SNAPS

Applied MedTech technologies

Neurograin technology

Neurograin technology is a new type of implantable mini-sensor that has been specially developed for use in the brain. The special feature? A single sensor is the size of a grain of salt, the technology works wireless and the goal is to combine hundreds of single sensors and place them on the surface of the brain as a sensor network! The task of the sensor network is to pick up signals from the brain, analyse them and then stimulate specific areas of the brain in a targeted manner! Researchers hope that this will provide new and deeper insights into the functioning of the brain. This could open the door for new, effective neurological treatment methods.

When the term neurograins is mentioned, it is often associated with well-known treatment methods that represent a human-machine interface. So far, mainly implanted electrodes are used that are connected to a computer and also capture brain signals and try to stimulate specific brain areas. The electrodes are connected either via cables or via a wireless connection outside the body. This form of deep brain stimulation is used for diseases such as Parkinson‘s and depression, or in cases of paralysis, to control and steer prostheses or robotic assistance systems. The biggest disadvantage, however, is that only one area of the brain can be examined at a time, as the electrodes are attached in the form of a „patch“ and thus the analysis is limited.

So what is behind the new research approach? Monolithic sensor clusters are to be distributed as individual sensors over the entire cerebral cortex. This is to be done using highly miniaturised but interconnected sensor units that are able to autonomously detect signals, capture them and send them wirelessly to a receiver unit about the size of a thumb that is attached to the scalp. The receiver unit functions as an energy supplier. It also bundles and coordinates the signals sent by the individual neurograins and forwards them to a computer. Since each sensor has its own network address, the signals can be specifically assigned to individual brain areas during further processing and evaluation and, conversely, these can also be electrically stimulated individually. A transcutaneous 1 GHz connection is used for better communication.

RESEARCH PROJECTS TO LOOK AT:

Brown University x Baylor University x University of California x Chiphersteller Qualcomm

- **What?**
  Neurograin technology
- **Challenge?**
  Optimise monolithic sensor cluster technology by capturing as many points as possible and making a comprehensive statement about all brain areas
- **How?**
  Thousands of individual sensors, which together form a network of sensors yet can be traced back to their individual, exact location on the cortex
- **Contact person:**
  Prof. Dr. Arto Nurmikko

Future prospects:

Researchers state that with the current state of technology, the sensor network can consist of around 770 individual sensors. However, the network is to be expanded in the future through further miniaturisation and optimisation to several thousand individual sensors, which are then attached to the Cortex.