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# Automatic identification of water-logged agricultural areas using LiDAR DEMs

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Remote sensing is an important approach to control the implementation of the area-based subsidy system of the European Common Agricultural Policy (CAP) in Denmark. The control process aims at deriving limits of declared cultivated parcels and the identification of non-eligible areas (NEA) for farmland support. Until today, however, control with remote sensing (CwRS) has combined manual, visual interpretation of aerial ortho photos and field inspection, thus being labor intensive and limited to a small extent of the country-wide agricultural area.

The project RemoteControl commissioned by the Danish agricultural ministry aims at the development of methods and techniques towards automatic mapping of non-eligible agricultural land and related mapping tasks such as the update of field-block polygons from high-resolution aerial ortho photos and LiDAR derived, high-resolution point clouds and digital elevation models (DEM). DEMs are particularly important within the CwRS approach since they contain structural, physically meaningful information that can be used to identify and delineate landscape features that are related to water redistribution, sediment flux and habitat characterization.

The central aim of this study is to develop and test an approach towards the automatic identification of NEAs for farmland support. Our objectives are (1) to develop a conceptual model for the identification of agricultural areas prone to water logging, (2) to design a procedure combining geomorphometric analysis and digital image processing to extract these areas using LiDAR DEMs, (3) to train the procedure in an area where data on water logged areas is available, and (4) to validate it.

Preliminary results show that the combination of geomorphometric land surface characterization and deployment of mathematical morphology is promising to attain the mentioned goals. A prerequisite of the approach, however, is a thorough preprocessing of LiDAR DEMs to remove features in the data such as bridges to obtain a hydrologically connected landscape. Using the preprocessed DEMs validation of our procedure against mapped NEAs provides promising results.

Our results point at the general feasibility and potential of our approach to support the CwRS process. Future developments will comprise the automatic extraction of further structural features using DEMs and to combine these approaches with object-based image analysis of high-resolution ortho photos.