New approaches in mountain maps

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Abstract
Paper presents possible directions of future maps for outdoor use, especially for mountaineers. Different small screen electronic devices, direct access to internet and remote databases are some of possible substitutes for paper maps, which can also be prepared more realistic and user friendly like traditional ones. Some examples of possible future maps are presented in the paper, some of them have been also presented to the potential users in the internet questionnaire and it brought interesting user's opinion about proposed map design.

Keywords: mountain maps, map design, small screen maps, user opinion

1. Introduction

Traditional paper maps are still the most attractive spatial data presentation's media for the majority of outdoor users. But, contemporary mobile telephones, palm computers and other small and portable devices offer new possibilities, like presentation of colour images on small screen, combination with GPS data, interactivity, links to remote datasets etc. Many mountaineers want to make the whole trip preparation on computer and then just print the selected area with selected additional information. All these make strong demands to cartographers to prepare some totally different types of terrain presentations or at least adept existing maps for different type of use. Yet nowadays traditional paper maps can be quite different like ones from 10 or 15 years ago, computer technology offers better and more user oriented design and content. The same source data should be also used for maps prepared for computer screen use. These maps have to be slightly different, they should include user's interactive interventions, allow three-dimensional views, navigation with pan and zoom, multimedia and dynamical possibilities. Finally, maps for small screens have to be designed different; since the screens are very small, only images with few pixels can be designed.

2. View direction

Mountaineers and other tourist map users mostly use two different types of maps: vertical, ground-plan maps (traditional 2D) and perspective panoramic maps. The first group is more convenient for route planning and orientation in the terrain, while panoramic maps offer better general overview, especially for les skilled map readers. But, these are not the only possible types of views. Basically, we have two different types of looking on a scene: orthogonal and perspective. According the angle between horizontal plane and view direction three typical situations appear: vertical view, parallel view and (most general) incline view. Combining type and direction we get six different views (Petrovic, 2001), presented in figure 1. Upper figures (in black) present regular grid in a horizontal plane (heights set to zero) while lower figures (in blue) represent real terrain model, presented by regular grid.

In general three of those presented typical views are useful in cartographic presentations: orthogonal vertical view for ground plane (traditional 2D) maps, orthogonal inclined for various panoramic maps, and perspective (either parallel or inclined, since there are no real difference), but sometimes also other views

offer information of specific interest and can be used for presentation. Orthogonal vertical view is the only one that allows complete measurements, both horizontal coordinates and heights, if the terrain is presented with contours. The lack of vertical view is poor direct height presentation especially for less skilled map readers. But, for the huge majority of tourists the map is more then less souvenir, on the terrain they follow marked tracks and way-posts, usage of map and compass in the terrain is reserved for minority of skilled map users. Therefore we have to think, how important map measurements for map users are, indeed.

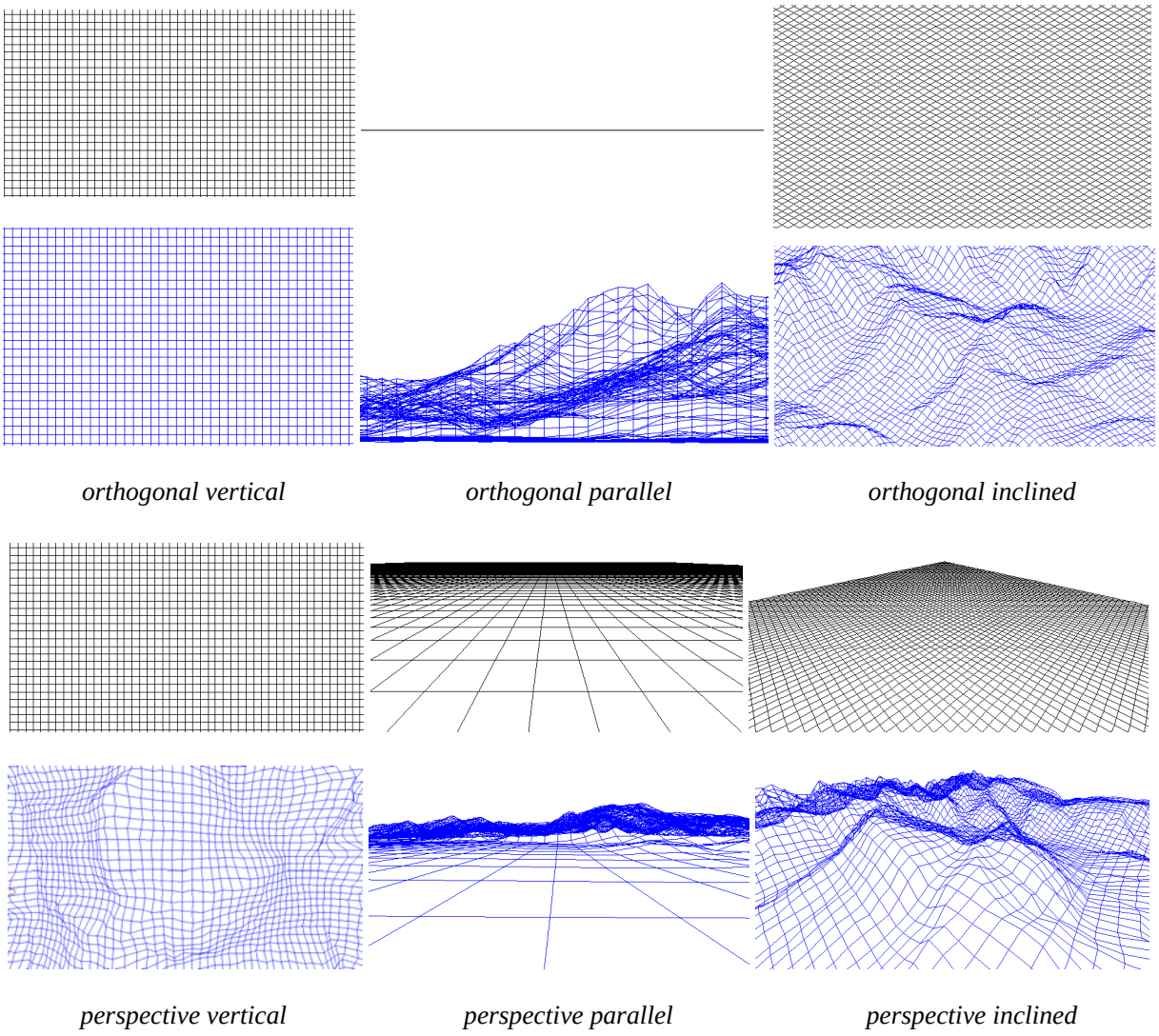

Figure 1: Regular horizontal grid and terrain model as grid, presented by six typical views

To find out, how different views can fulfil users needs we prepared an internet questionnaire about possibilities of getting numeric data from different perspective views (Masera, 2004). As examples three different perspective presentations have been prepared: topographic map, draped over DTM, an orthophoto image, draped over DTM and 3D symbolic presentation (figure 2). We have asked different map users, how they could use these three kinds of perspective view for similar purposes like they use 2D maps: defining distance direction and height difference between two points and through selected track and recognition of particular point, linear and area-type objects. The questions were mostly general and therefore we didn't expect any surprising results. Invitations for fill in the questionnaire have been sent to many map users and we got relatively good response that would have lead to reliable results. 430 persons visited the page while 119 answered to questions. More than half of them (55%) were mountaineers, about fifth (21%) scouts and 12% spatial planners. 26% of participants were geodesist, 9% were geographers, the others had different occupations. In generally participant gave quite positive evaluation of presented 3D presentations. Draped

topographic map has been recognised almost as adequate for height or direction measurements as traditional 2D topographic map, while distance measurements bring more problems. The other two examples were evaluated nearly equally, they gave only limited accessibility for proposed measurements. Possibilities of recognition particular objects gave different order. Although the users are familiar with 2D topographic maps and therefore they know symbols presented particular objects in draped topographic map, users found 3D symbolic presentation as much suitable for recognition majority of proposed objects. Draped orthophoto was graded the worst, of course.

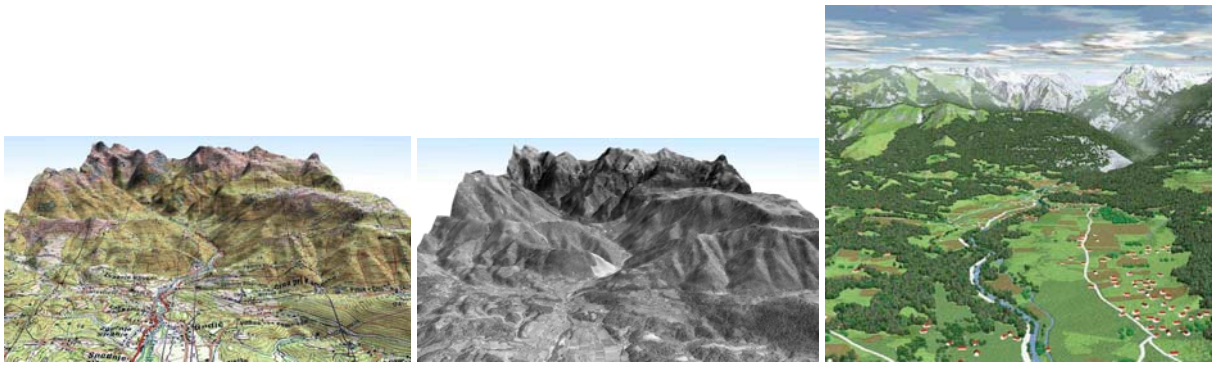

Figure 2: Three perspective presentations

3. Improvements of traditional 2D maps

Traditional 2D paper maps have been developing from the very early years of human existence, while from renaissance this development is continued. Last changes in 2D paper maps were brought by involving compute technology in paper map production. Computer made maps have better and especially more homogeneous graphical quality, in most cases also geometrical accuracy could be better. Geometrical accuracy is not very important for majority of users, indeed. We are trying to prepare 2D paper maps, which can be useful and interesting for as wide range of users as possible. Figure 3 shows two examples.

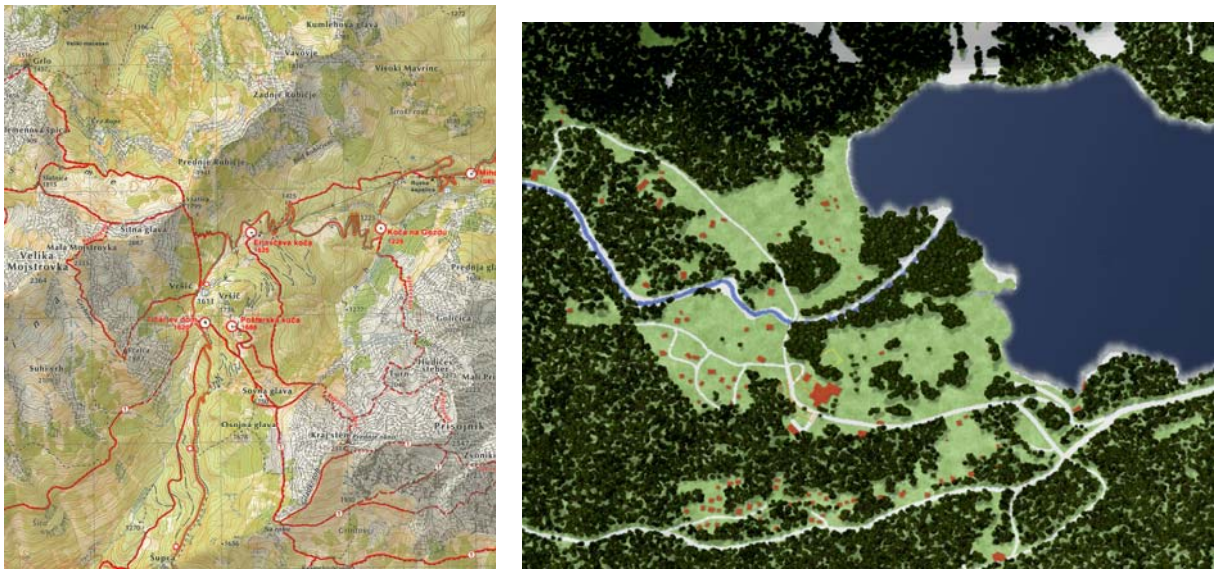

Figure 3: Mountain map Mangart 1 : 25 000 and test map of Lake Bohinj

Mountain map Mangart is the first map of new series of a “large scale” mountain maps in Slovenia. Although the map holds really a lot of contents we tried to put them into different levels. Less skilled users can easily recognise main roads, marked mountain paths, vegetation areas, important topographic names and

hill-shading, which gives the general impression of height character. Other contents, mostly important for map measurements and detailed terrain orientation, like contours, grids, and unmarked paths are unaccented.

The other example is by now only an insert of planed mountain map of Lake Bohinj and surroundings (Miklavcic, 2004). It will be much more oriented to realistic presentation of object and phenomena, like it is usual on panoramic maps. But due to traditional vertical view this map will preserve all map measurements quality.

4. Small screen maps

Probably the biggest disadvantage of any screen maps regarding traditional paper maps is limited format. Paper map in huge format, e.g. B1 or similar, offers users both general overview and detailed interpretation of selected area. In computer screen we have to zoom in and zoom out to complete both tasks. With nowadays computer screen resolutions, which are at least 1024 × 786 pixels this in possible in few steps. In the terrain even notebook is not suitable and users are more oriented to small screen devices, which can present spatial data or even maps. Small screens are raster colour screens with colour depth at least 256 colours and size less then 320 × 320 pixels (usually 180 × 180 pixels). If the size of pixel is 0.25 mm, the size of screen is 45 × 45 mm. In the group of small screen devices we can find pocket computers, mobile phones and GPS receivers. For terrain navigation GPS receivers are the most useful, but on the other hand they usually have smaller screens like pocket computers or mobile phones.

The GPS receivers offer three ways of use (figure 4). The easiest one is just reading the coordinates of current position and manually finding this position on the map. Vector lines data on the screen enable simple route finding and navigation along lines, while presentation of complete map offers complex orientation in the surroundings. On figure 4 presented map's insert with size of 176 × 220 pixels is an example of city map, prepared for small screens, while an insert of mountain map consists of 900 × 890 pixels. The size is much bigger and such raster map can be used only on small screen devices that allow panning of the picture. Both examples of small screen maps were prepared as a part of diploma work (Bubic, 2004).

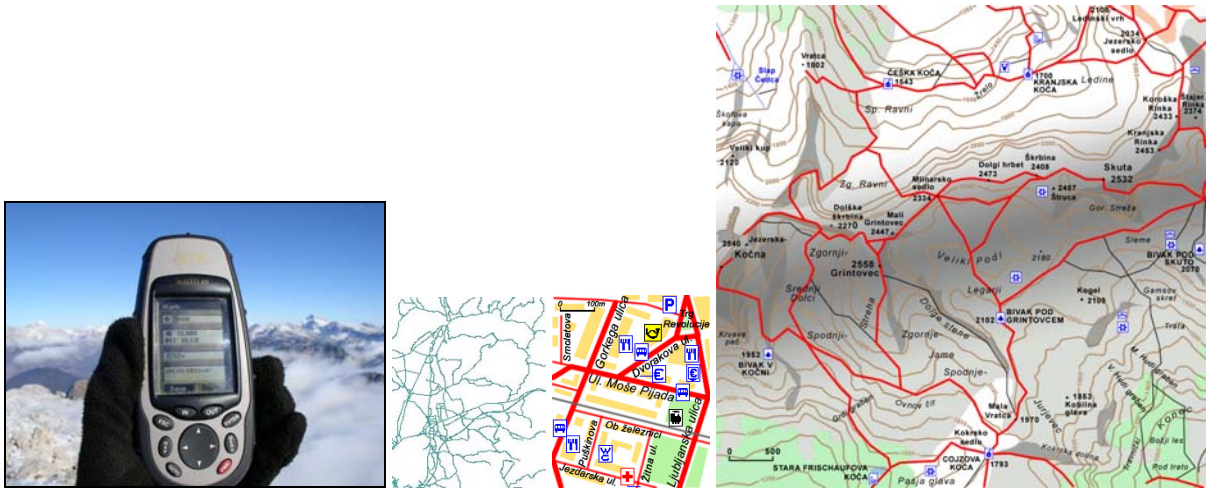

Figure 4: Presentation of spatial data on small screen – coordinates, vector lines, city and mountain map

5. Interactive and dynamical maps

Using interactivity, multimedia and dynamical effects we can efficiently overtake the lack of limited format in screen maps. Figure 5 presents interactive mountain map, prepared for internet use (Mahnic, 2002). The map shows the central part of Grintovci, mountain ridge north of Ljubljana. Users can zoom and pan the map, select layers of content, find mountain peaks, huts or other points of interest and finally, make same measurements. Presented interactive map was made only as an example and by now is available at any wide accessible internet sites.

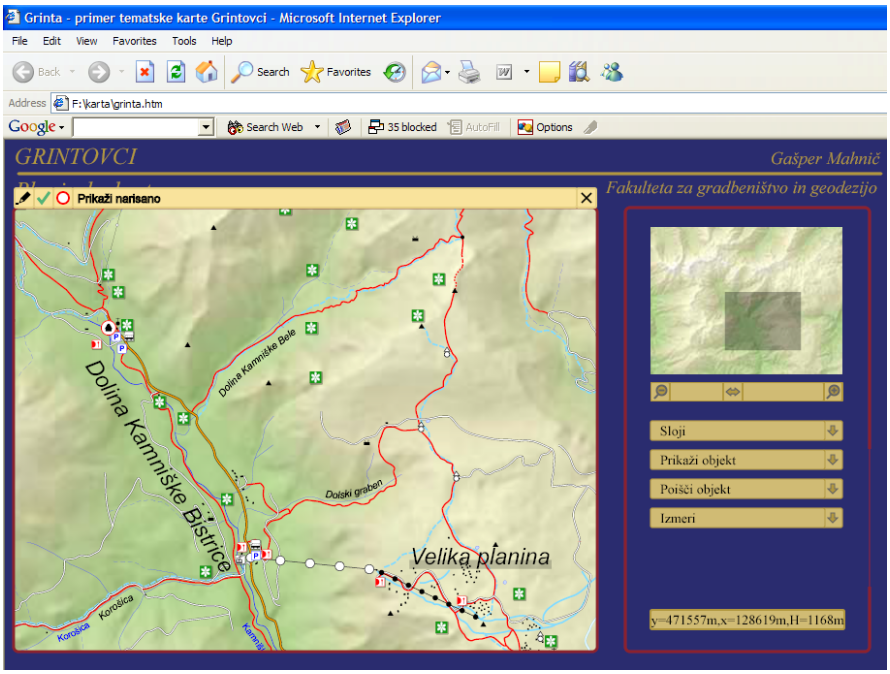

Figure 5: Interactive mountain map of Grintovci

Figure 6 shows four scenes of dynamic map of Italian and Austrian troupes' movement in 11th battle in Soca battle line during World War One, one of the world's bloodiest battles in the mountain area. This very interesting dynamic presentation is prepared also as an example of time space cube, where time is presented as third dimension in 3D presentation (Kuhar, 2004).

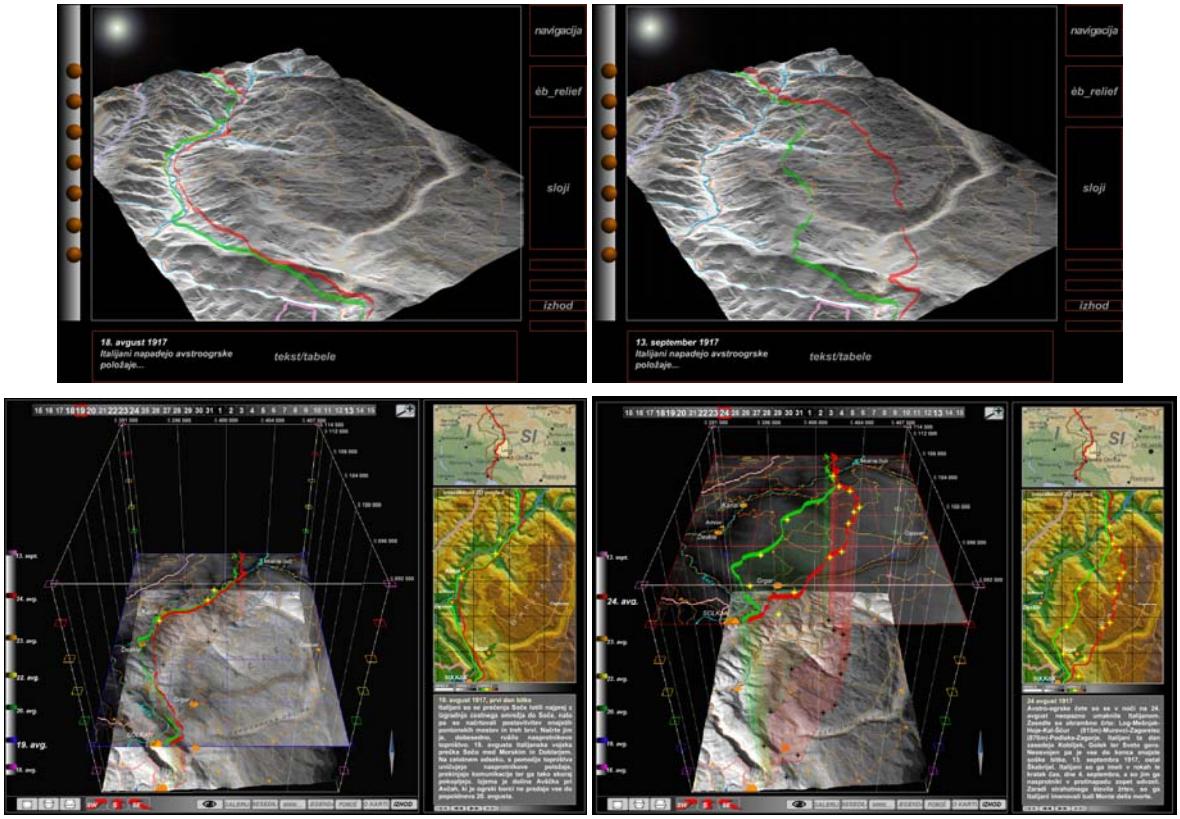

Figure 6: Scenes from dynamic map of 11th battle in Soca battle line

6. Conclusion

Paper presents different attempts which can improve nowadays mountain and similar maps and make them more users friendly. As it is obvious from the paper, the activities go in many possible directions. At that moment the majority of explained attempts are not completed yet and we are looking forward to get as useful users response as possible.

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