

NEW MAP GRAPHICS OF TOPOGRAPHIC MAPS OF THE REPUBLIC OF CROATIA

Stanislav Frangeš

University of Zagreb, Faculty of Geodesy
Kačićeva 26, 10000 Zagreb, Croatia
sfranges@geodet.geof.hr

Aleksandar Tonšetić

State Geodetic Administration
Gruška 20, 10000 Zagreb, Croatia

Robert Paj

Institute for Photogrammetry
Borongajska 71, 10000 Zagreb, Croatia
robert.paj@zg.tel.hr

Abstract. *In the Republic of Croatia, new topographic maps are just being produced, primarily at the scale of 1:25 000. The Military Topographic Map is being made for the Ministry of Defence according to the existing manual "Topographic symbols" from 1993. For civil needs, the Topographic Map is made at the scale of 1:25 000 according to the new, officially not yet adopted collection of symbols "Map Key" from 1998. The paper points out the importance of changing the map graphics of topographic maps according to the modern communication and visualisation of space.*

Keywords: map graphics, topographic map of Croatia

1. INTRODUCTION

Larger changes in the design of map graphics start mostly with the production of new map products, however, the changes are more or less limited by the tradition, the need for harmonisation of symbols on map products in a single state and by the need for standardisation within the international frame. The map graphics has proved itself as very successfully by being easily understood and remembered, as well as by its further usage in map products which is to follow in the future leading to the so much necessary standardisation of map graphics on official maps.

2. MAP GRAPHICS

Map graphics is a special way of presenting spatial objects. It is a system of symbols consisting of map symbols and of mutual relationship of symbols (syntactic dimension), the relationship of symbols according to the presented objects (semantic dimension) and the relationship of a user according to the symbols (pragmatic dimension).

Today the map graphics can be realised with the help of computers in at least equal or even higher quality than the one made with manual or photomechanical procedures. The usage of modern hardware and software yields a series of new possibilities.

2.1. Ingredient parts of map graphic on topographic maps

There is a great quantity of information presented on topographic maps relating to real, visible, general geographic or topographic objects. Relief features, water bodies, vegetation, settlements, traffic routes and borders are equally important on topographic maps.

The map graphics on topographic maps contains basic geometric and graphic elements: points, lines and areas, and the map signs that we call symbols when they are applied for the presentation of object position and quality. The map graphics includes furthermore: rasters with half-tone being their special case that can be used for clear presentation of relief features, then as an independent element it must include colour and obligatory lettering for the description and titles of objects on a map (Fig 1).

M A P			G R A P H I C S		
↓			↓		↓
basic geometric and graphic elements			map sign		raster
					colour
					lettering
point	line	area	symbol	diagram	half-tone

Fig.1. Ingredient parts of map graphics

2.2. General demands posed upon map graphics

Before the consideration and making of demands has commenced, one should reflect upon our experience of a map or upon what is necessary to experience a map. This question touches the essence of cartographic communication itself. According to Uçar (1979), map is a visually very clear and to a certain extent intuitive model of space. Cartographic communication is graphical and visual communication.

Hence, the sight is one of the most important bonds that connect us with the environment, it is man's bond with the world. In map usage, the sight and its possibilities or limitations set certain conditions, regardless whether the maps are in analogous or digital form. These conditions will be the most important in the case of making demands in map graphics.

The formation of map graphics can also be, according to Bos (1984), influenced by special circumstances in which a map will be used. These are: the distance from which the map is observed, i.e. normal reading distance or observation from greater distance when the map is hanging on some wall; available time for studying the map, i.e. whether we have enough time for observing the map or whether it is intended for quick orientation, further on, the question whether the map is observed at day light or under special light and similar.

It should be considered in this case that the sense of sight is created on the basis of received impulses as completely psychic event experienced individually. In order to have the sense of sight become the experience of sight, some higher psychic function should be involved as well, as for example memory, abstraction and similar. Hence, it can be concluded that we actually “watch” with brain (Knizhnikov, 1997).

In “classical” manual of cartography, as for example are those written by Peterca et al. (1974), Lovrić (1988), Hake and Grünreich (1994), Robinson et al. (1995) or Frančula (1999), various demands are stated that the map graphics should meet. The following three demands can be therefore demanded:

- legibility
- easy reference
- accuracy.

Apart from that, the map graphics should meet also the demands that can be posed upon any graphic presentation, including the map. The following is of the greatest importance for the map graphics:

- clearness
- aesthetic quality
- reproducibility.

Each of the above stated demands can be carried out on single ingredient parts of the map graphics, but it is much more adequate to do it through their purposeful combining. It has quite certainly much greater importance for the formation of the efficient map graphic, and thus also for the map appropriate to the user. In my researches (Frangješ, 1998) I have laid down the conditions that should be fulfilled in order to meet the demands made on map graphics (Fig. 2).

	M	A	P	G	R	A	P	H	I	C	S	
	↑	↑		↑		↑		↑		↑		↑
LEGIBILITY	CLEARNESS	ACCURACY	PLAINNESS	AESTHETIC	REPRODUCIBILITY							
- minimal sizes	- simplicity	- positioning accuracy	- symbolism	- harmony	- quality conditions							
- graphic density	- contrasting quality	- accuracy signs	- traditionality	- beauty	- economical							
- differentiation of known features	- layer arrangement		- hierarchic organisation									

Fig.2. Demands posed upon map graphics and conditions that should be fulfilled in order to meet these demands

3. INFLUENCES ON MAP GRAPHICS

The new map graphics is principally connected only with the modern technology of digital mapping. In spite of the new era of geographic information systems and of the new purpose and usage of maps, one should not forget the significance of cartography and map usage before the computers started to be used. One should especially not neglect the inherited spectre of completely established means of cartographic presentation and thoroughly created means of cartographic expression that have valuable sources and origins (Wood, 1994).

Looking through the history, the topographic maps for the territory of Croatia, being first original manually drafted, and then by printing reproduced maps, have reached the quality of very high level. The means of cartographic expression, spatial determination, scale, model symbol systems, accuracy and integrity and aesthetic quality have got very high level of quality on maps, but all that is adequate to the classical photomechanical procedures of map production. In the last decade the digital ones have largely replaced these procedures.

The map graphics is changing under the influence of the spirit of time, further under the influence of geoinformation systems and with regard to the map usage. So far, the map graphics of topographic maps has been in accordance to the classical photomechanical mapping procedures. Today, when the digital procedures are used, it should be changed. Because of the above mentioned influences it is necessary to set the principals of new map graphics that will be completely in accordance with the modern communication and space visualisation.

3.1. Current state of map graphics on topographic maps of the Republic of Croatia

So far the map graphics has been adequate to classical photomechanical cartographic procedures, but today, when the digital procedures are used, it should be changed.

In the Republic of Croatia the Military Topographic Map is made for the purpose of the Ministry of Defence at the scale of 1:25 000. The map graphics applied on these maps is determined according to the existing manual "Topographic Symbols on the Maps at the Scale of 1:25 000, 1:50 000, 1:100 000 and 1:200 000" (Križovan, 1993) that has been in analogous and digital form. By comparing this map key with the key of the Military Geographic Institute from 1981 it can be concluded that there is no difference in map graphics. The manual encompasses 327 symbols and 3 types of letter, and it has been realised by applying 7 colours. The difference is in naming and explaining single objects in accordance with the Croatian language.

For the civil purposes the Topographic Map at the scale of 1:25 000 is made to serve the needs of the State Geodetic Administration according to the new, officially not yet adopted collection of symbols "Map Key for Topographic Map 1:25 000" (Institute for Photogrammetry, 2000). According to this suggestion they have created partly because of catalogue of objects containing new objects, and partly for the needs of digital mapping and technology of GIS, 43 completely new signs, a 9 of them have been remarkably changes with regard to the symbols from the "Topographic Symbols" of 1993. Figure 3 shows some of newly suggested symbols.

For the purpose of making a new, more thorough and more complete Croatian collection of map symbols, it is necessary to study and examine the existing collections more thoroughly as it has been done partly in the work by Lovrić (1980), Frangeš et al. (1987), Frangeš and Lovrić (1997), Frangeš and Poslončec-Petrić (1998), Frangeš and Mastelić-Ivić (1999) and others. The participation of other various experts will be very important in it as well: linguists, geodesists, topographers, geographers, cartographers, military experts and many others.

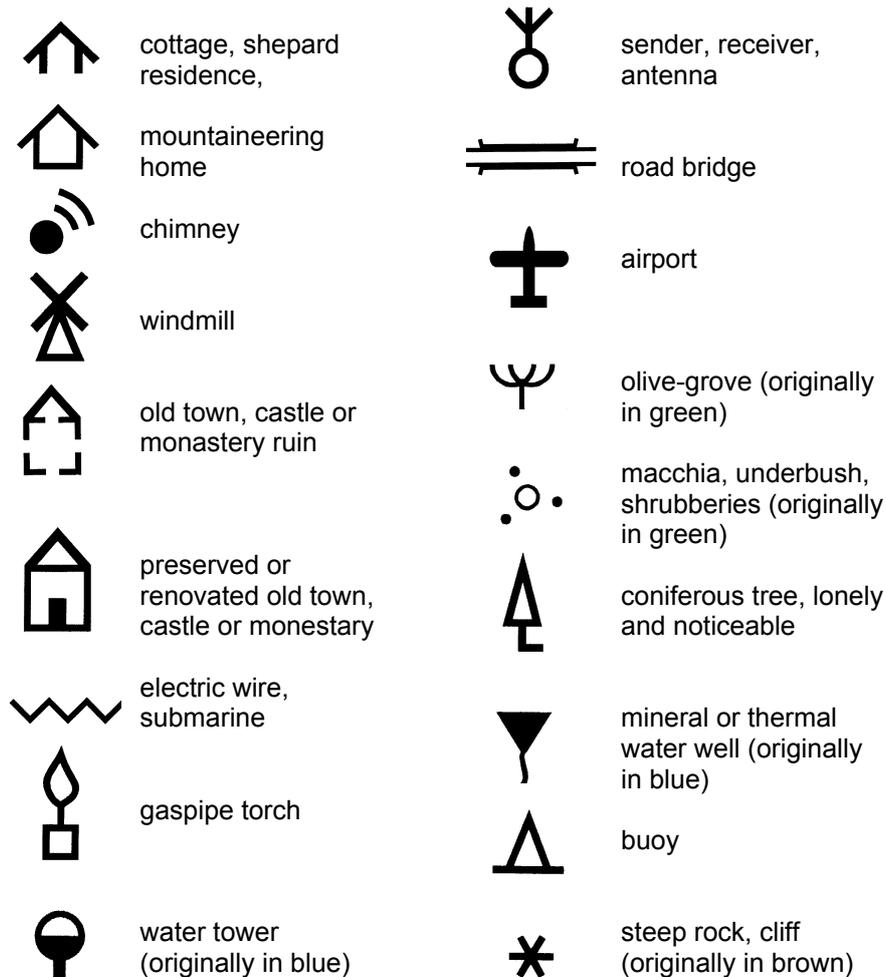


Fig. 3. A selection of newly suggested symbols according to the proposal of the “Map Key for the Topographic Map 1:25 000” (Institute for Photogrammetry, 2000), enlarged approximately 5 times.

4. TEST MAPS

The production of test maps is always a certain challenge. Namely, there is a certain degree of distrust and objection appearing towards test maps on which the map graphics has been changed considerably as compared to the one existing so far. Those who stick to the preservation of the old or to the establishment of the surviving achievements will take such maps as dangerous being new and as an unnecessary step into the unknown. Those who tend to carry out more radical changes will notice that map graphics should have been changed even more. If smaller changes of map graphics are carried out on test maps, the critics will be directed mostly on the account of too small operations done.

The test maps are indispensable as the evidence of successfully made research and analysis. Figure 4 shows some of test maps. Their production was intended for achieving at least some of the aspirations referring to the changes of map graphics and deriving from the demands made before:

- appropriate legibility due to the enlargement of minimal sizes, but not visually at the expense of graphic density, and due to the application of known features;

- clearness due to the fulfilment of the conditions referring to the simplicity, contrasting quality and layer arrangement which is not possible to be checked completely because only the cut outs, and not entire map sheets characterised by the clearness, have been made;
- accuracy due to the control of positioning accuracy referring to the pattern and due to the consistent following of accuracy signs;
- appropriate plainness due to the fulfilment of the demands of symbols, especially by symbols and colour, due to the traditional behaviour and hierarchic organisation of map graphics, with special attention to the creation of the series of symbols from the basic form and to the length of symbols;
- aesthetics due to the realisation of harmony, to the accordance of all applied elements of map graphics and the beauty, due to the symbols and the selection of colours, and to the typography;
- reproducibility due to the fulfilment of the quality conditions with the special emphasis on the resolution, due to the preparation for the six-colour print (CMYK + grey for shadows + brown for contour lines). This wish has been most badly realised because of the technical and material possibilities (Frangješ, 2000).

Good map graphics with adequate resolution, well-defined symbols, harmonious usage of colours, good legibility and optimally placed titles and optimal graphic density attracts users and gives them more information more quickly. Thereby it is especially important to apply colours systematically, e.g. according to the principle of similarity with the real situation in the nature or by adopting symbols. Also, the same objects should be presented in the same colour, different colour intensity should be associated according to the importance of an object etc. The appearance of symbols should be almost perfect, because with their ability to express and save space on the map they can replace the presentation similar to a plan with a description or they can intervene with additional information. Map symbols can vary differently, e.g. size, shape or colour, so that the map appearance would be optimal.

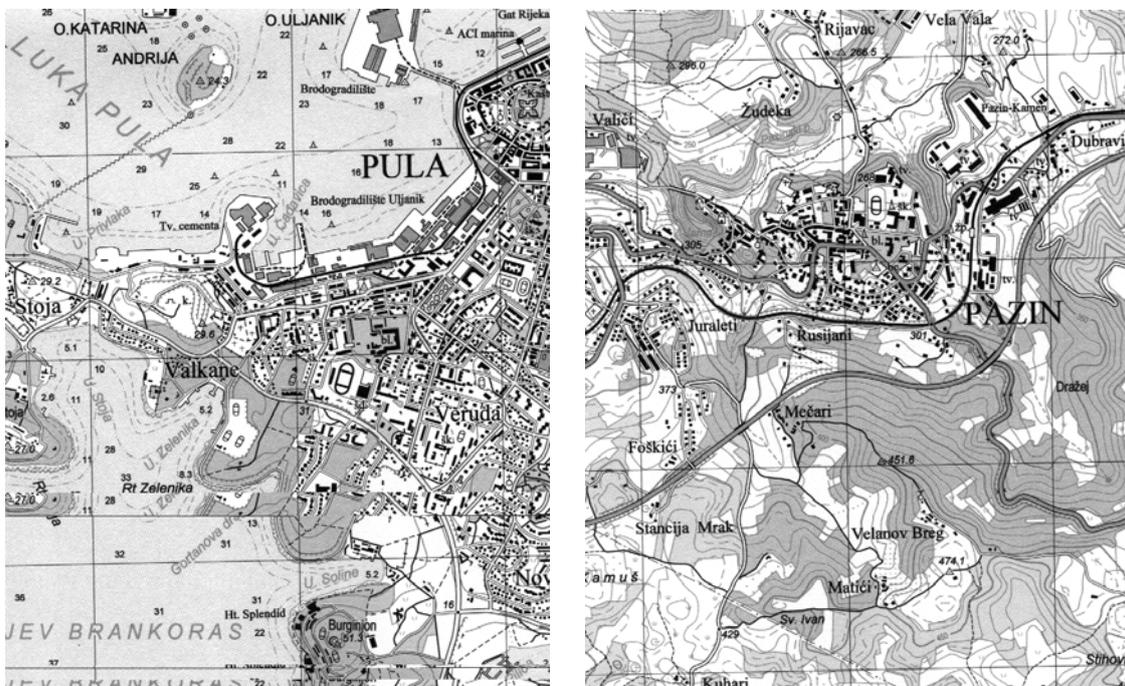


Fig. 4. Some of test maps, originally colour test maps, reduced approximately 1,5 times

During the thousand years of its long history, cartography has had a task to present as large amount of information as possible on a paper using the elements of map graphics and to realise at the same time optimal usage of that quantity. There should be as little map symbols as possible so that there would be a place for everything, but they have large enough at the same time to be visually recognisable for usage and possible reproduction. The smallest magnitudes depend then mostly on human sight, but also on the observing conditions that are usually not optimal. The increase of minimal sizes is necessary for the sake of legibility. Such rough map image could influence the reduction of information.

5. CONCLUSION

In order to have the changes in map graphics carried out, one should respect definite items:

- Appropriate map graphics is one of the most important presumptions for good map presentation on the paper and for the visualisation on the screen.
- A user demands appropriate map graphics and a clear visibility as well, accompanied by irreproachable understanding of a map.
- Available software systems should be improved further on for the mapping application, and easier to learn and use.
- The generale scale of a database is an illusion in cartography.
- Maps on the screen cannot replace analogous prints completely, but they can supplement them very successfully, and vice versa.
- Today everyone makes maps, and the map graphics has not been given necessary attention.
- One should accept that none of the achieved levels in map graphics is so completed that it could not be improved further on.

I would like to quote K.-H. Meine (1975): "Map graphics is a mutual game of elements on a map", and E. Imhof (1985): " Good map graphics is the essence of each good map".

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