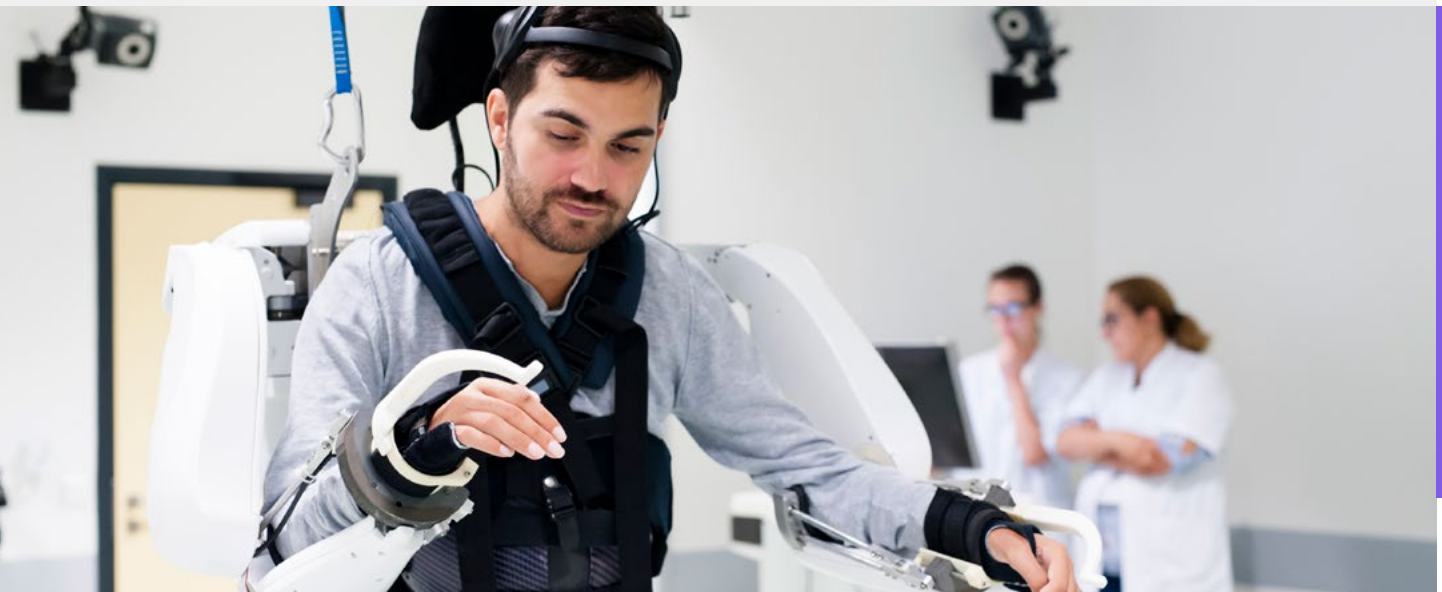


CLIENT CASE STUDY

CLINATEC (CEA + CHU Grenoble): a mind-controlled exo- skeleton to regain mobility

Since 2016, Expleo has been volunteering its expertise in engineering, quality and strategic development to the Clinattec Endowment Fund for the development of a brain-machine interface that allows quadriplegic patients to regain mobility by mentally controlling an exoskeleton, known as the BCI project (“Brain Computer Interface”).



A quadriplegic patient was able to control an exoskeleton from the measurement and decoding of his brain activity



30 Expleo employees involved in a large-scale project



6 years of skills sponsorship



Increase in the measurement resolution of implants (feasibility study to double the measurement resolution from 64 to 128 electrodes)



Firmware upgrade in accordance with IEC 62 304



Increase in the accuracy and robustness of brain activity decoding for motion prediction: validation by a clinical trial (in progress)



Project background & challenge

Expleo offers skills sponsorship to the BCI project, one of Clinatec's flagship programmes. To allow quadriplegic patients regain mobility, Expleo coordinates an agile and innovative team by supporting the numerous technical challenges faced. Indeed, Clinatec has created a neuroprosthesis implantable on the surface of the patient's motor cortex, which collects and transmits brain signals in real time to control the four limbs of an exoskeleton. Prior to implantation, it was necessary to obtain the go ahead for clinical trials, requiring a significant amount of regulatory documentation (ANSM and CPP), and to create test benches to trial all the functionalities of the system to ensure its functionality, reliability and regulatory compliance.

Solution

Expleo brought this revolutionary project its expertise in engineering and all the reliability resulting from its aerospace practice, in particular, we worked on mechatronic packaging, electronic hardware design, the creation and production of test benches, the development of embedded software and applications, a wireless communication module, signal and image processing algorithms, as well as all the necessary regulatory documentation.

In particular, Expleo participated in a feasibility study aimed at doubling the number of functional electrodes inside the neuroprosthesis implanted in the patient's brain. This upgrade aims to double the measurement resolution in the brain, which will improve the decoding performance of exoskeletal movements. Expleo has also developed software allowing BCI training in virtual environments as well as an application for home training.

Outcome

During the clinical trial, a young quadriplegic patient was implanted with the device. His movement intentions could be captured and decoded, and he was able to regain lower and upper limbs mobility thanks to an exoskeleton. A challenge met thanks to Expleo's core skills, but also thanks to its exploratory activities linked to feasibility research, and a strategy of partnership which makes it possible to carry out such cutting-edge research projects. The team recently delivered a second optimised version of the firmware, the software embedded in the neuroprosthesis, which offers greater information transmission and processing capacity in order to improve the decoding performance of the patient's movement intentions.

“Technical innovations were developed by doctors from the CHU, supported by CEA patents, coordinated by Clinatec, implemented by Expleo engineers. BCI is an exceptional project, which implements cutting-edge technologies. This type of ambitious project allows us to attract better talent and improve our medical skills so we can bring them to other clients.”

Romain Saiget

Business Director, Healthcare & Life Science, Expleo

“In one year only, we had to validate each step, one after the other. The next milestone was then to be able to combine them all: to be able to walk, use the arms, use the wrists, the hands etc. and make me able to use everything independently – all from a single programme within the exoskeleton.”

Thibaud

Quadriplegic patient

For further information, or if you have any other questions, please write an email to info@expleogroup.com

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