Automatic segmentation for insular habitats along the Loire River: test in a National Nature Reserve, Mareau-aux-Prés France

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Biodiversity recolonization

- Context of stream bed and stream bank excavation;
- Colonization by *Acer negundo*;
- European Beaver reintroduction.
Site location

A 13 ha site composed of 4 islands in a National Nature Reserve
Image acquisition and Habitat mapping

**Data:**

- Image acquisition by drone (l’Avion Jaune company, Aug 2017);
- Orthophotos: Red, Green, Blue, NIR and Lidar, resolution 2 cm;
- Identification of vegetation habitat 15m X 15m grid.
Workflow on OTB and Qgis

Segmentation steps

- Image Concatenation with 7 bands:
  Red, Green, Blue, NDVI, Roughness, DTM, DCM;

- Segmentation:
  \GenericRegionMerging, threshold = 1, cw = 0.9, sw = 0.2,
  Baatz and Shape
  Dunford et al. 2009, Potential and constraints of UAV technology for
  the characterization of mediterranean riparian forest.

Data field

- 500 split ground points: Training (250 pts) and Check (250 pts) files;
- Statistics:
  \FeaturesStatistics, variance and mean (7 bands).
## Grouping vegetation types

<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TALL-SEDGE COMMUNITIES</td>
<td>/</td>
</tr>
<tr>
<td>REED COMMUNITIES</td>
<td>Reed canary grass+ Common water reed+ Quack grass meadows</td>
</tr>
<tr>
<td>SANDBANK AND BANK VEGETATION</td>
<td>Wet and Dry bank</td>
</tr>
<tr>
<td>HARDWOOD FORESTS</td>
<td>Scrublands + Broom + Hardwood forests</td>
</tr>
<tr>
<td>WILLOWS AND POPLAR SEEDLINGS</td>
<td>Willows low river banks + <em>Populus nigra</em> seedlings</td>
</tr>
<tr>
<td>WILLOW-POPLAR FORESTS</td>
<td>Willows on high river banks + <em>Populus nigra</em> adults</td>
</tr>
<tr>
<td>ACER NEGUNDO</td>
<td>/</td>
</tr>
<tr>
<td>SHADOW</td>
<td>/</td>
</tr>
</tbody>
</table>
Classification step

- Classifier:
  \(\text{TrainVectorClassifier, fichiers.stats, classifier = test}\)

  LibSVM
  Boost
  Gradient Boosted Tree
  Artificial Neural Network
  Bayes
  Random forests
  KNN
**Workflow on OTB and Qgis**

**Best classifier**

- Gradient Boosted Tree, but with overall Kappa = 0.51

<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>Precision</th>
<th>Recall</th>
<th>F-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandbank and Bank vegetation</td>
<td>0.51</td>
<td>0.41</td>
<td>0.45</td>
</tr>
<tr>
<td>Tall-sedge communities</td>
<td>0.72</td>
<td>0.85</td>
<td>0.78</td>
</tr>
<tr>
<td>Reed communities</td>
<td>0.75</td>
<td>0.32</td>
<td>0.45</td>
</tr>
<tr>
<td>Willows and Poplar seedlings</td>
<td>0.55</td>
<td>0.79</td>
<td>0.65</td>
</tr>
<tr>
<td>Willow-Poplar forests</td>
<td>0.64</td>
<td>0.57</td>
<td>0.60</td>
</tr>
<tr>
<td>Hardwood Forests, Broom, Scrublands</td>
<td>0.81</td>
<td>0.75</td>
<td>0.78</td>
</tr>
<tr>
<td>Acer negundo communities</td>
<td>0.63</td>
<td>0.71</td>
<td>0.67</td>
</tr>
<tr>
<td>Shadow</td>
<td>0.33</td>
<td>0.34</td>
<td>0.33</td>
</tr>
</tbody>
</table>
Results on Qgis

LEGEND

**Ligneous communities**
- Flooded vegetation
- Willows and Poplar seedlings (*Salix spp, Populus nigra*)
- Willow-Poplar forests
- Rarely flooded vegetation
- Hardwood Forests and Brooms and Scrublands
- Allochtonous communities at different topographic positions
- *Acer negundo* communities

**Others habitats**
- Sandbank and herbaceous pioneer vegetation
- Sandbank and Banks vegetations (wet and dry)
- Herbaceous monospecific communities
- Tall-sedge communities
- Reed communities (Common reed, Reed canary grass) and Quack grass meadows
- Other
- Shadow

SEGMENTATION TEST WITH GBT CLASSIFIER NATIONAL NATURAL RESERVE IN THE LOIRE VALLEY

Mareau-aux-Prés, Aug 2017
Results on Qgis

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Confusion between different habitat types
Thank you

Photo credits: Jeanne Menanteau