

## **Validation Techniques for Land Cover and Land Use Maps**

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Land cover and land use (LCLU) maps are extremely important for a lot of applied satellite monitoring problems. We have built high resolution land cover maps for the whole territory of Ukraine for three decades: 1990s, 2000s and 2010s [1]. For this, atmospherically corrected time-series of Landsat-4/5/7 images were classified using a neural network ensemble. These maps contain six main land cover classes of the European Land Use and Cover Area frame Survey (LUCAS) nomenclature: artificial surface, cropland, grassland, forest, bare land and water.

We consider three most common methods for reference data sampling design: pseudo-random sampling, systematic sampling on a regular 10 km grid and the approach on the base of segments. During the first approach, an expert selects samples that can be interpreted by him with minimal errors. In such a case, the accuracy of the map could be overestimated. Systematic sampling approach is more objective for reference data selection, but might be more difficult and resource consuming for photo-interpretation. Taking into account the impact of human subjectivity, two independent experts participated in reference data collecting within the second approach. This

technique allows us to provide independent validation for land cover map and to compare it with the results based on random selection of reference samples. With the first pseudo-random sampling approach, the overall classification accuracy is approximately 95% for three different time periods (1990, 2000 and 2010). Within the second approach (regular grid), the overall accuracy of 84.5% was achieved [2]. We think this result is more objective due to regularity of grid and more independent selection of validation set. Third approach on the base of segments is the most difficult to realize because of a lot of so called “unknown” polygons which should be interpreted by expert with a low probability.

[1] M. Lavreniuk, N. Kussul, S. Skakun, A. Shelestov, B. Yailymov “Regional retrospective high resolution land cover for Ukraine: methodology and results,” IEEE International Geoscience and Remote Sensing Symposium (IGARSS), pp. 3965-3968, 2015.

[2] M. Lavreniuk, N. Kussul, A. Shelestov, B. Yailymov, T. Oliinyk, and A. Kosteckiy, “Validation methods for regional retrospective high resolution land cover for Ukraine,” IEEE International Geoscience and Remote Sensing Symposium (IGARSS), pp. 4502-4505, 2016.

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