A Knowledge-Based Approach to Raster-Vector Conversion of Large Scale Topographic Maps

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The scanned paper based maps in raster image format are suitable for humans, but geoinformatics prefer to use the properly converted, vectorized maps. The important topographic maps are already vectorized in most countries by a cumbersome, manual procedure. However, the task of raster-vector conversion of paper based maps will not become obsolete within the next few years. Newly issued maps and the updating of old ones will still require this activity.

In the IRIS project the authors have elaborated the theoretical background of a raster-vector conversion system, and they have developed the prototype of some components of the system. The aim of the development is to automatize the raster-vector conversion as much as possible. This goal puts an emphasis on the knowledge based approach. This article will focus on the automatic recognition and conversion of the three main types of map symbols, to improve the efficiency of the recognition system.

Point-like symbols are small icons each representing a real object (e.g. a monument). The recognition algorithm tries to identify these symbols based on given symbol patterns. Each connected pixel set under a given size limit will be matched against the data base of patterns.

Surface-like symbols cover a region with a solid color, or with a pattern (e.g. lake or scrub). The procedure first determines the smallest repetitive part (kernel) of the texture which can be identified by the algorithm used for point-like symbols.

In order to identify linear symbols (e.g. roads, railroad) both line style and topology must be recognized. To determine topology a graph is created using the end- and fork-points of the road-like graphics.

Currently, the automatic recognition of some kinds of map symbols (e.g. texts) is beyond the scope. Thus, the vectorized coverage generated automatically does not contain all of the elements occurring on the original raster map. Furthermore, the algorithms used for recognition provide the possibility for human expert's intervention in the case of false detection.

An important point in the expertise of human interpreters is, for example, the knowledge of the order of map layers they have been printed in. The inclusion of this knowledge would make the conversion much more intelligent.

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