Mapping Use and Land Cover in 1:5.000 of Angra dos Reis, RJ, with Object Based Image Classification

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ABSTRACT

With the increasing growth of the use of high resolution images, arise the object based classifiers. In this research we compared the results of two different methodologies generated by the software Definiens 7. The first was a land cover map generated by a classification modeled for the central area of Angra dos Reis; and the second was another land cover map obtained by a classification with manual editions of the same area. This comparison allows us verify the accuracy of the models determined for each class and the automatic level of the whole process.

Keyword: remote sensing, object based image classification, land cover, Angra dos Reis.

INTRODUCTION

The thematic maps, like land use and land cover, match with the observed into the surface, identifying the characteristics of the area that representing several activities or actions undertaken by man. In this way, the use of indicators of land cover, obtained through remote sensing images, has achieved good results in the evaluation of transformations into landscape, enabling temporal and spatial analysis.

Most of land use and land cover maps are related to some kind of interpretation over aerial photographs and / or remote sensing images. However, their representation in different scales still needs more standardization.

In this way, the aim of this research is evaluate the method of classification defined by a modeling process from a high spatial resolution image (0.5m x 0.5m) of GeoEye sensor, comparing two land cover maps in 1:5:000 for a central area of Angra dos Reis.

The classifications will be performed using the Definiens 7 software. One of them without using the resource of manual editing and the other one already fixed with manual editing by an expert. In the classification, will be evaluated four main thematic

mapping classes of reference. They are: water, forest, pasture and urban. These four simple classes are important to define the first level of a hierarchical classification.

METHODOLOGY

The methodology presented here consists of the object oriented program implemented by Definiens 7. The thematic map generated from this classification was analyzed based on the level of automatization. The diagram below (figure 1) presents the steps in the systems developed Definiens 7.

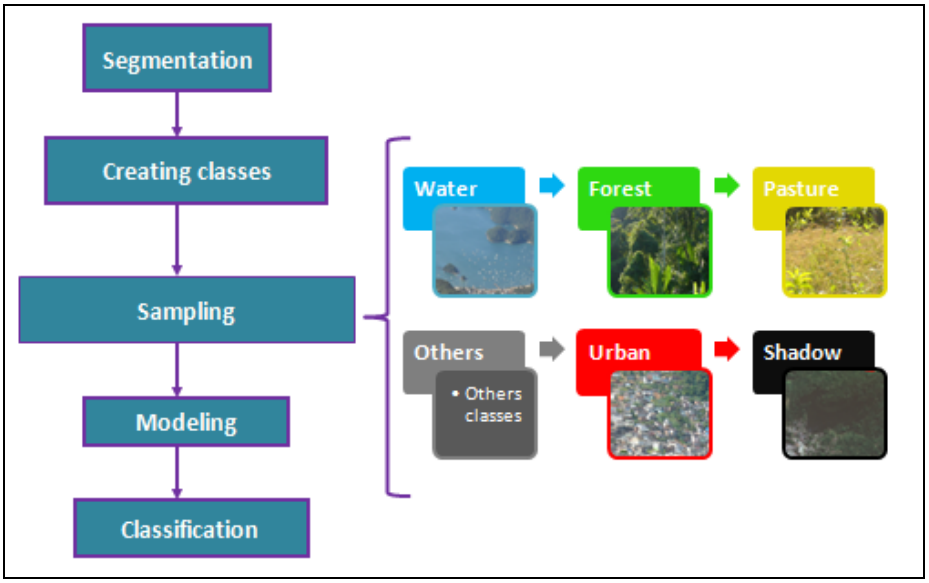

Figure 1: Steps performed in Definiens 7.

A comparison was performed by crossing the map obtained by object based classification with the reference map (with editions). This process was made in ArcGIS 9.3.

PRELIMINARY RESULTS

The comparison between the reference map and the classification map has generated a map containing the spatial distribution of the errors discussed in classification process (Figure 2).

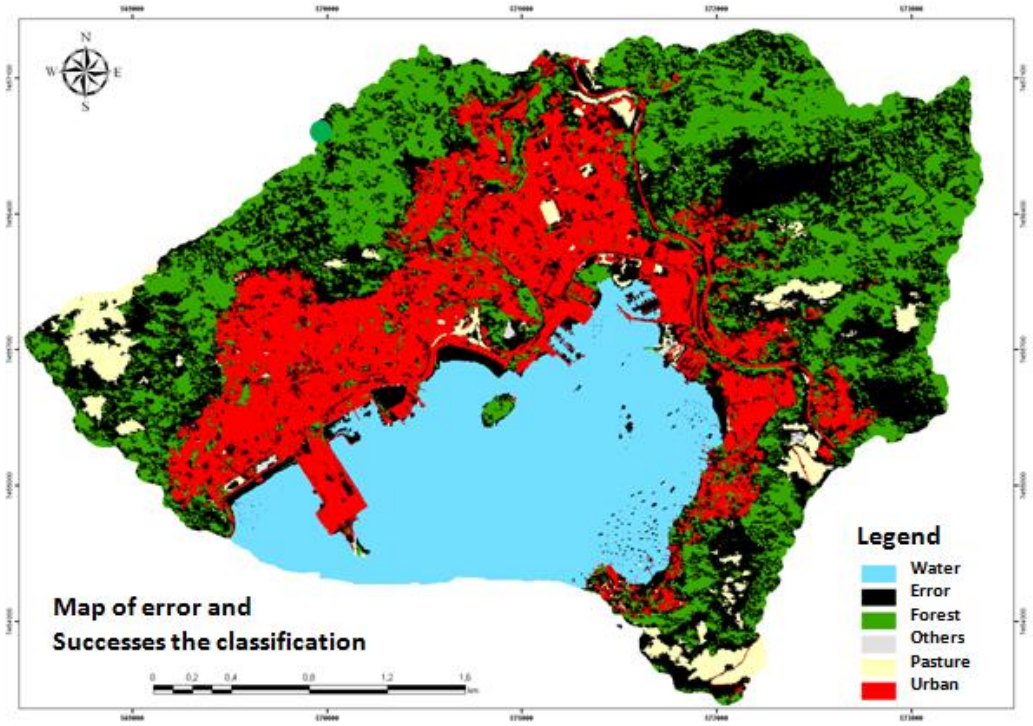

Figure 2: Map the error of classification.

From the analysis of the percentage of success and failure of class by class was possible to generate the confusion matrix between the reference map and the classification map (Table 1).

Table 1: Confusion Matrix.

	Water	Forest	Pasture	Urban	Others	Total Modeled
Water	**2.143.521**	192	59	3.542	230	**2.147.544**
Forest	1.404	**2.632.670**	349.680	120.968	178.175	**3.282.897**
Pasture	10.335	302.367	**402.346**	258.442	34.281	**1.007.771**
Urban	62.080	125.102	57.058	**2.210.783**	93.538	**2.548.561**
Others	18	405.944	58.606	4.233	**61.472**	**530.273**
Total Reference	**2.217.358**	**4.256.172**	**871.178**	**2.648.613**	**378.517**	**10.371.838**

In the confusion matrix, we extract the ratio of the sum of elements correctly classified by the total of elements, so we came to an overall accuracy of 71.4%, qualified as Very Good, according to the table presented below.

Table 2: Concordance Index

Concordance Index	Qualification
0,0< k ¡A 0,2	Bad
0,2< k ¡A 0,4	Medium
0,4 < k ¡A 0,6	Good
0,6 < k ¡A 0,8	**Very Good**
0,8 < k ¡A 1,0	Excellent

Source: Adapted from Landis (1977) *apud* Carvalho (2011).

PRELIMINARY CONCLUSIONS

The conclusion of this work is that model generated for the classification is able to identify the classes chosen for analysis, reducing the editions efforts. However, this classification was performed on a preliminary basis. The result of this analysis will help us to generate a more detailed classification, including a greater number of classes, which is what is expected of a high-resolution image.

The two most successful class models were generated for the urban and water classes. The water is easier because is more homogeneous and the urban because is represented for two models, one for bright objects (roof more bright) and another for dark objects (roof more dark), to represent different spectral responses, which were then grouped. There was an attempt to make the differentiation of vegetation patterns in two or more classes, however it failed to reach a model that differentiated these patterns.

It is intended, as the next stage of work, do a more detailed analysis of the Confusion Matrix (Table 1). In this context, will be analyzed for each class, the following errors: omission errors (areas that are no longer associated with a given class) and commission errors (areas that are associated, wrongly, to a class). Seeking evaluate what are the main confusions and consequently improve the modeling for each class.

REFERENCES

CARVALHO M.V.A., KUX J.H., FLORENZANO T.G., MOREIRA M.A.M.,(2011) Cover classification and land use of a sector of western São Paulo-SP data mining and analysis of objects in images based on WorldView-2. INPE, São José dos Campos.

CRUZ, C. B. M.; VICENS, R. S.; SEABRA, V. S.; REIS, R. B; FABER, O. A.; RICHTER, M.; ARNAUT, P. K. E. & ARAÚJO, M Object-Oriented Classification Mapping of the remaining vegetation of the Atlantic Forest biome, Scale 1:250,000. In: Proceedings of the XIII Brazilian Symposium on Remote Sensing, Florianópolis, 2007,. INPE, p. 5691-5698.