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Identification and visualization of anomalous areas by using the cause-effect analysis of spatial data

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Application of cause-effect analysis to spatial data allows visualizing the areas which have been affected or may be affected by some natural phenomenon under study (f.i., formation of mineral deposits, landslides, earthquake, etc.). Primary data for performing the cause-effect analysis may be represented both by individual maps and some combination of maps at different scales, as well as by some combination of conventional and contour maps. The maps must include some areas with already known manifestations of the phenomenon under study. Mathematical tools underlying the cause-effect analysis are Boolean algebra operations and transformations as well as algorithms of the Boolean function minimization [1,2]. Software realizing the cause-effect analysis is an expert system with artificial intelligence capabilities [3]. The result of cause-effect analysis is a set of combinations formed by legend items. Depending on the aim of research, these combinations may be either favorable settings or hazard settings [4]. As any identified setting is related to unit area of a standard size and shape, boundaries of anomalous domains characterizing by these settings are determined rigorously and can be visualized on the result predictive maps. There are two ways of constructing these maps, based on using the different types of map legends. In one type, items of legends are the elements of source maps which form the identified anomalous settings, and in the other, the items are these settings whole. Depending on the number of anomalous settings which falls to unit area, it is possible to divide the anomalous unit areas into categories according to the intensity of possible manifestations of the phenomenon under study. Mathematical tools of cause-effect analysis provide the minimum size of anomalous domains which may be achieved on the base of given cartographic material.

References:

[1] Sirotinskaya S and Strieder A (2008) Lógica Matemática na Integração de Dados e na Modelagem. Ed UFRGS, Porto Alegre, Brazil, 282

[2] Sirotinskaya S (2011) Métodos de Lógica Matemática em Geociências. Ed. UFRGS, Porto Alegre, Brasil, 528

[3] Sirotinskaya S (2004) Natural Resources Research 13 (1): 17-28

[4] Sirotinskaya S (2014) In: *Mathematics of Planet Earth*: *Proc 15th Conference IAMG*: Springer: 167-170