

# **AUTOMATIC QUALITY CONTROL OF CROPLAND AND GRASSLAND GIS OBJECTS USING IKONOS SATELLITE IMAGERY**

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## **ABSTRACT:**

As a consequence of the wide-spread application of digital geo-data in GeoInformation Systems (GIS), quality control has become increasingly important. A high degree of automation is required in order to make quality control efficient enough for practical application. In order to achieve this goal we have implemented a semi-automatic image analysis technique for the quality control of cropland and grassland GIS objects using 1 m pan-sharpened multispectral IKONOS imagery. In order to check cropland and grassland objects contained in the GIS, textural, structural and radiometric features are combined. Every cropland and every grassland object in the GIS is verified independently by checking whether the image data inside the object boundaries provide evidence for the class as it is contained in the GIS. The automated process starts with a segmentation of the image that is based on a textural analysis to distinguish the classes 'agriculture' from all other classes. For the purpose of textural segmentation, the object classes cropland and grassland are combined to class 'agriculture', because these classes show similar texture in the images. The output of the texture analysis is used to check whether a cropland or grassland object corresponds predominantly to the 'agriculture' class. If this is not the case, the GIS object is considered to be not verified, and the system will flag the object as having a wrong class. Otherwise, a further analysis of structural and radiometric features has to check whether the object is a cropland object or whether it corresponds to grassland. Structural features are used based on the fact that cropland can be differentiated from grassland by exploiting parallel straight structures caused by cultivation. Thus, a gradient histogram of the frequency of occurrence of the direction angles of the lines can be used as evidence for cropland objects. Furthermore, the Normalised Difference Vegetation Index (NDVI) is used as a radiometric feature to detect untilled cropland objects, which should have a low NDVI compared to grassland objects. Again, if the class detected by the image analysis tool does not conform to the class contained in the GIS, the object is flagged as an error. The results of the image analysis tool are presented to the user, who only has to check the objects indicated to belong to a wrong class, whereas the objects that could be verified by the automated tool need not be checked. In this paper we describe the algorithms in detail, and we give results for quality control of cropland and grassland objects in several test areas in Germany. The results are evaluated using reference data.

**TOPIC:** Land cover classification

**ALTERNATIVE TOPIC:** Image processing and pattern recognition