Scales and Hierarchies in Geomorphometry

Rendicontazione

Informazioni relative al progetto

SCALA-PLUS

ID dell'accordo di sovvenzione: 239312

Progetto chiuso

Data di avvio
16 Aprile 2009

Data di completamento
15 Ottobre 2011

Finanziato da
Specific programme "People" implementing the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007 to 2013)

Costo totale
€ 37 500,00

Contributo UE
€ 37 500,00

Coordinato da
PARIS-LODRON-UNIVERSITAT SALZBURG
Austria

Final Report Summary - SCALA-PLUS (Scales and hierarchies in geomorphometry)

The SCALA-PLUS project contributes towards increasing knowledge on scale and hierarchies in geomorphometry and related disciplines. The overall objective of this project was to provide a coherent framework of nested hierarchical organisation of topography for modelling purposes. The first objective of the SCALA-PLUS project was developing methods of identifying characteristic scales in landscape

representation from digital elevation models (DEMs). To achieve this objective, we introduced the method of local variance (LV) graphs, originally developed in image analysis, to DEM analysis.

Although land-surface 'objects' are characterised by smoother transitions in comparison with land cover objects, the application of LV method looks promising for multi-scale analysis in geomorphometry as well. We further coupled LV method with object-based image analysis (OBIA) to find suitable scale parameters in segmentation of multi-scale object. The tool we created based on this approach is free for download (see http://www.scalaproject.at/webseiten/index.php?option=com_content&view=article&id=16&Itemid=17 online for further details) and we expect it will make an impact within both the OBIA and geomorphometry communities. In brief, we developed a method that allows identifying characteristic scales in DEMs as a function of averaged standard deviation of geomorphic objects. This procedure was embedded within a free tool. The second objective was setting up a procedure for integrating terrain information into nested hierarchies of landforms, both morphometric and morphologic relevant. We achieved this objective by designing an automated method to classify landforms in a nested hierarchical structure. The approach was developed at global scale and results were embedded in a web application, with functionalities for data exploration and download http://zgis202.plus.sbg.ac.at/LandformClassification/default.aspx

Quantitatively and qualitatively, the results exceeded our initial expectations. Thus, in the project proposal we expected three journal publications. We have already published three ISI-indexed papers in the leading journals in GIScience and geomorphology, as follows:

(1) Drgu, L., Eisank, C. and Strasser, T., 2011. LV for multi-scale analysis in geomorphometry, Geomorphology 130: 162-172, doi:10.1016/j. geomorph.2011.03.011.
(2) Drgu, L. and Eisank, C., 2011. Object representations at multiple scales from DEMs, Geomorphology 129: 183-189, doi:10.1016/j. geomorph.2011.03.003.
(3) Drgu, L., Tiede, D. and Levick, S., 2010. ESP: a tool to estimate scale parameters for multiresolution image segmentation of remotely sensed data, International Journal of Geographical Information Science 24: 859-871, doi:10.1080/13658810903174803.

Although published in June 2010, the last paper was the most downloaded article in IJGIS in 2010, with 944 downloads, and has received more than 10 citations to date. Other two papers are in review in Geomorphology and Journal of Archaeological Science:

(1) Verhagen, P. and Drgu, L., in review. Object-based landform classification from DEMs for archaeological predictive mapping, Journal of Archaeological Science (minor revision).
(2) Drgu, L. and Eisank, C., in review. Automated classification of topography from SRTM data using object-based image analysis, Geomorphology (minor revision).

Besides the ISI-papers, we have published seven articles in international peer-reviewed journals and book chapters, as follows:

(1) Verhagen, P. and Drgu, L., in print. Discovering the Dutch mountains: an experiment with automated landform classification for purposes of archaeological predictive mapping, Proceedings CAA2010

(accepted).
(2) Eisank, C., Drgu, L. and Blaschke, T., 2011. A generic procedure for semantics-oriented landform classification in object-based image analysis. In:Hengl, T., Evans, I.S. Wilson, J.P. and Gould, M. (Eds.), Proceedings of Geomorphometry2011, 7-9 Sept., Redlands, CA, USA, 125-128.
(3) Drgu, L. and Eisank, C., 2011. Automated classification of topography from SRTM data using object-based image analysis. In: Hengl, T., Evans, I.S. Wilson, J.P. and Gould, M. (Eds.), Proceedings of Geomorphometry2011, 7-9 Sept., Redlands, CA, USA, 113-116.
(4) Eisank, C. and Drgu, L., 2010. Detecting characteristic scales of slope gradient. In: Geospatial Crossroads at GI_Forum '10. Proceedings of the Geoinformatics Forum Salzburg, edited by Car, A., Griesebner, G. and Strobl, J., Wichmann, pp. 48-57.
(5) Eisank, C., Drgu, L., Götz, J. and Blaschke, T. (2010) Developing a semantic model of glacial landforms for object-based terrain classification - the example of glacial cirques. In: Addink, E.A. and F.M.B. Van Coillie (Eds.) Geobia 2010-Geographic Object-Based Image Analysis. Ghent University, Ghent, Belgium, 29 June - 2 July. ISPRS Vol. No. XXXVIII-4/C7, Archives ISSN No 1682-1777.
(6) Eisank, C. and Drgu, L. (2010) Multi-scale pattern analysis of geographic entities. In: Painho, M., Santos, M.Y. and Pundt, H. (Eds.) Proceedings of AGILE 2010. Geospatial Thinking. Guimaraes, Portugal.
(7) Drgu, L., Eisank, C., Strasser, T. and Blaschke, T., 2009. A comparison of methods to incorporate scale in geomorphometry. Proceedings of Geomorphometry2009:133-139 (see http://www.geomorphometry.org/system/files/dragut2009geomorphometry.pdf online).

These results were further disseminated through abstracts, lectures and posters presented at 15 conferences and summer schools, among which two (Geomorphometry2009 and Geomorphometry2011) had Lucian Drgu as member in the scientific committee:

(1) Drgu, L. and Eisank, C., 2011. Automated classification of topography from SRTM data using object-based image analysis. Oral presentation, Geomorphology2011, 9 September, Redlands, CA, US.
(2) Eisank, C., Drgu, L. and Blaschke, T. (2011). Knowledge and Semantics in Landform Classification (KnowLand). Poster, GI-Forum 2011, 5 - 8 July, Salzburg, Austria.
(3) Eisank, C., Drgu, L. and Blaschke, T. (2011). Towards semantic interoperability in digital geomorphological mapping. Oral presentation, EGU2011 General Assembly, 6 April, Vienna, Austria.
(4) Drgu, L., Eisank, C. (2010). Hierarchical mapping of landforms from DEMs. Oral presentation, XIX Congres of the Carpathian- Balkan Geological Association, Thessaloniki, Greece, 23 - 26 September 2010.
(5) Eisank, C. and Drgu, L., 2010. Detecting characteristic scales of slope gradient. GI_Forum 2010, Salzburg, Austria, July 2010.
(6) Drgu, L. (2010). Digital elevation models in landscape ecology. Invited lecture, GISLERS Summer School, 06 July, Salzburg, Austria.
(7) Drgu, L., Tiede, D. and Levick, S., 2010. ESP: a tool to estimate scale parameters for multiresolution image segmentation of remotely sensed data. GEOBIA 2010, Ghent, Belgium, June 2010.
(8) Drgu, L. and Eisank, C., 2010. Multi-scale object representation for mapping landforms from Digital Elevation Models (DEMs). 14th Joint Geomorphological Meeting (JGM), Bucharest-Sinaia, Romania, May 2010.
(9) Eisank, C. and Drgu, L., 2010. Multi-scale pattern analysis of geographic entities. Poster. AGILE 2010,

Guimaraes, Portugal, May 2010.
10. Verhagen, P. and Drgu, L., 2010. Discovering the Dutch mountains: an experiment with automated landform classification for purposes of archaeological predictive mapping. In: Melero, F.J. Cano, P, Revelles, J. (eds.). Fusion of Cultures. Abstracts of the XXXVIII Conference on Computer Applications and Quantitative Methods in Archaeology, pp. 695.
11. Drgu, L., Eisank, C. and Strasser, T., 2009. Cells versus objects and scale issues in terrain-based environmental modeling. Poster. International Cartography Conference 2009, Santiago, Chile, November 2009.
(12) Drgu, L., Eisank, C., Strasser, T. and Blaschke, T., 2009. A comparison of methods to incorporate scale in geomorphometry. Geomorphometry2009, Zurich, Switzerland, September 2009.
(13) Drgu, L. (2009). Digital Elevation Models in Landscape Ecology. Invited lecture, GISLERS Summer School, 3 - 14 July, Salzburg, Austria.
(14) Eisank, C. and Drgu, L., 2009. Multi-scale analysis of slope gradient using local variance graphs. Poster. GI Forum Salzburg, Austria, July, 2009.
(15) Drgu, L., Strasser, T. and Eisank, C., 2009. Incorporating scale into digital terrain analysis. Poster. European Geosciences Union General Assembly 2009, Vienna, Austria, April 2009.

As foreseen in the proposal, Dr Drgu together with Prof. Blaschke and Dr Walz (Leibniz-Institut für Ökologische Raumentwicklung, Dresden) organised symposium: The third and fourth dimensions of landscapes within the European Conference of the International Association for Landscape Ecology (IALE) held in Salzburg in 14 July 2009. As outcomes of this symposium, one conference abstract has been published and a journal paper has been accepted:

- Drgu, L., Walz, U. and Blaschke, T., 2010. The third dimension of landscape: towards conceptual models of topographically complex landscapes. Landscape Online 22: 1-10, doi:10.3097/LO.201022.
2. Drgu, L., Walz, U. and Blaschke, T., 2009. The third and fourth dimension of landscapes. In: Breuste, J., Kozava, M., Finka, M. (eds.). European Landscapes in Transformation. Challenges for Landscape Ecology and Management. Salzburg, Bratislava, 356-357.
- Dr Drgu has taken a permanent position as a lecturer at the West University of Timisoara, Romania. He will develop further his research ideas through a research grant funded by the Romanian Research Council.

Ultimo aggiornamento: 14 Agosto 2013

Permalink: https://cordis.europa.eu/project/id/239312/reporting/it