OPENING FOR PEOPLE

AUTOMATED LANDSCAPE VARIABILITY ASSESSMENT IN KEO SYSTEM

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PROJECT ENVIRONMENT

I introduce a new application in KEO system. Within the confines of an ESA-PECS project[1] that aims the EO information development and dissemination in Hungary, I had an opportunity to take part in the definition of the first (partly) Hungarian application in KEO system.

The name of the application is Automated Knowledge-centered Assessment of Tourism Adequacy[2]. During the application definition, questions of automated information extraction arose. I try to answer these questions clearly from both points of view: from the side of future user and from the side of the developer.

AKATA is an application that assesses landscape variability and correlating tourism adequacy. In these terms of use, tourism adequacy means the attribute of the landscape that is derived just from its territorial quality - so point-like attractions are excluded.

1 http://earth.eo.esa.int/rtd/Projects/EKAT/
2 See AUTOMATED KNOWLEDGE-CENTERED ASSESSMENT OF TOURISM ADEQUACY at http://geonetwork.dimeola.esrin.esa.int/geonetwork

KIEMSTEDT METHOD

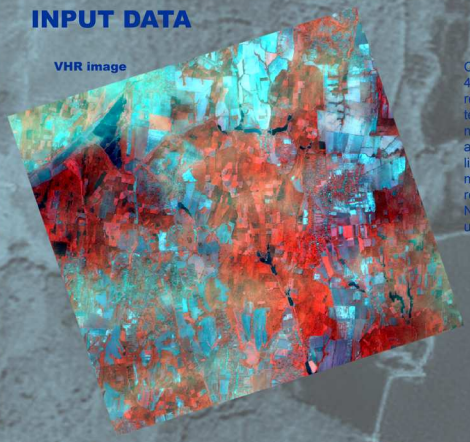
Within AKATA we actualized and automated an existing method put into shape by Hans Kiemstedt in 1967. The Kiemstedt method is an empirical formula that estimates the landscape variability (V - Vielfertigkeitswert) by sqkms with the use of five factors. He used 1:25 000 topographic maps as input of the assessment, and did the estimation manually. The formula uses the factors as the following:

V=(Esz+3Vsz+R+T)/K

— **V** is the variability of the landscape correlating with tourism adequacy;
— **Esz** is the length of the edge of forest patches by sqkm;
— **Vsz** is the length of the edge of water surfaces by sqkm;
— **R** is the relief – the difference between the highest and lowest point by sqkm;
— **T** is the weighted area of landuse patches by sqkm;
— **K** is the climate factor that we excluded in the application definition as the application is specified for smaller than county areas, where climate is almost the same.

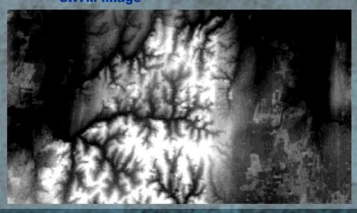
INPUT DATA

VHR image



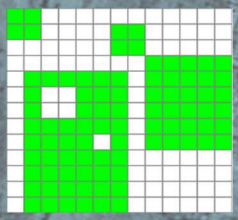
Of our test area we used KOMPSAT-2 4 band VHR images (4 m geometric resolution) and SRTM 90 m DEM as test data. The defined application must use similar data to these to have an output of landscape variety visualized in 1 km by 1 km raster thematic map. All possible constraints can be read in the RDS document on GeoNetwork. For validation process we used DOP images of 1m resolution.

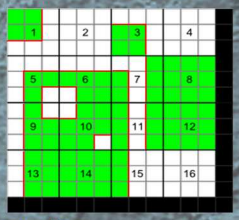
SRTM image



DOP image

FACTOR COMPUTATION AND ASSESSING SYSTEM





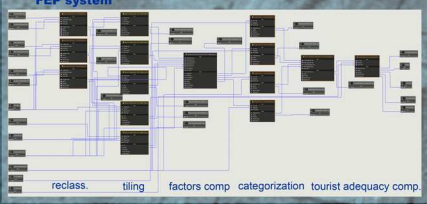
Sample for edge measuring when tiling

During the application definition, that was basically an automation process, we gained some valuable experiences about the nature of the extraction of the actually aimed information. As we defined the application in KEO system, we helped to form the assessing system in the FEP designer. MEEO provided us indespensable technical aid with the FEP definition.

The FEP structure consists of five modules:

- Reclassification
- Tiling
- Factors computation
- Categorization
- Tourist adequacy computation and visualization

FEP system

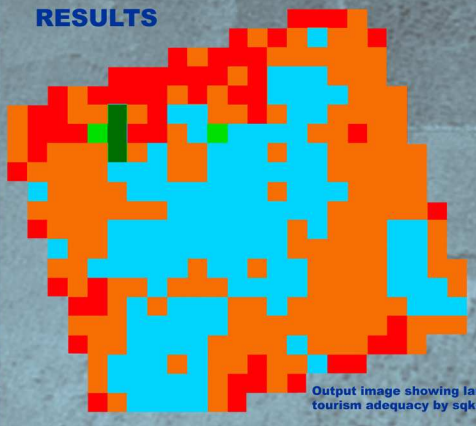


One of the definition experiences:
Importance of edges

The edges are the perimeters of the landuse patches. The length of edges per unit determine the variety of landscape very much. The edges have either ecological and psychological-aesthetical impact on people. Forest and water surface edges are the most stressful edges from the point of view of tourism.

During the definition of the algorithms measuring the length of edges by 1 sqkm tiles, there arose some questions. By the tiling into 1sqkm cells, there came up the problem of the handling of the edges collining with tileborders. We chose not to count those collining edges, for the greater afraid of not-existing data production than the negligible possibility of the described situation (recon a 1sqkm tile to be 250*250 VHR pixels).

RESULTS



ID	Category	Legend colour
5	Excellent for tourist use	
4	Good for tourist use	
3	Fair for tourist use	
2	Poor for tourist use	
1	Awful for tourist use	

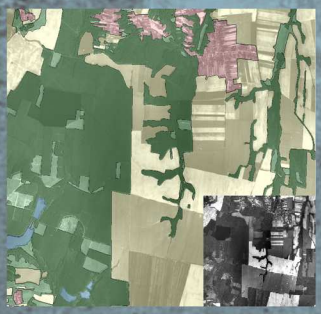
Category	Interval
1	$[DN_{min}+DN_{min}+I] = [DN_{min}+I_1]$
2	$[I_1+I_1+I] = [I_1+I_2]$
3	$[I_2+I_2+I] = [I_2+I_3]$
4	$[I_3+ I_3+I] = [I_3+ I_4]$
5	$[I_4+DN_{max}]$

Output image showing landscape variability and correlating tourism adequacy by sqkms

VALIDATION PROCESS

The validation of the application is still in process. It aims to compare the reliability of the automated method to the goodness of the original method – the hand-made digitalization and the personally counted V values. The validation process besides its quality controlling nature, also can emphasize the efficiency increasing effect of the application.

During the verification we use DOPs (digital orthophotos) to gain the same data with the same actuality level. We chose two times three random tiles of the output of the application. Than we produced from each three 1 sqkm tiles rates. Than we manually assessed the same tiles on a DOP and produced the same rates of the gained V values. The comparison takes place in these days, where we use statistic probes (two sample F and t-probes) to characterize the difference between the two outputs.



As it formerly was written, we put emphasis on to use vector-based data validate our raster-based application. At the same time I have to outline that we used trios and not duos of tiles during the validation to measure the detorsions of the model as we compute the value of scew – this way we can show the goodness of the resampling algorithm.

OUTLOOK

Multidisciplinar decision-making is needed nowadays. Rural development is an (Achilles-) heel point of national development. Economic diversification in rural areas must be stimulated. These facts are well-known. The only question is what will be the production of diversificated rural development? How will be dead-burden eliminated, how can economic nivellation work with better outputs?

An actual change in the future gives the apropos to steer our attention towards landscape variability. In 2013-14 CAP (Common Agricultural Policy) turns into CARPE (Common Agricultural and Rural Policy). The forth pillar of the policy pay attention to the multidiscipline field of rural development. Also agricultural support changes, and more rural development programmes will start. This trend will cause changes in landuse and landscape as well. It depends on us, how we utilize the chance for developing of our landscapes. I hope our AKATA application in KEO system will serve the better monitoring of landscape variability.

Project information

http: //earth.eo.esa.int./rtd/Projects/EKAT
e-mail: phargitai@geoadat.hu

Application information

http://geonetwork.dimeola.esrin.esa.int/geonetwork
e-mail: gyfulop@geoadat.hu; iszigeti@geoadat.hu