DYNAMIC OBJECTS: UNRAVELLING VEGETATION PATTERNS IN A HIGHLY DYNAMIC FLUVIAL ENVIRONMENT

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EXTENDED ABSTRACT:

Multitemporal analysis with GEOBIA is complicated by the changing geometry of image objects, even when the scene objects are static. The analysis gets even more complicated when the scene objects are dynamic and geometric changes stem from the scene and image processing. In this study we applied GEOBIA to a time series of photos representing a highly dynamic landscape, i.e. a natural cause of geometric dynamics.

In floodplains of meandering rivers erosion and sedimentation are dominant processes that remove and create banks. Consequently, banks and the vegetation on top have different (maximum) ages at short distances. This vegetation affects the hydrodynamics during high discharge and hence erosion and sedimentation patterns. Vice versa the hydrodynamics affect vegetation through shifting channels, flooding, drought, and seed dispersal.

First attempts to model this interaction produce realistic vegetation patterns (Van Oorschot et al., 2016). However, no ground truth on dynamic vegetation patterns is available. In this project we analyzed emerging vegetation patterns in aerial photographs in five time steps spanning 30 years. The study site was a 2-km stretch of the river Allier near Chatel-de-Neuvre in France. Land cover is characterized by open areas with no or low vegetation dotted by isolated shrubs and trees, next to patches of riparian forest (Geerling et al., 2006). The river shows strong discharge fluctuations, leading to significant channel migration and at least yearly flooding of the entire floodplain.

We focused on isolated shrubs and trees as these are the intermediate step from vegetated plains to riparian forests and facilitate the development of new shrubs/trees. We distinguished four categories: small and large objects with a bare or vegetated surface background. We monitored their status in relation to their size, shape and position relative to the river.

First results show that vegetation along the Allier is highly dynamic, caused by a frequent setback to the pioneer stage. Only 20-25% of the shrubs/trees survive a period of 10+ years (figure 1). The vast majority of trees/shrubs disappear within 10 years, indicating that 75-80% of the trees/shrubs are only a few years old. The evolution of forest patches is the exception rather than the rule, even though forest patches are omnipresent. Apparently the trees are highly resistant against flooding and drought once they reach the forest stage.

We will include our findings in a framework for dynamic-object-based image analysis to support studies of changing landscapes.

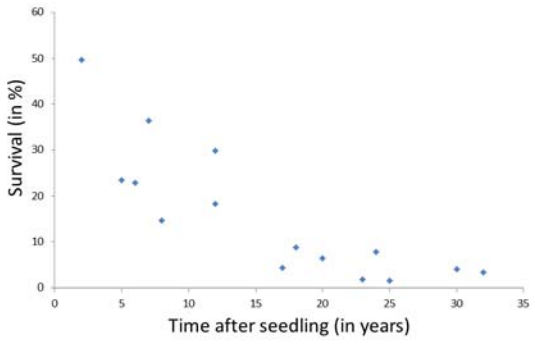

Figure 1. Survival of isolated trees and shrubs

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