



GENERALITAT
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VNIVERSITAT
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SUPPORT TOOL IN BRAIN STIMULATION SURGERY APPLIED TO PARKINSON

INVENTION DESCRIPTION

Nowadays, patients with neurological diseases related to movement disorders such as Parkinson's disease, suffer from different symptoms as tremor, stiffness, constriction, slow movement, and walking problems. Despite some drugs may help in blocking these symptoms, it is known that a group of these patients does not respond to pharmacological therapies. The implant of electrodes by surgery with the technique of deep brain stimulation (DBS) can be a treatment option for them, with the aim of eliminating these symptoms.

For Parkinson's disease, the DBS technique consists of the insertion of an electrical stimulator electrode in the subthalamic nucleus. It covers an area of approximately 2-5 mm. Its small size makes the implantation of this electrode critical for a successful patient's relief after the surgery, which fully depends on the neurosurgeon's or neurologist's experience. Therefore, the main problem during surgery is the accurate location of the stimulation electrode. So as the surgeon may have some support, a microelectrode recording is obtained at different points in the path of the implant. It allows to analyze the neuronal activity in each zone of the brain.

Generally, the interpretation of the microelectrode recording is performed visually by the neurosurgeon or neurologist during the surgery. Due to the complexity of the signals obtained and the variability of the patients, this interpretation may have an error, leading to a misallocation of the stimulating electrode and thus, not fully recovering the patient's symptoms..

Researchers of the Universitat de València and of the Instituto de Investigación Sanitario del Hospital La

Fe de la Comunidad Valenciana have developed a new Integral Analytical Support System for the Surgery and Postoperative Monitoring of Parkinson's disease by Deep Brain Stimulation.

The Digital Processing and Design Research Group and the Neuronal Circuits Laboratory of the Universitat of València, in collaboration with researchers from the Neurosurgery and Neurology Service of the Instituto de Investigación Sanitario del Hospital La Fe de la Comunidad Valenciana, have developed computer applications to support the surgeon in the interpretation of the microelectrode recording signals obtained from the brain, especially in the subthalamic area. It provides additional information to the expert to be able to improve the target area of electrode location and its postoperative monitoring. Specifically two computer software packages were developed: DBScan and DBSPost.

DBScan: "Support tool in brain stimulation surgery applied to Parkinson's disease". It allows obtaining information on the target area and selecting the optimum final position of the stimulation electrode based on the information processing of the signal obtained with microelectrodes.

DBSPost: "Support tool for the monitoring of patients whom were applied a deep brain stimulation surgery for Parkinson's disease". It provides complementary information to that currently obtained using conventional questionnaires (UPDRS). It is carried out by recording the brain bioelectrical activity in the preoperative period and in successive revisions of the patient.

BUSINESS APPLICATION SECTORS

The new system could be applied in the field of medical equipment of functional neurosurgery movement disorders. It adds a great functionality, precision and optimization of results to current equipment, complementing conventional micro-registration techniques. In addition, it can be applied to other pathologies in which DBS is used as symptomatic therapy such as obsessive-compulsive disorder, depression, Alzheimer's, chronic pain, epilepsy or dystonia, among others.



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TECHNICAL ADVANTAGES AND BUSINESS BENEFITS

The main advantages provided by **DBScan** are:

- Greater accuracy in implant position due to optimal interpretation of brain signal records.
- Clinical benefit for the patient due to the optimal position of the implant and therefore minimization of adverse effects.

The main advantages provided by **DBSPost** are:

- Obtaining the analysis of electroencephalography changes in the motor cortex induced by stimulation, during patient monitoring, to extract objective information that can be correlated with motor improvements in the unified scale of Parkinson's disease.
- It provides additional information of the correct electrode position and of the proper functioning of the DBS system.

DEVELOPMENT STATUS OF TECHNOLOGY

The technology has been validated with clinical data for intraoperative use with 22 patients and nowadays the research group is working on its optimization.

INTELLECTUAL PROPERTY RIGHTS

The technology is protected by Intellectual Property Rights through the following software:

- DBScan: "Help tool in brain stimulation surgery applied to Parkinson's disease"
- DBSPost: "Help tool for the monitoring of patients implanted in deep brain stimulation surgery applied to Parkinson's disease".

COLLABORATION SOUGHT

- License agreement, use, distribution or commercialization.
- R & D project to apply to other sectors.



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RELATED IMAGES

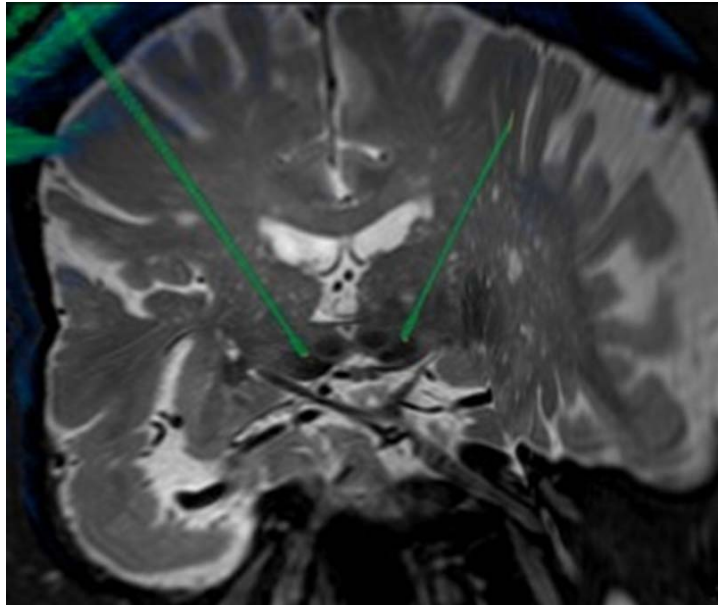


Figure.1. Brain TAC-RX image superposed with RMI. The electrodes can be observed (green lines), which are crossing different brain structures. Micro-electrode signal recording allows to adequately allocate the stimulating electrode in the subthalamic area.

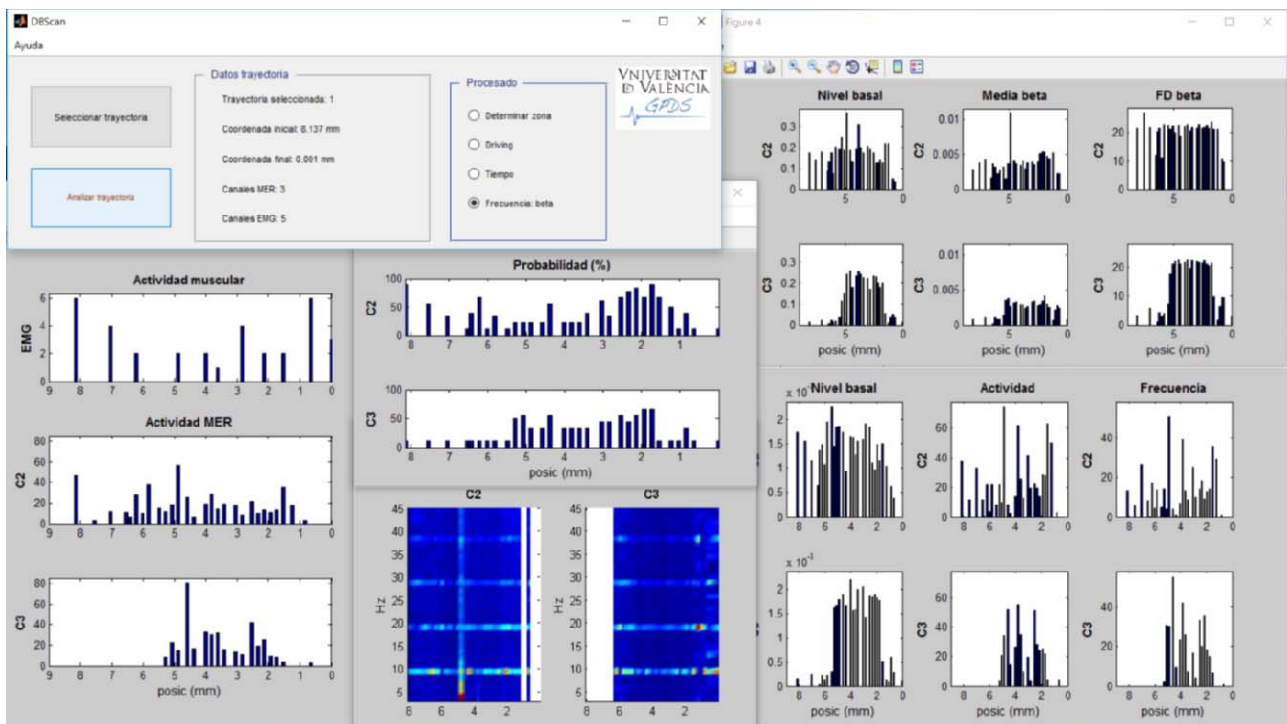


Figura 2. DBScan software screenshot with an example of the information provided to surgeons during surgery for proper allocation of the stimulating electrode.



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