Mapping secondary succession in non-forest ecosystems by means of remote sensing

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The secondary succession is currently an often observed process taking place on agricultural areas. Even though this phenomenon can have a highly positive impact on environment e.g. climate, carbon storage or biodiversity, it can also be perceived as a threat when present on Natura 2000 habitats. The process of succession taking place on the protected areas needs to be therefore monitored in order to understand and assess it's influence on ecosystems' functioning. This can be achieved and automated by the use of remote sensing data and novel image processing techniques.

In our work we took advantage of the simultaneously acquired, high-resolution aerial remote sensing data - hyperspectral imagery and LiDAR data - to develop a complete methodology for monitoring the succession process. The algorithms implemented within the methodology included i.a. Structure from Motion and Dense Image Mapping for processing the archival images, segmentation and Voronoi Tessellation for succession spatial extent delineation, as well as Machine Learning Random Forest classifier, Recursive Feature Elimination and t-distributed Stochastic Neighbor Embedding algorithms used for succession species differentiation. The prepared methodology was tested on seven research areas located in Poland.

In our presentation we would like to show a set of different maps being the products of the developed methodology: a map depicting the spatial extent of shrubs and trees forming the succession process, maps showing the internal and external threat to the habitats, a map showing the spatial extent of succession species present on an example research area and maps presenting the dynamics of the succession process. We will also explain how different data and algorithms can be used to develop these products and how different management units can use them to make informed decisions about Natura 2000 protected areas.