

Analysis of Relief Shading Tools and Methods for Terrain Representation

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Abstract:

One of the key roles in map creation belongs to terrain representation. Relief shading is a traditional manual technique allowing users to perceive the terrain in an intuitive and naturalistic way. With the advent of digital elevation models (DEM), analytical relief shading came into a wider use, since it is faster, requires less effort and delivers reproducible results. In contrast to manual relief shading, it often lacks clarity when representing heterogeneous landscapes with diverse landforms though. The goal of this ongoing project is to identify which relief shading techniques are suitable for depicting specific landforms.

Techniques developed over time to surmount this limitation mainly include (but not limited to) terrain generalisation, light direction adjustments, contrast enhancement and terrain segmentation. Each of numerous methods is usually applied and performs better in a particular landscape and does not consider possible landscape diversity within an area hillshading is generated for. Thus, it is necessary to detect the right combination of tools and parameters providing the best results regarding the visual quality in each landscape type and to find a correlation between those methods and landforms they are applied to.

In the frame of this project, existing methods to automatically perform relief shading are initially tested on sample areas. Having miscellaneous landforms within sample areas and rendering them in the best possible way leads us to understanding which features analytical hillshading has to inherit from the manual one. It is planned to generate shaded reliefs using different techniques and to show them to cartographers and laymen worldwide via an online survey to define which combination of tools and methods consistently provides better results in terms of visual quality in each landscape type. A large number of participants should minimise the subjectivity peculiar to relief shading depiction. As the project involves both laymen and specialists, the survey is complemented with an extra section of questions for specialists with a higher weight in the final feedback evaluation based on their deeper knowledge of the subject.

Analysis of participants' feedback is meant for creation of a series of rules to be applied to specific landform or landscape type. For landscape features the range of qualitative and quantitative parameters is used (e.g. DEM derivatives). Besides, the resulting shaded reliefs are also compared with the Swiss Federal Office of Topography manual shaded reliefs at different scales. As a result, a direct correlation between the values of landscape features and visual quality of relief shading is provided.

Finally, it can be seen that a particular combination of tools and methods is ideal for a landscape type based on the level of its geomorphological complexity. This should give users a possibility to improve the automatically produced relief shading as a whole, to adjust its parts if different landforms are present, or to bring more focus to those landscape features that were not revealed by automatic hillshading.

Topics:

T18 Mountain Cartography

T23 Topographic Mapping