University of Granada Researchers Develop a New Software System for Early Diagnosis of Alzheimer's disease

Publication Date: 2012-07-11

Rosabel Liñán Sánchez
Universidad de Granada
Acera de San Ildefonso s/n
18071 Granada
Spain
ri@ugr.es
Tel: 34 958243170
Fax: 958246130
http://www.ugr.es/

The study was recently presented at the World Conference of Computer Intelligence (WCCI2012) held in Brisbane (Australia)

University of Granada researchers have developed a new computer system for the early diagnosis of Alzheimer's disease. This study has been recently presented at the World Conference of Computer Intelligence (WCCI2012) held in Brisbane (Australia) by Alberto Prieto, a researcher at the University of Granada Centro de Investigación en Tecnologías de la Información y las Comunicaciones (CITIC-UGR). More than 1300 experts attended this Conference, which is the most important in this field.

University of Granada researchers have designed a software program that automatically classifies nuclear magnetic resonance scans of healthy subjects, patients with mild cognitive impairment, and patients with Alzheimer's disease, the most common mental disease in the world.

One of the most remarkable innovations of this new procedure is that it includes scans of subjects with mild cognitive impairment (MCI). These subjects are at an intermediate situation between clinic normality and dementia, but they do not suffer a significant alteration of their daily life.

A Lot of Scans

Another peculiarity of this study –which has obtained significantly enhanced results– is that it uses a significant number of scans (1.350) collected from the ADNI database developed in the USA. The scans were selected and standardized by the Mayo Clinic in Rochester, Minnesota. The ADNI project (Alzheimer's Disease Neuroimaging Initiative) was initiated in 2004 and completed in 2011. It involved a massive effort to develop new treatments to delay or prevent the evolution of Alzheimer's disease.

The tests conducted included 443 scans of healthy subjects, 448 scans of subjects with mild cognitive impairment and 459 scans of subjects with Alzheimer's disease.

A variety of techniques were employed to develop the new software such as the Discrete Wavelet Transform (DWT) for the collection of the scan features, Primary Component Analysis (PCA) for the reduction of the features, and a variety of methods for the selection of features as the minimum-redundancy maximum-relevance (mRMR) and the Standardized Mutual Information method. Finally, the classification of scans by features was performed by the Support Vector Machine (SVM).

The results obtained in the classification of the scans have a sensitivity and specificity of 98.7% for the distinction between healthy subjects and patients with Alzheimer's disease, and 80% and 96% respectively, when subjects with mild cognitive impairment are included. It is worth noting that the scientific community considers that results are considered good when they are greater than 80%.

This research study was conducted by the University of Granada researchers Ignacio Rojas, David Jaramillo and Alberto Prieto (CITIC researchers and members of the Department of Computer Architecture), Olga Valenzuela (Department of Applied Mathematics), in collaboration with Dr. Ignacio García, a neurologist at the University Hospital Virgen de las Nieves, Granada, Spain.

This study confirms that advanced image analysis techniques have a key role in the early diagnosis of patients that might potentially develop dementia, and in differential diagnosis, which would enable a more efficient control of the evolution of the disease.

Contact:

Alberto Prieto Espinosa
Head of the Centro de Investigación enTecnologías de la Información y las Comunicaciones(CITIC-UGR)
Phone:+34 958241718
E-mail: aprieto@ugr.es

Ignacio Rojas Ruiz
Centro de Investigación en Tecnologías dela Información y las Comunicaciones (CITIC-UGR)
Teléfono:+34 958246128
E-mail: ignacio@atc.ugr.es

Subject: 39; 56;
Country: Spain;

RCN: 31170

Quality Validation Date: 2012-07-11