitally enhanced by current technology (Clark 2004) and to some extent this may, in any case, alter morals. Yet despite this for the most part things have remained the same. The big difference with regard to transhumans though is that their brain is part human part machine and hence the epicentre of moral and ethical decision making is no longer of purely human form.

One aspect is that a transhuman would most likely have a brain, which is not stand alone, but rather is connected directly to a network. The leading question realistically is therefore is it morally acceptable for transhumans to give up their individuality and become mere nodes on an intelligent machine network. This is of course as much of a question for transhumans as it is for humans.

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