

Paper GeoDMA → JAG

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 - 2.2. Data Mining
 - 2.3. Object-based image analysis software
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	Main segmentation algorithms	Available features	Classification scheme
eCognition [4]	Multiresolution, based on [34].	Spectral (Image Related), Spatial (Shape Related) and Neighborhood (Class Related).	Rule set defined in a workflow, by the user; nearest neighbor algorithm.
InterIMAGE [5]	Multiresolution, based on [34], and a Region Growing strategy based on [35].	Spectral (Statistical and Texture), Spatial (Shape and Basic) and Neighborhood.	Rule set defined in a semantic network, by the user.
GeoDMA	Multiresolution, based on [34], and a Region Growing strategy based on [35].	Spectral (Statistical and Texture) and Spatial (Shape Metrics) and Landscape Ecology.	Data mining techniques to build automatically the rule set (decision tree), or rule set defined by the user.



- BlueRoofs
- BrightRoofs
- CeramicTileRoofs
- DarkAsbestosRoofs
- Grass
- GrayAsbestosRoofs
- Shadow
- SwimmingPools
- Trees

0 50 100 150
Meters



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0 50 100 150
Meters

```

Pixel Mean, Red Channel <= 67.23
| Pixel Mode, Blue Channel <= 89.00
| | Pixel Mean, Infra-Red Channel > 57.86 -> Trees
| | Pixel Mean, Infra-Red Channel <= 57.86
| | | Pixel Mean, Red Channel <= 19.93
| | | | Pixel Mode, Infra-Red Channel <= 28.00 -> Shadow
| | | | Pixel Mode, Infra-Red Channel > 28.00 -> Trees
| | | Pixel Mean, Red Channel > 19.93
| | | | Pixel Mean, Red Channel > 43.69 -> DarkAsbestosRoofs
| | | | Pixel Mean, Red Channel <= 43.69
| | | | | Pixel Mode, Infra-Red Channel <= 34.00 -> DarkAsbestosRoofs
| | | | | Pixel Mode, Infra-Red Channel > 34.00 -> Trees
| Pixel Mode, Blue Channel > 89.00
| | Pixel Mode, Blue Channel <= 175.00 -> BlueRoofs
| | Pixel Mode, Blue Channel > 175.00 -> SwimmingPools
Pixel Mean, Red Channel > 67.23
| Pixel Mean, Green Channel <= 196.44
| | Pixel Mean, Red Channel <= 118.94
| | | Pixel Mean, Infra-Red Channel > 116.25 -> Grass
| | | Pixel Mean, Infra-Red Channel <= 116.25
| | | | Polygon Shape Index > 2.61 -> GrayAsbestosRoofs
| | | | Polygon Shape Index <= 2.61
| | | | | Polygon Main Angle <= 0.14 -> BlueRoofs
| | | | | Polygon Main Angle > 0.14
| | | | | Pixel Mean, Green Channel <= 87.64 -> DarkAsbestosRoofs
| | | | | Pixel Mean, Green Channel > 87.64
| | | | | | Polygon Elliptic Fit <= 0.85 -> GrayAsbestosRoofs
| | | | | | Polygon Elliptic Fit > 0.85 -> DarkAsbestosRoofs
| | Pixel Mean, Red Channel > 118.94
| | | Pixel Mean, Red Channel <= 178.10
| | | | Pixel Mean, Green Channel > 119.65 -> GrayAsbestosRoofs
| | | | Pixel Mean, Green Channel <= 119.65
| | | | | Pixel Mean, Infra-Red Channel <= 106.89 -> DarkAsbestosRoofs
| | | | | Pixel Mean, Infra-Red Channel > 106.89 -> CeramicTileRoofs
| | | Pixel Mean, Red Channel > 178.10
| | | | Pixel Mean, Blue Channel <= 137.32 -> CeramicTileRoofs
| | | | Pixel Mean, Blue Channel > 137.32 -> GrayAsbestosRoofs
| Pixel Mean, Green Channel > 196.44
| | Pixel Mode, Red Channel <= 209.00 -> GrayAsbestosRoofs
| | Pixel Mode, Red Channel > 209.00 -> BrightRoofs

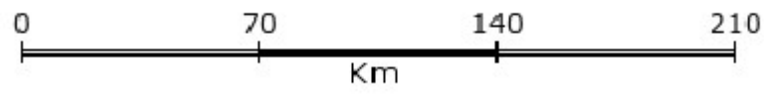
```

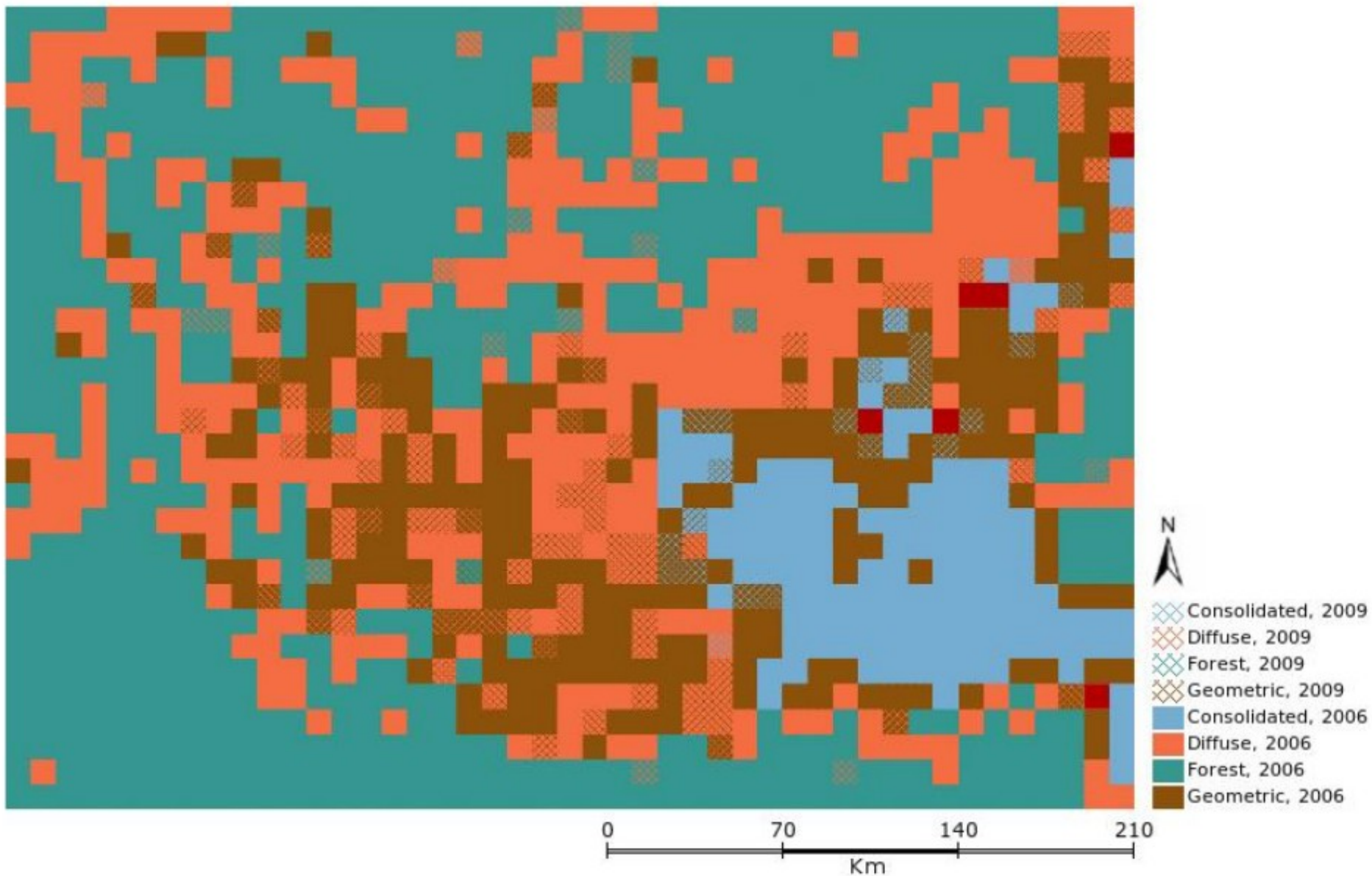
(...) Both approaches obtained similar accuracies, with 85% of correct matches, and kappa values of 0.842 for GeoDMA and 0.841 for InterIMAGE.

The major advantage of using GeoDMA is that the proposed approach obtained the results in no more than two ours, whereas in InterIMAGE the manual definition of rules and parameters tuning were time-consuming tasks.



- Consolidated, 2009
- Diffuse, 2009
- Forest, 2009
- Geometric, 2009
- Consolidated, 2006
- Diffuse, 2006
- Forest, 2006
- Geometric, 2006





	2006		2009	
	kappa	correct matches	kappa	correct matches
GeoDMA	0.87	90%	0.81	86%
eCognition	0.79	84%	0.85	88%

Percentage of Landscape ≤ 0.96

| Patch Density ≤ 0.00 -> Forest

| Patch Density > 0.00 -> Diffuse

Percentage of Landscape > 0.96

| Class Area ≤ 3275.99 -> Geometric

| Class Area > 3275.99 -> Consolidated

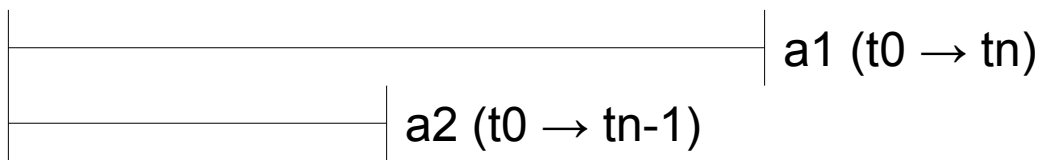
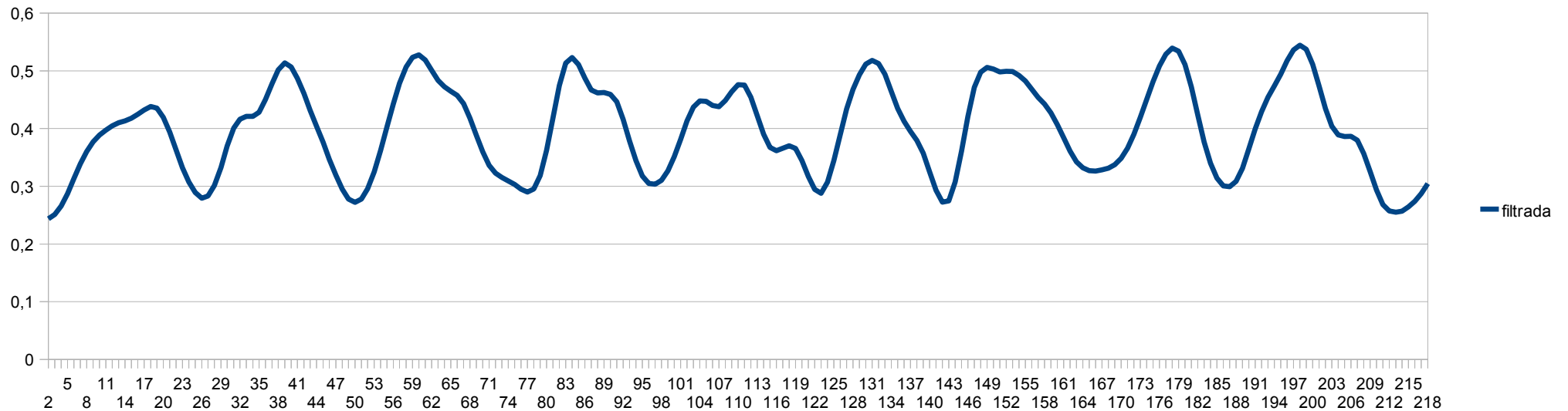
Análise Multitemporal

- Change can be detected by comparing the brightness values for each pixel for the same area, but on a different date. *Milne 1988 IGARSS*
- Apply Discrete Fourier Transform, and keep only the first few coefficients (features). Rectangles in the feature space are created to join a smaller representation, *Faloustsos 1994 SIGMOD*
- Time-localized clustering, each time-window in the series possesses a corresponding classification, *Heas 2003 Multitemp*
- Pixels having the same evolution at the same dates are set to the same color, *Andreea 2008 IGARSS*

Análise Multitemporal

- Analysis of a vegetation-related variable (EVI) , measured by MODIS and applied Recursive Merging, *Boriah 2008 SIGKDD*
- Multivariate Alteration Detection (MAD) is a correlation analysis between two groups of images, *Doxani 2010 GEOBIA*
- Predict spatiotemporal changes of some object at forthcoming dates based on data mining over radiometric, textural and geometric features. *Boulila 2011, JAG*

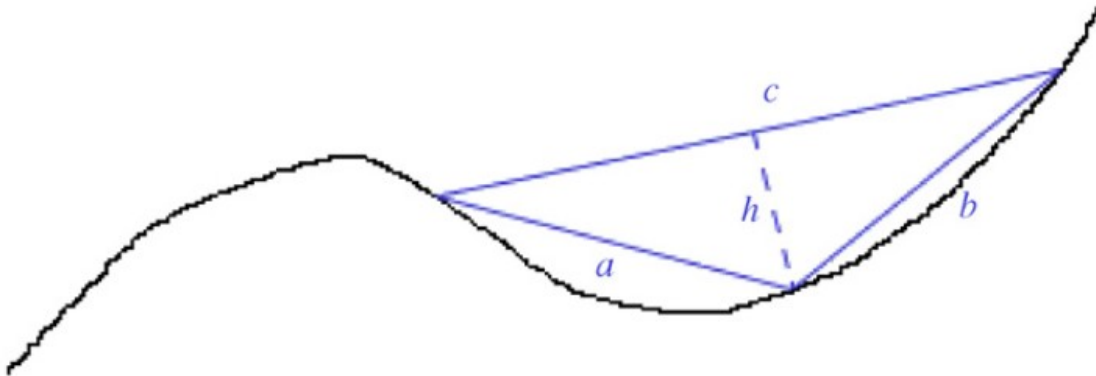
Detecção de Trajetórias



$a1 = a2?$
Trajetória cíclica

'a' é algum atributo que descreva a curva

Descritores de curva



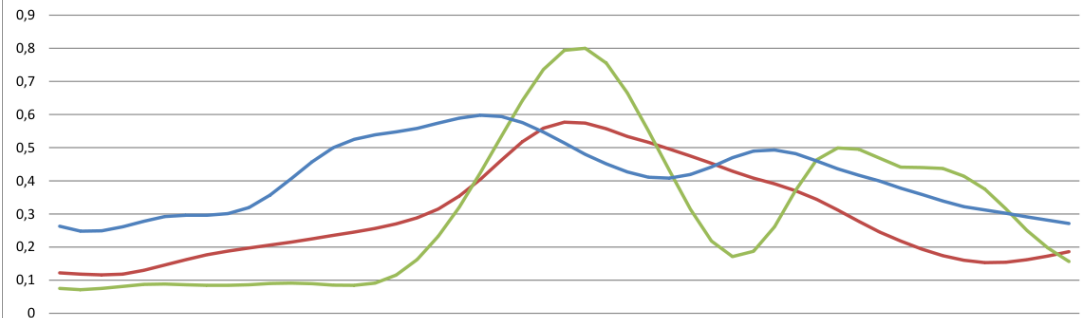
Triangle Heights
Triangle Perimeters

(Stojmenovic et al 2008, Pattern Recognition)

Decision trees can classify change signatures in remote sensing imagery.

```
amp_serie <= 0.461
| avg_1d <= 0.001188
| | min_1d <= -0.083: sugarcane
| | min_1d > -0.083: pasture
| avg_1d > 0.001188: sugarcane
amp_serie > 0.461: general agriculture
```

amp_serie = data amplitude
avg_1d = first derivative average value
min_1d = first derivative minimum value



GeoDMA

- Versão 0.2.1 para TerraView 4.0.0
- Linux/Windows
- Segmentação Bins et al, Baatz et al, Checkerboard
- Atributos de forma, textura, paisagem e espectrais
- Validação por kappa, simulação Monte Carlo
- Classificação Árvores de Decisão, SOM, Redes Neurais