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Número Especial: 7ª Conferência Internacional sobre Incêndios Florestais - Resumos

Caatinga Burned Areas' Validation through a Machine Learning approach to the INPE's Burns and Forest Fires Monitoring

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ABSTRACT – Regular monitoring of fire occurrences provides relevant subsidies for decision making on the effects and impacts of fire. INPE maintains a program of Burns and Forest Fires Monitoring [1] based on Earth Observation satellites. As part of this project, the AQ30m data product provides burned surface's estimation based on Landsat medium-resolution images (with pixel' sizes around 30m). INPE's burned areas mapping process finds which areas have changed in a comparison of two different acquisition times. The changes detected are caused by many factors and some of them are fire. Before the official data publication, a further evaluation process is essential to classify burned and non-burned areas and to ensure that overall accuracy is larger than 90% and omission and commission errors are no more than 10%. Currently, a manual validation by specialists is carried out, an exhaustive and time-consuming process. Our objective is to automatically classify the changed areas caused by fire with good accuracy. Previously [2] we proposed an automatic approach through Machine Learning to classify burned areas for the Cerrado biome. We defined relevant attributes, a one year period as enough to build a historical knowledge base and we analyzed classification models, with accuracies at around 90%. In this article, we will advance knowledge by developing an approach to classify burned areas for the Caatinga biome. The approach is based on the Random Forest classifier, combines distinct vegetation indexes and related features, employs Cerrado data to classify data from adjacent path/rows in the Caatinga, and that have no previous historical dataset. This work analyzes a region within a 10km buffer along existing transmission lines inside four path/rows and contains 8838 changed areas. We performed experiments at Orange [3] environment and the results were validated against reference data derived from classifications manually done by experts. Resulting accuracies are larger than 95% in the burned areas' classification, commission errors around 40% and omission around 5%. Results indicate that is possible to use this preliminary approach to classify distinct path/rows, to deal with distinct biomes and to create a more automatic process of burned areas classification.

Keywords: Burned areas classification; machine learning; Caatinga

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