COMPUTER AIDED RELIEF SHADING

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Since computers are capable of handling large data sets, attempts with analytical relief shading were undertaken and associated algorithms were constantly improved. Unfortunately, currently available programs almost completely ignore the rules and guidelines that were developed for manual relief shading. This paper highlights certain aspects of a computer program that enables the user to interactively edit the relief shading.

During the manual production of shaded reliefs, the terrain is cartographically generalized by means of local adjustments of the drawing. The goal of this process is to emphasize important landforms and to accentuate or weaken details in function of their importance. For this purpose, light direction is locally adjusted and hillsides are darkened or brightened, depending on their relative importance on the entire map sheet. To simulate the third dimension on the two-dimensional map sheet, contrast is adapted to elevation. This imitates aerial perspective, the effect due to haze, lowering the contrast of remote mountains. Moreover, a bright tone is assigned to flat areas, in order to avoid veiling of these densely occupied areas.

The program presented offers the possibility to designate subareas and to provide them with their own parameters for the calculation of the shaded relief. These subareas are delimited by polygons, which are structured in layers. In order to achieve smooth transitions at the limits of these subareas, the program automatically constructs a second polygon inside the first one and interpolates the parameters between these two boundaries. As in the case of manual shading, light directions can be adjusted, and brighter gray tones can be assigned to flat areas. Additionally, subareas can be vertically exaggerated to emphasize relief depiction. Examinations were carried out with relief shading neglecting the terrain’s slope relying only on the exposition to the light direction. This type of calculation provides better results for mountainous sections than Lambert shading. Furthermore, the program offers the possibility to adjust the contrast hypsometrically, in order to simulate aerial perspective. The algorithm identifies points in hillsides of a certain minimum slope and length and determines their relative position within the hillside. This information is used in combination with an orientation toward the light direction to calculate an adjustment of the contrast.

The implemented algorithms enable us to simulate working procedures developed for manual relief shading. However, shaded reliefs produced with the program presented here, do not achieve the quality of fine hand shadings. Nevertheless, their quality surpasses standard, digitally shaded reliefs, and are useful as a basis for a variety of digital topographic and thematic maps.

Keywords:
Shaded relief, hill shading, computer assisted cartography, digital elevation model, local adaptations of light direction, hypsometric correction, vertical exaggeration of elevation data, gray tone for flat areas, exposition based shading.