

Classification of multiattribute objects in environmental research

Galant Katarzyna

Institute of Geodesy and Geoinformatics Wrocław University of Environmental and Life Sciences

katarzyna.galant@up.wroc.pl

Polonia

Introduction

Environmental investigations concern to many interrelated components and processes, which may be biological, physical, climatic, social etc. Whenever we attempt to analyse a chosen part of surrounding space, we are immediately confronted with complexity. Therefore, whether to make decisions related to space or make an assessment on natural environment conditions and prediction of its changeability, it is requisite to create models, which in their nature simplify reality as well as constitute comprehensive conception of research phenomena. Such models are inter alia maps presenting types of regions determined in taxonomical classification, which establishes relation between objects, reduces redundant information and synthesizes it.

Natural environment is characterized by abundance of heterogeneous data, from numerous sources, with different formats, resolution and qualities. Moreover many interactions between components of environment are non-linear what makes them difficult to interpret and predict. Hence data exploration is an important issue in the paper. Data taken into consideration have different reference units (land use data, erosion, relief etc.), therefore it is proposed to assume geometric units as objects that deliver particular information on chosen components of environment. The size of reference units is adjusted to the research area (Lower Silesia) and to the presentation of the outcomes in the form of cartographic models.

Objectives

Data on environmental features characterizes heterogeneity and complexity, therefore the introductory purpose is extraction of useful information and choice of environmental components which are directly connected with application of the research. The objective of performed taxonomy is determination of sub-areas which are similar when it comes to assumed conditions. The characteristics of homogenous sub-areas allow for their classification due to a direction of research. It has to be stressed that the analysis of source data may allow for hierarchization of delineated sub-areas with regard to aspects of interests.

Methodology

Efficient tools for data preprocessing delivers GIS software as well as statistical packages. Diagnostic features which complement each other delivering similar information should be eliminated from taxonomical classification. Hence the correlation between diagnostic features is examined – its strength and direction. The object which collects chosen characteristics is a geometrical unit of Temkart system. Choice of size of reference unit is a subject of distinct research. The grid-cell mode enables independence on data source i.e. uniformity of reference units. Classification is carried out with use of chosen taxonomical methods resulting in types of regions. There are several variants of classification which differ from each other in weighting ways. Moreover impact of the number of ‘clusters’ on types distribution and their characteristic is investigated.

Results

Various, depending on selected variant, maps of types are the result of taxonomical classification. The regional models of delineated taxonomical types constitute a basis for classification areas due to a particular purpose. Hence important issue is characterizing of types occurred within each sub-area. Furthermore cartographic models outcome from performed taxonomy may be used as a background for presenting other environmental phenomena or indices characterizing them.

Conclusión

Research presented in the paper bring a conclusion that maps of types are models which simplify at the same time present studied phenomena detailed enough, what enables to use them in environmental assessment and decision support. The important issue is gaining both simplicity of a model and conveyance of complete and reliable information. The issue is not only to determine types in taxonomical processes, but especially to analyse their internal characteristics that leads to classification of regions considering various assumptions which define the hierarchy.