

Classification of Forest Types Using Remote Sensing and Self-Organizing Maps

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Abstract : Human actions are a threat to the balance and conservation of the Amazon forest. Therefore the environmental monitoring services play an important role as the preservation and maintenance of this environment. This study classified forest types using data from a forest inventory provided by the 'Florestal e da Biodiversidade do Estado do Pará' (IDEFLOR-BIO), located between the municipalities of Santarém, Juruti and Aveiro, in the state of Pará, Brazil, covering an area approximately of 600,000 hectares, Bands 3, 4 and 5 of the TM-Landsat satellite image, and Self - Organizing Maps. The information from the satellite images was extracted using QGIS software 2.8.1 Wien and was used as a database for training the neural network. The midpoints of each sample of forest inventory have been linked to images. Later the Digital Numbers of the pixels have been extracted, composing the database that fed the training process and testing of the classifier. The neural network was trained to classify two forest types: Rain Forest of Lowland Emerging Canopy (Dbe) and Rain Forest of Lowland Emerging Canopy plus Open with palm trees (Dbe + Abp) in the Mamuru Arapiuns glebes of Pará State, and the number of examples in the training data set was 400, 200 examples for each class (Dbe and Dbe + Abp), and the size of the test data set was 100, with 50 examples for each class (Dbe and Dbe + Abp). Therefore, total mass of data consisted of 500 examples. The classifier was compiled in Orange Data Mining 2.7 Software and was evaluated in terms of the confusion matrix indicators. The results of the classifier were considered satisfactory, and being obtained values of the global accuracy equal to 89% and Kappa coefficient equal to 78% and F1 score equal to 0,88. It evaluated also the efficiency of the classifier by the ROC plot (receiver operating characteristics), obtaining results close to ideal ratings, showing it to be a very good classifier, and demonstrating the potential of this methodology to provide ecosystem services, particularly in anthropogenic areas in the Amazon.

Keywords : artificial neural network, computational intelligence, pattern recognition, unsupervised learning

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