



Image sub-segmentation by PFCM and Artificial Neural Networks to detect pore space in 2D and 3D CT soil images

Joel Quintanilla-Dominguez (1,2), Maria Guadalupe Cortina-Januchs (1,2), Benjamin Ojeda-Magaña (1,3), Antonio Vega-Corona (2), Ana Maria Tarquis (1,4), and Diego Andina (1)

(1) Group for Automation in Signals and Communications GASC. Technical University of Madrid. Madrid, Spain (d.andina@upm.es), (2) Computational Intelligence Laboratory LABINCO-DICIS. University of Guanajuato. Salamanca Guanajuato, Mexico, (3) Project Engineering Department CUCEI. University of Guadalajara. Zapopan Jalisco, Mexico, (4) CEIGRAM-ETSI Agrónomos, UPM, Madrid, Spain

The image by Computed Tomography is a non-invasive alternative for observing soil structures, mainly pore space. The pore space correspond in soil data to empty or free space in the sense that no material is present there but only fluids, the fluid transport depend of pore spaces in soil, for this reason is important identify the regions that correspond to pore zones. In this paper we present a methodology in order to detect pore space and solid soil based on the synergy of the image processing, pattern recognition and artificial intelligence. The mathematical morphology is an image processing technique used for the purpose of image enhancement. In order to find pixels groups with a similar gray level intensity, or more or less homogeneous groups, a novel image sub-segmentation based on a Possibilistic Fuzzy c-Means (PFCM) clustering algorithm was used. The Artificial Neural Networks (ANNs) are very efficient for demanding large scale and generic pattern recognition applications for this reason finally a classifier based on artificial neural network is applied in order to classify soil images in two classes, pore space and solid soil respectively.

Funding provided by Spanish Ministerio de Ciencia e Innovación (MICINN) through project no. AGL2010-21501/AGR is greatly appreciated.