Robot control by neural signals wins award

20 September 2012

DLR researcher shares the German Erwin Schrödinger Prize

A robotic arm controlled entirely by the thoughts of a paraplegic woman – to accomplish this, Patrick van der Smagt from the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) and John P. Donoghue from Brown University in the USA 'networked' expertise from their two research disciplines, robotics and neuroscience. For this interdisciplinary collaboration, the Helmholtz Association and the Association for the Promotion of Science in Germany (Stifterverband für die Deutsche Wissenschaft) awarded the two researchers the German Erwin Schrödinger Prize on 20 September 2012.

A woman paralysed from the neck down imagines the movements of her own arm and an implant in her skull transfers the corresponding brain signals – in response to which DLR's lightweight robot arm reaches for a beaker and guides it to the mouth of the test subject. This was all made possible by the work jointly carried out by Patrick van der Smagt and neuroscientists from Brown University. DLR incorporated the experience it gained with Justin the lightweight robot, while Brown University contributed its experience with an implant known as a Neural Interface System. Back in 2006, the bionics group at the DLR Institute of Robotics and Mechatronics had started work on feasibility studies and created software that would later translate brain signals into three-dimensional movements for the robot arm and hand. Even the grip strength employed by the robot hand and the speed of the arm's movements were controlled very precisely.
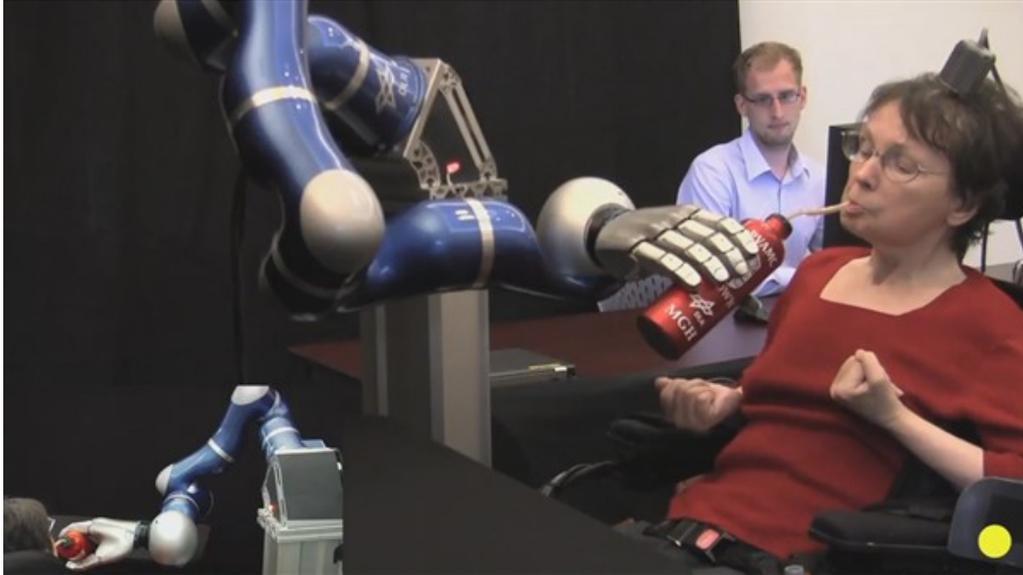
Robotic assistance

On 12 April 2011, the moment finally arrived; a 58-year-old stroke patient was once again able, for the first time in 15 years, to drink from a bottle independently. Her only assistance – a robot arm whose sensors were capable of responding to even the slightest control error by powering down and moving very gently. "If our test candidate were ever to control the robot arm incorrectly, she could not be endangered by this," explained van der Smagt. This successful experiment demonstrates that even people who have been paralysed for a long time can issue commands to a robot via neural signals, meaning that they can once again attain a measure of autonomous movement. Further tests will now investigate how robot systems and human beings can best work together.

With the Erwin Schrödinger Prize, the Association for the Promotion of Science in Germany and the Helmholtz Association recognise the achievements of teams of scientists who combine multiple disciplines in their research work and, by so doing, achieve innovative results in the interface areas between medicine, the natural sciences and engineering. This award is accompanied by prize money that can be spent as the prizewinners deem appropriate.

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Video: The participant is able to drink using the DLR robot arm

Almost 15 years after being paralysed by a stroke, a 58-year-old US-American woman was once again able to serve herself a drink of coffee. This was possible thanks to a state-of-the-art DLR robot arm and hand that she controlled with neural signals sent directly from her brain.

Credit: John Donoghue et al / Nature.

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