P-008

CONCEPTS OF TERRAIN REPRESENTATION FOR MOBILE MAPS OF HIGH MOUNTAINOUS AREAS

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The most significant challenge in mobile map design is how to efficiently use small display devices (Ulugtekin, Dogru 2007). Comparing to widespread car navigation maps, maps used by mountain hikers are not so popular, have less usability and are produced only for popular mountain destinations. They are usually in raster format which is not compatible with all common touristic GPS devices and of little applicability in terms of navigation (Sarjakoski, Nivala 2005). On the other hand, rare examples of vector maps seem to have scantier content than the raster ones. In case of relief representation vector maps are usually limited to contours, drainage network and main peaks, barely sufficient in high mountain conditions. In this case, a problem of small display cartography is loss of spatial context distinctive for traditional maps, with a consequence that a mobile map user is missing important information which normally he would subconsciously read from the map context. Therefore some proposals to improve vector mobile maps are suggested in this poster. The presented work is a part of the PhD research which aims at elaboration of effective methods of land cover and relief features extraction from remote sensing data and their cartographic representation.

In mountainous environment it is worth to give users a product which is at least as well readable as traditional maps. Contours are the most important elements of the cartographic terrain representation and the only one that determines the geometry of relief forms (Imhof 2007). Therefore, contour intervals for each zoom level should be chosen purposefully. Contours allow to read not only elevation but also slope gradients; therefore contour density should not change visually while zooming in / out, providing the same visual perception of slope gradients for respective areas. This effect can be achieved by maintaining a constant ratio of scale and contour interval for each zooming level, according to the equation:

$$i_2 = (M_2/M_1)*i_1$$

where: i – contour interval, M – scale denominator.

For example, if we decide to use a 50 m contour intervals for scale 1:100 000 (after Imhof 2007) we receive correspondingly: 1:50 000 – 25 m, 1:200 000 – 100 m (fig. 1).

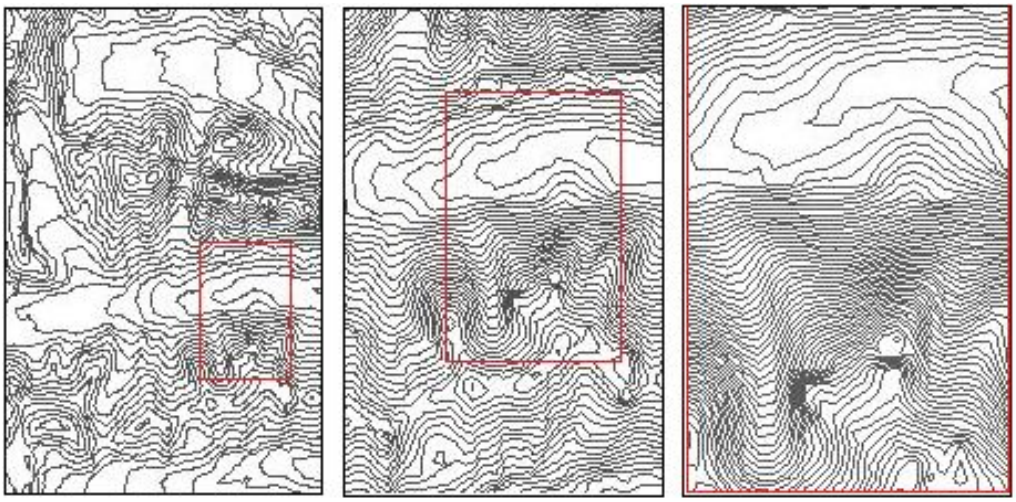

Figure 1. Slope gradients represented with various contour intervals for scales: 1:200 000 (left), 1:100 000 (middle), 1:50 000

Contours are not efficient to visualize steep rock areas which normally require special methods of presentation by means of rock drawing, e.g., using vector-based features. This option should not be omitted in mobile maps. Assuming that rock drawing is applied to areas with slope gradient higher than 55° (Klimaszewski 1978) additional quantitative information is delivered to the map user.

The next improvement could be the differentiation of contour colors according to slope gradients for selected areas. The most valuable information which might be provided in this way would be distinguishing of the avalanche-prone areas (in terms of slope gradient; 30-50°; Fyffe and Peter 1990).

Another example of contextually obtained information which can be lost in a small display are locations of terrain skeletal lines. These features (like ridges, valleys) could be added to maps besides contour lines. Furthermore, in the small zoom (e.g. in scale smaler than 1:200 000) the skeletal lines could completely replace contours as more legible and pictorial.

Next, having only a short set of contour lines displayed on screen, user can hardly find out where a slope is declining. The suggested solution is a down-slope indicator which could be placed on some contours to show downward direction (fig. 2).

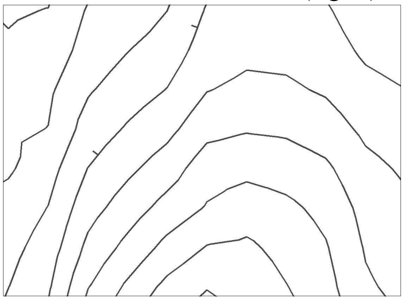

Figure 2. Set of contours with down-slope indicators

Finally, additional vector features like peaks, passes, gullies, screes should be added to complete relief data and help in navigation.

The described ideas should improve terrain representation of high mountain areas on mobile maps and will be fully presented at the proposed poster.

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