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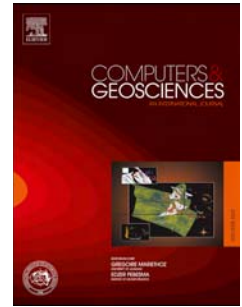
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A continuous scale-space method for the automated placement of spot heights on maps

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Abstract

Spot heights and soundings explicitly indicate terrain elevation on cartographic maps. Cartographers have developed design principles for the manual selection, placement, labeling, and generalization of spot height locations, but these processes are work-intensive and expensive. Finding an algorithmic criterion that matches the cartographers' judgment in ranking the significance of features on a terrain is a difficult endeavor. This article proposes a method for the automated selection of spot heights locations representing natural features such as peaks, saddles and depressions. A lifespan of critical points in a continuous scale-space model is employed as the main measure of the importance of features, and an algorithm and a data structure for its computation are described. We also introduce a method for the comparison of algorithmically computed spot height locations with manually produced reference compilations. The new method is compared with two known techniques from the literature. Results show spot height locations that are closer to reference spot heights produced manually by swisstopo cartographers, compared to previous techniques. The introduced method can be applied to elevation models for the creation of topographic and bathymetric maps. It also ranks the importance of extracted spot height locations, which allows for a variation in the size of symbols and labels according to the significance of represented features. The importance ranking could also be useful for adjusting spot height density of zoomable maps in real time.

Keywords: scale-space, spot heights, soundings, map generalization, terrain mapping

1. Introduction: placing spot heights on maps

Spot heights are included in topographic maps to quickly and accurately ascertain the elevation values of points on a terrain surface. For locations below sea level, spot heights are referred to as depth points or soundings. For important summits and mountain passes, the name of the mountain or pass is commonly placed next to the spot height symbol in addition to the elevation. To indicate the relative importance

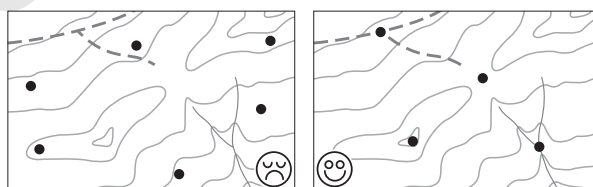


Figure 1: Poor and good placement of spot heights (after Spiess, 1996).

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