

[Home](#) > [Journal](#) > [Earth & Environmental Sciences](#) > [JGIS](#)[Indexing](#) [View Papers](#) [Aims & Scope](#) [Editorial Board](#) [Guideline](#) [Article Processing Charges](#)[JGIS](#) > Vol.2 No.3, July 2010

OPEN ACCESS

Contribution of Topographically Explicit Descriptors of Landscape Measures for Application in the Vector Data Environment

PDF (Size: 2001KB) PP. 163-168 DOI: 10.4236/jgis.2010.23023

Author(s)

Jomaa Ihab, Auda Yves

ABSTRACT

Digital terrain models (DTMs) are not commonly used to integrate for landscape spatial analysis. Two dimensional patch/corridor/matrix models are prototypes in landscape spatial ecology analysis. Previous studies have motivated ecologists to integrate terrain models in landscape analysis through 1) adjusting areas and distance calculations prior computing landscape indices; 2) designing new indices to capture topography and 3) searching the possible relationship between topographic characteristics and vegetation patterns. This study presents new indices called Relative number of Topographic Faces (RTF) and Simplicity of topographic Faces (STF) that can be easily computed in a GIS environment, capturing topographical features of landscapes. Digital terrain model was first prepared and topographic units were extracted and installed in computing the suggested indices. Mountainous and rugged topography in Lebanon was chosen on a forested landscape for the purpose of this study. The indices were useful in monitoring changes of topographic features on patch and landscape level. Both indices are ecologically useful if integrated in landscape pattern analysis, especially in areas of rugged terrains.

KEYWORDS

Landscape Indices, Topography, Forest, Digital Terrain Model, Patch, Lebanon

Cite this paper

J. Ihab and A. Yves, "Contribution of Topographically Explicit Descriptors of Landscape Measures for Application in the Vector Data Environment," *Journal of Geographic Information System*, Vol. 2 No. 3, 2010, pp. 163-168. doi: 10.4236/jgis.2010.23023.

References

- [1] R. V. O' Neill, J. R. Krummel, R. H. Gardner, G. Sugihara, B. Jackson, D. L. DeAngelis, B. T. Milne, M. G. Turner, B. Zygmunt, S. W. Christensen, V. H. Dale and R. L. Graham, " Indices of Landscape Pattern," *Landscape Ecology*, Vol. 1, No. 3, 1988, pp 153162.
- [2] N. Lele, P. K. Joshi and S. P. Agrawal, " Assessing Forest Fragmentation in Northeastern Region (NER) of India Using Landscape Matrices," *Ecology Indicators*, Vol. 8, No. 5, 2008, pp. 657663.
- [3] I. Jomaa, Y. Auda, B. Abi Saleh, M. Hamze and S. Safi, " Landscape Spatial Dynamics over 38 Years under Natural and Anthropogenic Pressures in Mount Lebanon," *Landscape and Urban Plan*, Vol. 87, No. 1, 2008, pp. 6775.
- [4] M. Li, C. Huang, Z. Zhu, H. Shi, H. Lu and S. Peng, " Assessing Rates of Forest Change and Fragmentation in Alabama, USA, Using the Vegetation Change Tracker Model," *Forest Ecology and Management*, Vol. 257, No. 6, 2009, pp. 14801488.
- [5] W. Kong, O. J. Sun, W. Xu and Y. Chen, " Changes in Vegetation and Landscape Patterns with Altered River WaterFlow in Arid West China," *Journal of Arid Environments*, Vol. 73, No. 3, 2009, pp. 306313.
- [6] M. Sano, A. Miyamoto, N. Furuya and K. Kogi, " Using Landscape Metrics and Topographic Analysis to Examine Forest Management in a Mixed Forest, Hokaido, Japan: Guidelines for Management Interventions and Evaluation of Cover Changes," *Forest Ecology and Management*, Vol. 257, No. 4,

[JGIS Subscription](#)[Most popular papers in JGIS](#)[About JGIS News](#)[Frequently Asked Questions](#)[Recommend to Peers](#)[Recommend to Library](#)[Contact Us](#)

Downloads: 128,262

Visits: 272,988

[Sponsors, Associates, and Links >>](#)

- [7] I. Jomaa, Y. Auda, M. Hamze, B. Abi Saleh and S. Safi, " Analysis of Eastern Mediterranean Oak Forests over the Period 1965-2003 Using Landscape Indices on a Patch Basis," *Landscape Research*, Vol. 34, No. 1, 2009, pp. 105124.
- [8] E. J. Gustafson, " Quantifying Landscape Spatial Pattern: What is the State of the Art?" *Ecosystems*, Vol. 1, No. 2, 1998, pp. 143156.
- [9] B. Dorner, K. Lertzman and J. Fall, " Landscape Pattern in Topographically Complex Landscapes: Issues and Techniques for Analysis," *Landscape Ecology*, Vol. 17, No. 8, 2002, pp. 729743.
- [10] S. Hoehstetter, U. Walz, L. H. Dang and N. X. Thinh, " Effects of Topography and Surface Roughness in Analyses of Landscape Structure—A Proposal to Modify the Existing Set of Landscape Metrics," *Landscape Online*, Vol. 3, 2008, pp. 114.
- [11] R. T. T. Forman, " Land Mosaic: The Ecology of Landscapes and Regions," Cambridge University Press, Cambridge, 1995.
- [12] M. G. Turner, R. H. Gardner and R. V. O' Neill, " Landscape Ecology in Theory and Practice: Pattern and Process," Springer, New York, 2001.
- [13] K. McGarical, S. Tagil and S. A. Cushman, " Surface Metrics: An Alternative to Patch Metrics for the Quantification of Landscape Structure," *Landscape Ecology*, Vol. 24, No. 3, 2009, pp. 433450.
- [14] B. Traub and C. Kleinn, " Measuring Fragmentation and Structural Diversity," *Forstw Centralblatt*, Vol. 118, 1999, pp. 3950.
- [15] S. A. Cushman, K. McGarical and M. C. Neel, " Parimony in Landscape Metrics: Strength, Universability, and Consistency," *Ecology Indicators*, Vol. 8, No. 5, 2008, pp. 691703.
- [16] V. H. Dale and S. C. Beyeler, " Challenges in the Development and Use of Ecological Indicators," *Ecology Indicators*, Vol. 1, No. 1, 2001, pp. 310.
- [17] W. H. McNab, " Terrain Shape Index: Quantifying Effect of Minor Landforms on Tree Height," *Forest Science*, Vol. 35, No. 1, 1989, pp. 91104.
- [18] J. L. Ohmann and T. A. Spies, " Regional Gradient Analysis and Spatial Pattern of Woody Plant Communities of Oregon," *Ecological Monographs*, Vol. 68, No. 2, 1998, pp. 151182.
- [19] W. H. Romme and D. H. Knight, " Fire Frequency and Subalpine Forest Succession along a Topographic Gradient in Wyoming," *Ecology*, Vol. 62, No. 2, 1981, pp. 319326.
- [20] M. G. A. Kramer, A. J. Hansen and M. L. Taper, " Abiotic Controls on Long-Term Windthrow Disturbance and Temperate Rain Forest Dynamics in Southeast Alaska," *Ecology*, Vol. 82, No. 10, 2001, pp. 27492768.
- [21] F. J. Swanson, T. K. Kratz, N. Caine, R. G. Woodmansee, " Landform Effects on Ecosystem Patterns and Processes," *BioScience*, Vol. 38, No. 2, 1998, pp. 9298.
- [22] K. El Husseini and R. Baltaxe, " Forest Map of Lebanon at 1/50,000 Scale," Forestry Education, Training and Research Project, Green Plan, Lebanon. United Nations Special Fund/FAO, 1965.
- [23] MOA/MoE, " Landcover Map of Lebanon for the Year 1998 (MOS: Mode d' Occupation du Sol)," Prepared by the Lebanese National Council for Scientific Research (CNRS) Remote Sensing Center with the Collaboration of IAURIF (Institut d' Aménagement et d' Urbanisme de la Région d' Ile de France). LEDO Program, UNDP, Ministry of Agriculture and Ministry of Environment (Lebanon), 2002.
- [24] B. Hakim, " Recherches hydrologiques et hydrochimiques sur quelques karst méditerranéennes: Liban, Syrie et Maroc," Publications de L'université Libanaise, Section des études géographiques, Tome 2, 1985, p. 701.