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Object-based feature extraction of Google Earth imagery for mapping termite mounds in Bahia, Brazil

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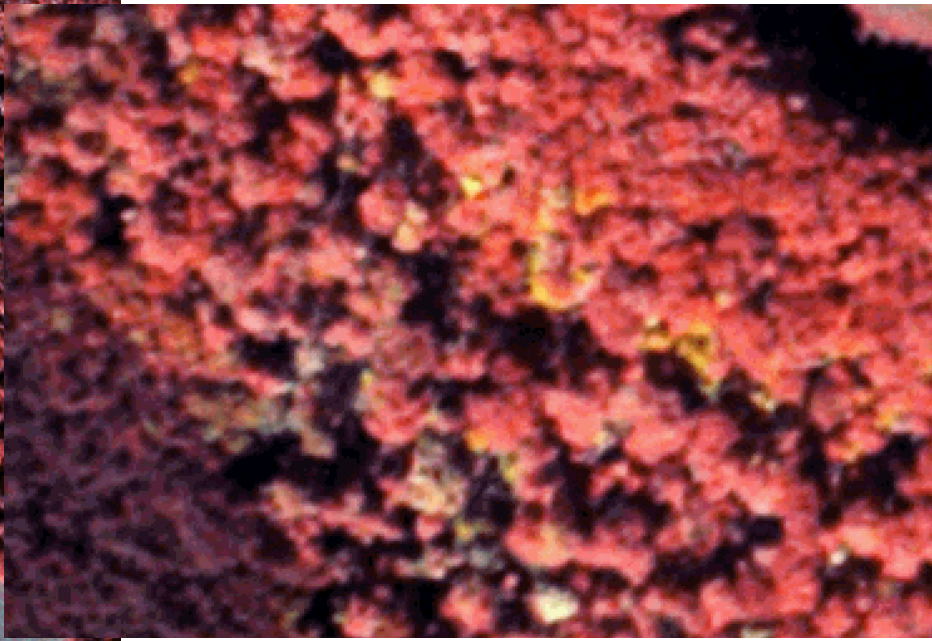
Smarter Image Processing: Object-Oriented Classification

Traditional classifiers don't work as well for new generation of high resolution data, like this 2 foot Emerge Color infrared airphoto. Why? Meaningless to classify each pixel



Object-Oriented Classification

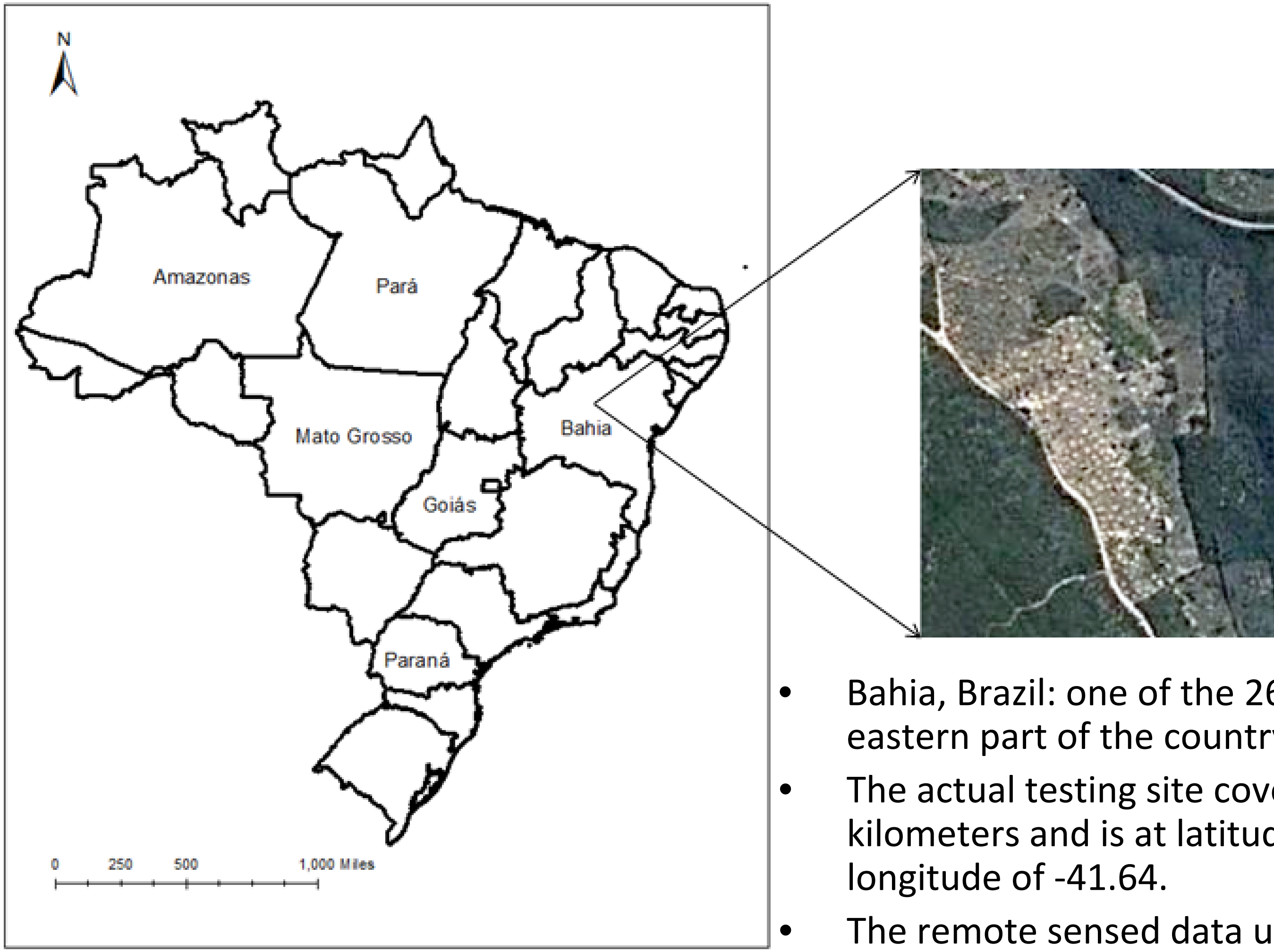
- Problems with pixel based classifiers:
  - Extreme heterogeneity of small pixels (e.g. shading, multiplicity of colors within an object)
  - Two pixels with same spatial reflectance might be totally different types of objects/ features (e.g. building and road)
  - Two pixels with very different reflectance may actually be part of the same object type (e.g. building materials of different reflectance)

Termite Mounds

- often hotspots of plant growth (i.e. primary productivity). Accurate and timely
  - Extreme heterogeneity of small pixels (e.g. shading, multiplicity of colors within an object)
  - Two pixels with same spatial reflectance might be totally different types of objects/ features (e.g. building and road)
  - Two pixels with very different reflectance may actually be part of the same object type (e.g. building materials of different reflectance)

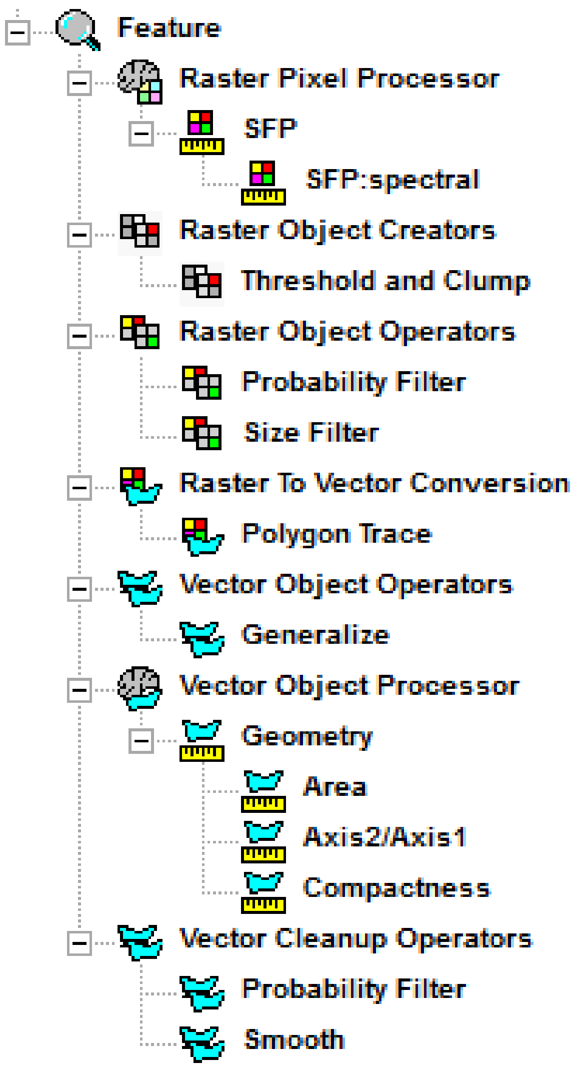
Study Area and Data

Brazil Admistrative Regions Showing the Study Site



- Bahia, Brazil: one of the 26 states of Brazil, eastern part of the country on the Atlantic coast
- The actual testing site covers 0.77 square kilometers and is at latitude of -12.47 and a longitude of -41.64.
- The remote sensed data used was captured from Google Earth Imagery

Methods

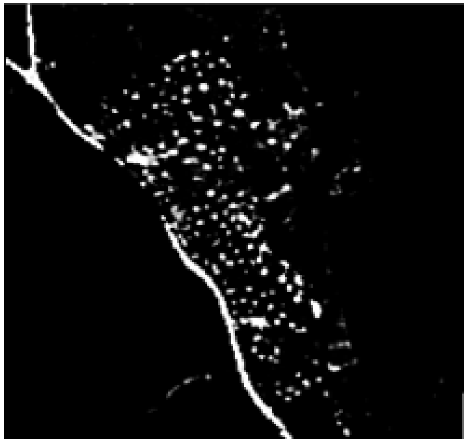


Imagine Objective in Erdas 2011 version and later versions provide solutions to object-based image analysis

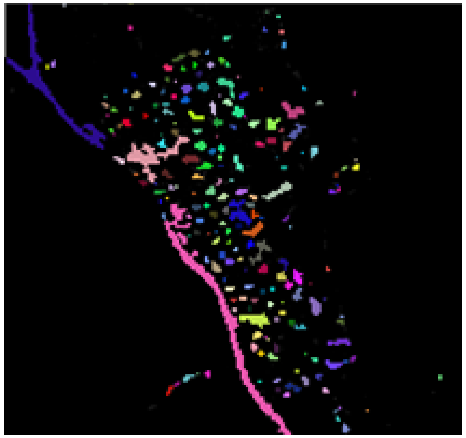
- Step 1) Raster Pixel Processor: For this pixel based classification the SFP (single feature probability) was chosen, which uses a Bayes-classifier. The definition of training areas for termite mounds is important for the outcome;
- Step 2) Raster Object Creators: in this step, the function “Threshold and Clump” was used and assigns an average pixel probability (combined with results of step 1;
- Step 3) Raster Object Operators: Using “Probability Filter” and “Size Filter” allowed keeping pixel objects with high probability and a certain amount of pixels only;
- Step 4) Raster to Vector Conversion: with “Polygon Trace”, raster objects were automatically vectorised converting objects;
- Step 5) Vector Object Operators: In this step, the vector objects are generalized which accelerates later processing;
- Step 6) Vector Objects Processor: This function processes geometric and textural features of the Vector Objects and writes the probability value for each feature to each object in an attribute table. This involves specifying area, Axis2/Axis1 and compactness cues.

Methods/Results

(a) Original Image



(b) Step 1: Raster Pixel Processor (Bayes-clssifier)



(c) Step 2: Raster Object Creators (Threshold and Clump)

(d) Step 3/4: Raster Object Operators (Size Filter) and Vectorization

(e) Step 5: Vector Object Operators (Generalization)

(e) Step 6: Vector Object Processor (applying geometric and texture cues)

Conclusion/Outlook

- Nearly 90% of the total termite mounds was identified and extracted with the feature model
- Large cluster of termite mounds have maximum 1122 square meters in size and 328 meters in perimeter, small cluster of termite mounds have 240 square meters in size and 72 meters in perimeter.
- Most termite mounds had an average compactness of about 0.7.
- The object-based feature extraction model by Imagine Objective can be applied to further study areas. In most cases, only the training process has to be adjusted.
- The study ensured the capability inherent with an object based image analysis using 3 visible bands-Google Earth Image.

Thank You!

Comments and Questions?

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