UGR, Michael J. Fox Foundation move forward on the study of Parkinson's disease

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During the past year, the research group TIC 218 at the Department of Signal Theory, Telematics and Communications attached to the University of Granada and the Andalusian Information Technology and Communications Center (CITIC) has implemented the methods for the detection and diagnosis of Alzheimer's disease, within the PPMI initiative of the Michael J. Fox foundation for the study of Parkinson's disease. In addition, other databases were used such as that of the Virgen de la Victoria Hospital, Málaga, Spain, and Virgen de las Nieves Hospital, Granada, Spain.

The research studies were financed by the Andalusian Regional Government through its excellence research program calls TIC-4530, TIC-2566 and TIC-7103. Additional funds were granted by the Spanish National R&D Plan call TEC2008-02113 and "DiagnoSIS" TEC2012-34306. The research group has been awarded several prizes as the University of Granada Premio del Consejo Social and the Andalusian Regional Government's Premio Andalucía Sociedad de la Información.

This research group has published more than 40 papers indexed in the ISI-JCR in the field of diagnosis and scan imaging analysis. The last three papers –devoted to the study of Parkinson's disease- have been published in the most prestigious journals in the field of neuroscience such as *Medical Physics* (impact index 3.075) and *NeuroImage* (impact index 5.985, Nº1 journal in its category).

Undestanding the behavior of brain functions in patients with Parkinson's disease

The introduction of SPECT imaging worldwide for the diagnosis of Parkinson's disease (PD) –based on the innovative DaTSCAN agent– has allowed experts to better understand the behavior of behavior of brain functions in patients diagnosed with Parkinson's disease. The data provided by SPECT images can be processed by pattern-recognition machine, which allow an objective analysis of data.

A collaborative work with Virgen de la Victoria Hospital

The latest study conducted by this research group (Automatic assistance to Parkinson's disease diagnosis in DaTSCAN SPECT imaging. I. A. Illán, J. M. Górriz, J. Ramírez, F. Segovia, J. M. Jiménez-Hoyuela, and S. J. Ortega Lozano *Med. Phys.* 39, 5971 (2012)) presents a computer procedure that does not need the intervention of an expert (normalization, location of relevant regions, "clinical eye"...). In addition, this new technique systematically analyzes the effect of the different elements involved in the building process of the computer-assisted diagnosis technique on the accuracy of the final diagnosis. As a result, the technique proposed may exceed 90% of accuracy in the diagnosis of PD with the right selection of elements, and with the additional advantage of being a robust and simple computer software.

Similarly, the researchers at the research group SiPBA TIC 218 recently published the paper Improved Parkinsonism diagnosis using a partial least squares based approach. (F. Segovia, J. M. Górriz, J. Ramírez, I. Álvarez, J. M. Jiménez-Hoyuela, and S. J. Ortega, *Med. Phys.* 39, 4395. 2012), an enhanced versión of the former paper with the same title. In this paper, researchers propose a method consisting on separating brain hemispheres to fulfill two goals: firstly to correctly diagnose AD when it only affects one hemisphere (in many patients, PD evolves asymmetrically during the first stages)

A Paper Accepted for the Prestigious Journal *Neuroimage*

The group SiPBA has also developed a method for the linear normalization of intensity of FP-CIT SPECT-type brain images, which are generally used in the diagnosis of PD. The method proposed is based on experimental evidence that the histogram of image intensity values can be accurately adjusted using only four parameters through asymmetric Levy-stable distributions.

In this study, stable-distribution parameters, concretely those of scale and position, are used to linearly convert the intensity values for each voxel. This conversion is performed in such a way that the new intensitivy histograms for each brain image have the same values for the parameters position and dispersion. The proposed method has a better performance that the traditional intensity normalization method, which is based on the ration between the intensity values of specific and non-specific brain regions.

This paper, titled Linear intensity normalization of FP-CIT SPECT brain images using the alpha-stable distribution, D. Salas-Gonzalez, J. M. Górriz, J. Ramírez, I. A. Illán, E.W. Lang, and the Parkinson's Progression Markers Initiative (PPMI), has been recently accepted for publication in the journal *Neuroscience*, which is the top journal in the Thomson/ISI ranking, with 5,898 impact points.

Source: **University of Granada**

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