

# AN OBJECT ORIENTED DATA MODEL FOR A HIGH END LAND COVER CLASSIFICATION PRODUCT

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Land Cover Classifications remain a major product of the Remote Sensing industry and is used by a wide audience, ranging from conservation bodies interested in land degradation and habitat fragmentation, government agencies concerned with urban planning and the private sector such as the cellular phone industry interested in optimal allocation of service infrastructure. Current one-dimensional land cover classification products cannot satisfy the various requirements of different users. This has been a source of great concern to those defining land cover standards. The current paper proposes a new Object Oriented Land Cover Data Model that provides all the sophistication required by higher end power users without compromising transparency and simplicity to users with basic skills and requirements.

Land cover products face inherent problems to maintain consistency and ensure their suitability for analysis in the mid-term future. These problems can be attributed to changing data-sources, classification methodologies and class definitions.

High-end data users have specific requirements for land cover data products. These include the ability to refine or generalise, modify, adapt and update classifications to cater for their own needs. In many instances users are in the possession of unique ancillary data that need to be integrated into this process of reclassification. Modifications should be made possible in a quantitative way without losing the ability to predict classification product accuracy and its variability over space and time. Related to the above is the user-need to reconstruct rules and methodologies applied to derive class distinction of a land cover product. The documentation of accurate metadata adhering to international standards forms the final component of this requirement.

For most hierarchical land cover classification systems such as the LCCS and CORINE, classes as defined at higher levels require very specific source data such as satellite imagery from particular sensors and ancillary data. As landscapes vary greatly and contain a mixture of classes, source data used to derive the classification product will in turn vary and not all datasets will be available for the whole area. As old sensors are retired and new designs are brought into service, classification rules need to be flexible. A new Land Cover data model will thus have to cater for the use of multi-source and multi-resolution in terms of spatial, temporal, spectral, radiometric and polarimetric properties of source data. The data model will in turn have to be compatible and fully functional with conventional GIS software accessible to users.

An object-oriented land cover data model is proposed to address all the issues mentioned above. At present eCognition is the most widely used object oriented image analysis software and will have to provide the base data to assemble the data model. This is done by providing sub-, reference- and super-objects optimally segmented for each class and then amalgamated into three separate ESRI shape files each representing the sub-, reference- and super object. Together with each object, attributes such as class ID's, regional classification accuracy, classification stability and reliability are provided for each class in the different hierarchical levels of the classification system. Classifications from different dates may in addition be imbedded in the same set of objects facilitating a land cover change analysis.

Data used to define the class of each object is provided with the classification products in the form of features captured in the shape file database and in the imagery and ancillary data used to calculate the features. The three object shape files are integrated into one ARC GIS Geo-database that captures the rules used for the classification in either a Microsoft Access or Oracle database. The rules are extracted from the exported eCognition Class Hierarchy used to generate the classification and then translated as rules into the MS Access or Oracle database. The advantage of an MS Access database lies in its portability and usability to address low end users that do not have access to Oracle. The disadvantage of MS Access lies in a maximum database size of 1 Gigabyte that is not limited in an Oracle database. Users will thus have the choice between different tile sizes, dependent on the database engine accessible to them.

Classification validation data from in field observations used to undertake the accuracy assessment is provided as additional ESRI shape file in the form of point and area features hyper-linked to photographs taken in field. Metadata is provided in XML format according to ISO standards.

The data model described above has been implemented for a Land Cover Classification for parts of the Western Cape, South Africa and serves as a demonstrator for such a model. Efforts are currently underway to implement this data model as a national standard for South African land cover products.