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B-CRATOS - Final Press Release

B-CRATOS successfully concludes its ambitious mission in brain-machine interfaces

After four years of intensive research and collaboration, B-CRATOS project (Empowering independence through wireless Brain-Connect inteRfAce TO machineS) comes to an end. The project has generated important scientific advances that will transform the future of brain-machine interfaces and intra-body communications.

Launched under the European Union's Horizon 2020 program, B-CRATOS took on the ambitious challenge of creating the first battery-free high-speed wireless in-body communication platform for Brain-Machine-Body connectivity. This new technology opens doors for medical applications that could help millions of people with neurological injuries or motor disabilities.

Key Innovations and Achievements:

The loss of mobility significantly impacts quality of life for millions worldwide. Enabling natural movement and independence required innovative breakthroughs beyond conventional approaches. In particular, implantable brain-computer interface systems hold great promise for novel restorative and rehabilitative techniques but have challenged engineers to achieve big data and low transmission latencies in low-power, body-friendly devices.

B-CRATOS has overcome key brain-computer interface limitations by developing several groundbreaking technologies. The team successfully demonstrated a battery-free wireless system for powering implanted electronics, eliminating the need for battery replacement surgeries and giving users more freedom. Additionally, they demonstrated a wireless data transmission system capable of very-low power readout of high-quality neural activity. They also developed an innovative communication system called Fat-IBC that uses the body's fat tissue as a transmission channel, enabling high-fidelity neural transmission with minimal interference. Importantly, these technologies were demonstrated both in bench testing and *in vivo* settings.

Another major achievement was the development of smart artificial skin that can detect touch, force, and even identify object materials properties and object geometry before fully grasping them, bringing natural sensations to prosthetic limbs. The team demonstrated fast and reliable object recognition performance of this artificial skin when being applied onto a gardening glove. This works alongside intelligent AI-powered control systems that can interpret brain signals and translate them into natural movements for prosthetic devices.

The B-CRATOS team integrated these technologies into a complete bidirectional communication system in which signals flowed both from the brain to a dedicated device that implemented advanced ML/AI algorithms to decode these signals accurately into movement commands for the prosthetic hand and back to the brain to provide sensory feedback. This two-way communication is critical to restore the natural feedback loop between brain and body essential for precise motor control and environmental awareness. Moreover, the novel neural decoding algorithms demonstrated better accuracy than previously achieved.

Looking forward, B-CRATOS has demonstrated that a fully implantable, wireless bidirectional system for controlling advanced prosthetics is viable. Future work will expand animal studies before moving to initial human trials. Our roadmap includes developing the system into a long-term implantable solution suitable for clinical use. Beyond prosthetic control, we envision applications in functional organ control such as electrical stimulation of muscles in individuals with spinal cord injuries, or the regulation of bladder function. The platform developed under B-CRATOS opens new frontiers in neuroprosthetics and bioelectronic medicine, offering transformative potential for restoring function and improving quality of life in patients with severe motor and sensory impairments.

About B-CRATOS

B-CRATOS (Empowering independence through wireless Brain-Connect inteRfAce TO machineS) is an innovative and revolutionary project established as part of Horizon 2020, the European Union's five-year program for research and innovation. B-CRATOS aimed to create for the first time a battery-free high-speed wireless in-body communication platform for Brain-Machine-Body connectivity.

To achieve these ambitious findings, B-CRATOS was led by a diverse team covering research, engineering and medicine. The partners involved include Blackrock Microsystems Europe GmbH, Deutsches Primatenzentrum GmbH, Links Foundation, Norwegian University of Science and Technology, Scuola Superiore Sant'Anna, SiNANO Institute and Uppsala University.

For more information, please visit our website: https://www.b-cratos.eu/