Extending Global Land Cover Accuracy Assessment Capacities Through Education

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BACKGROUND

Several Earth observation programmes, like Copernicus, have been established recently to satisfy demands of users by providing free, high-resolution and frequently updated imagery. Land cover (LC) maps are valuable source of information about Earth's surface in many fields, such as biodiversity monitoring, natural resource management, tracking climate change, and detecting change in land use. Practical use of a global LC map is determined by its thematic accuracy, which is a prerequisite to confirm its reliability before employing it.

CHALLENGE

Accuracy assessment of global maps is not trivial. Lack of accurate and up-to-date reference data on a global level, and not well-documented and thus difficult-to-use tools for accuracy assessment are just some of the limitations.

The barriers in accuracy assessment must be removed in order to exploit full capacity of LC maps.

ACCURACY ASSESSMENT OVERVIEW
-Free and Open Source Software-

QGIS | GRASS GIS | ORFEO ToolBox | SAGA | SNAP

Existing Free and Open Source Software have no accuracy assessment functionalities or the functionalities are not well documented. Overall accuracy, user's accuracy, producer's accuracy, kappa, conditional kappa, quantity disagreement and allocation disagreement are the indexes implemented in the available software. The number of accuracy indexes included in the available software is rather small in comparison to the ones available in the literature (more than 20).

EDUCATIONAL MATERIAL AS A SOLUTION

Detailed educational resources based on the practical examples and easy-to-use tools were created to address the challenges in accuracy assessment. We developed tools to compute accuracy indexes, and a web-based and mobile application for reference data collection. Both tools are supported by exhaustive educational material to simplify their use. Moreover, educational material includes instructions for online accuracy assessment tools.

Each of the mentioned components is documented with screenshots and complemented by textual explanation. It was tested, and well-rated, in workshops in three countries: Kenya, Uganda and the Netherlands. The educational material is available under CC BY 3.0 license, and the tools under GNU General Public License or corresponding ones.

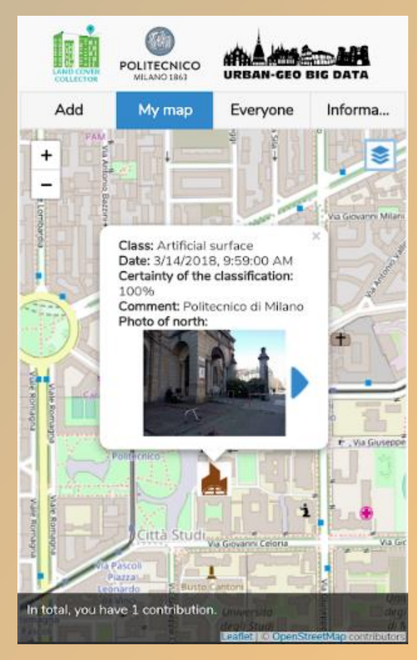
EDUCATIONAL MATERIAL
-Desktop accuracy assessment-

Provided that different indexes might reveal more about accuracy, we created new PyQGIS scripts through which users can compute many more indexes, besides the ones already available in FOSS software (among them: classification success index, ground truth index, Hellden's and Short's mean accuracies).

The PyQGIS scripts, "pts_lcval" and "raster_lcval", can be run within QGIS. The difference between the two scripts is in the reference data type. "pts_lcval" input reference data are LC sample points, while in case of "raster_lcval" reference data is an LC raster map.

EDUCATIONAL MATERIAL
-Reference data collection-

LAND COVER COLLECTOR



To deal with the deficit of reference data, a Web-based and mobile application for LC data acquisition, "Land Cover Collector", was developed. The application is available online, as well as on Google Play and Apple Store. All the necessary steps, from registration, LC data acquisition, suggestions concerning privacy, to data visualization and download are demonstrated in the educational material.

EDUCATIONAL MATERIAL
-Online tools-

From the practical point of view, online tools are appreciated in overcoming the possible desktop tools issues related to the limited performance of computers.

GLCVal is an example of GL30 validation platform. Among other functionalities, GLCval allows users to choose whether to import their own sample points, or to create sample points using some of the provided sampling schemes, and eventually to interpret them taking into consideration different base maps (Bing, OpenStreetMap imagery, Landsat imagery…).

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