Creating and Updating Navigation Maps for Children Purposes (in Crises Situations)

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ABSTRACT: The basic aim of the project is to be created a navigation map of Bulgaria as we take in account the specific requirements of navigational mapping and as well as the country conditions. The technology will be created, the contents, symbol system and the accuracy of the navigation map will be defined. The project's aim is to put the navigation map on the scientific base. A part of the project will be directed to special users of navigation mapping like children. The most special application will be done for early warning in crises management process and two map elements (symbol system and colors) will be discussed.

KEYWORDS: navigation maps, crises situations, colors, symbol system, cartography, children

Introduction

The electronic issue InfoWeek defined 2008 as a year of GPS market in Bulgaria. It is mentioned that it is expected 100 % increased sale of GPS navigation tools this year. They are giving users specific cartographic information, different from paper tourist maps. The existing navigation maps for Bulgaria have uncompleted contents and not enough good accuracy. They are made by classical cartographical methods without taking in account the specificity of navigation mapping.

If we improve the quality of navigation mapping we will have a possibility to use navigation tools as Mobil phones with such functions for different special users, for example children. For this purpose we need to create the navigation maps for children needs. Other more special application could be to direct this work (navigation mapping for children purposes – mobile phone and GPS) to early warn children in crises situation.

Research Purposes

The main purpose is to be created a Project for a navigation map of Bulgaria. Specific requirements of the mapping and the specificities of the country and users will be taken in account. Technology, contents, symbol system, accuracy of navigation maps will be defined. For execution of this purpose the following tasks will be done:

1. Analyzing of the possibility for navigation maps creation by different sources: air-photo images, topographic maps, GPS measurements. The research should include accuracy, maps' details, actuality and other factors.

2. Specific conditions in Bulgaria of navigation maps should be researched. The accuracy and contents details of the maps could be defined;
3. Symbol system of navigation maps should be estimated and special symbol system should be proposed for different users and needs.

Analyzing different software platforms and proposal for a technology for navigation map creation should be done.

Additional purposes of the project are scientific researches of students to be helped, creation of conditions for practical works with students and preparation of the team for EU projects.

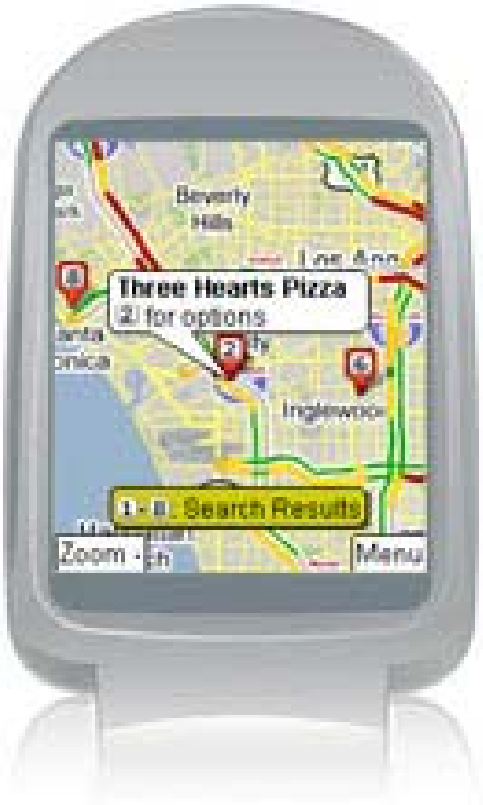


Figure 1: Using Google Maps for Navigation Purposes. Source: www.google.com/gmm

Navigation Maps Existence and Possibility for Their Use by Children

One of the most used and popular sources for navigation maps are Google Maps. We can find in Brian White report nice comments as "Google Maps' capability for the mobile environment won us over a long time ago. Alas, it was just a matter of time before GPS integration was unveiled in Google Maps for Mobile. That day recently arrived, and Google's mobile maps software will now use the GPS capability of many newer handsets (with GPS carrier support) to pinpoint your location and make directions and navigation just that much nicer" (see [http://www.engadgetmobile.com]).

Such good example could be seen in Figure 1. The map is very nice for professionals. But if everything is clear for specific needs? Do children (for example 10-14 years old) could

be manipulated easily by the proposed maps, does symbol system present information in suitable cartographical language for children, etc.?

In many advertisement web sites (as in [http://www.filetransit.com/screenshot]) the following texts and images (as in Figure 2) can be seen: “With MobiumGPS, your Windows Mobile device is turned into an advanced Mobile Navigation System with turn-by-turn voice announcements and detailed driving directions. You can search over 15 million point of interests (POIs) - places like hotels, restaurants, shopping malls and other tourist attractions - then dial the POI's phone number for reservations, hours of operation, or other information”.

Yes, very rich information is provided but many cartographic rules of visualisation for specific needs and users are not done. The visualisation is proposed by GIS without cartographic rules of generalization, symbol system creation, legend.

Figure 2: Navigation maps by Mobium GPS. Source: http://www.filetransit.com/screenshot.

These only 2 examples are enough to show that cartographers should manage navigation mapping when we need such products for children purposes and not only in this situation. If we have good navigation maps in mobile phone for children we could use them in crises situation and risk management. Combination of sms, GPS, mobile phone and appropriate navigation maps could save children life in crises situation.

Children and Navigation Maps

Children are using mobile phones and are playing games from very early ages. These activities do not mean that they know how to behave and how to use their equipment (as mobile phones), and what to do in crises situation.

Blogger Eirik Solheim writes about how he used a Nokia N95 to entertain his kids in the car: “I simply connected it to my son’s small DVD screen. Wow! Seven inches of pure joy for the small ones in the back. Changing view, colors and the language of the navigation voice keeps them happy. You need a Nokia with video out, a navigation system running on your nokia, a DVD system or screen for the kids with video in and a couple of cables. And some slightly geeky kids”. It could be seen in Figure 3. In Figure 4 we can find another pictorial map, created as children game. The father of a boy using this map writes “It’s great to see maps associated with fun. I think kids are naturally

curious about maps and how to use them. In this case, maps give the games a foundation needed for navigating the Froot Loops treasure hunt. It would be better if there was a traditional compass on the map on the box, but fortunately they are there on most of the maps on the Web site. Kellogg's had an objection to promote the brand, and the theme and activities accomplish that. Maybe we can get it to take the next step and put some geography games in the mix. Cereal shaped like countries anyone?" (http://www.thegeofactor.com/). This map is too easy for the youngest children and we can add some additional information as topographical information or to present our navigation maps the most closely to real environment.

Figure 3: Children are Using Mobile Phones for Playing. Source: http http://www.thegpsinsider.com.

Teachers could teach children how to read and use maps. Because of this cartographers should create some standards in creating and updating navigation maps for children. In the report will be discussed 2 elements of such maps: symbol system and colors.

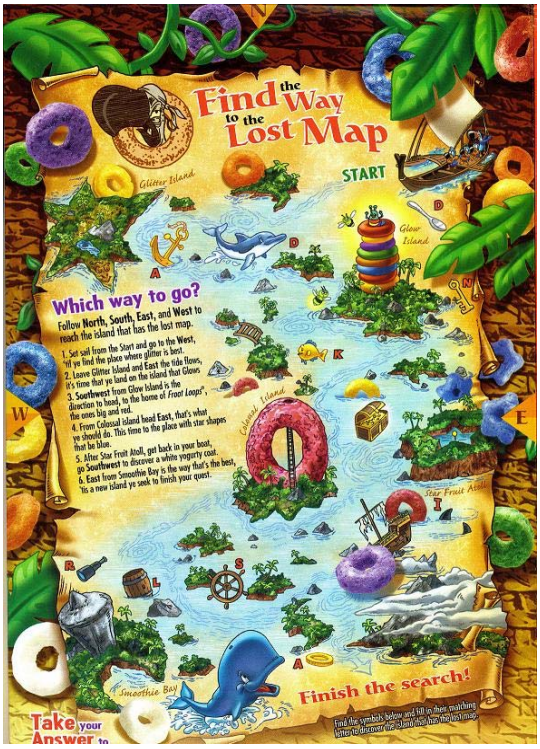


Figure 4: A Pictorial Map for Children Game. Source: http://www.thegeofactor.com/.

Symbol System

The utilization and standardization of symbol system for mapping nature hazards, risks and disasters need a detailed research in the international level. It could start by classification of represented objects and phenomena and clarify the color system presentation. Many authors and organization propose standards for symbols systems represented nature hazards and risk processes, as well as disasters. All of them are representing as national standards or they are active in different branches of science and practice (see Figure 5).

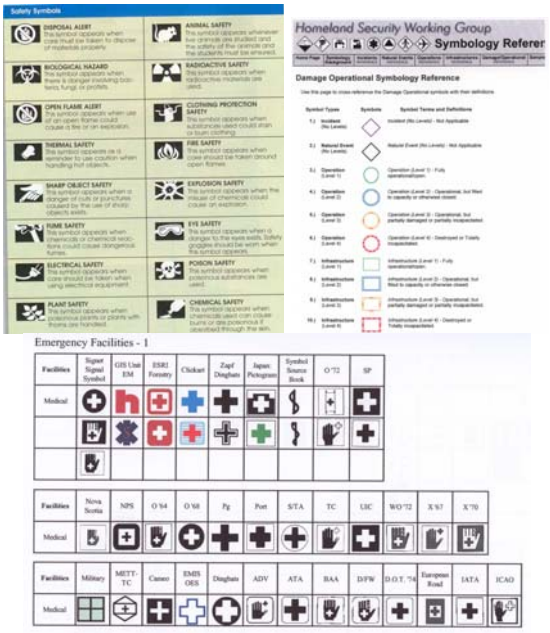


Figure 5: Proposals for Symbol System Standards in Hazards Mapping.
Source: http://science.valleyheights.org/safety.jpg, last two by [Dymon, Ute J., 2002]

First symbol system has very wide explanations in the legend and the second two are specialized for emergency situations.

The cartographic symbols should have clear and short definition to be used in a map legend. The next very important characteristic of them is to be situated on a map and the last one is that they should give qualitative and quantitative information about represented object, phenomena or process to users.

The steps in symbols creating for these maps are distinguished as follows:

a) gathering information about an object (quality and quantity characteristics, images, textures);
b) analyzing information and collecting data about each object;
c) designing symbols and then applying computer graphics techniques;
d) visualizing symbols in the virtual or paper environment;
e) obtaining synthesized information for an object.

The created symbols should be created and respond on following conditions:

a) easy for reading and understandable;
b) simply graphic construction;

c) association with presented phenomena, process, object;
d) color system presentation in RGB;
e) independency of software system.

Recommendations given by J. van den Worm could be added. "All proposed symbols had to be **platform and software independent**. This is one of the reasons that animation and the use of transparency (despite its advantages for the display of area related risks) have not been applied" [J. van den Worm, 2006]. Other authors as John Kostelnick all give special requirements to symbol system, created for risk maps.

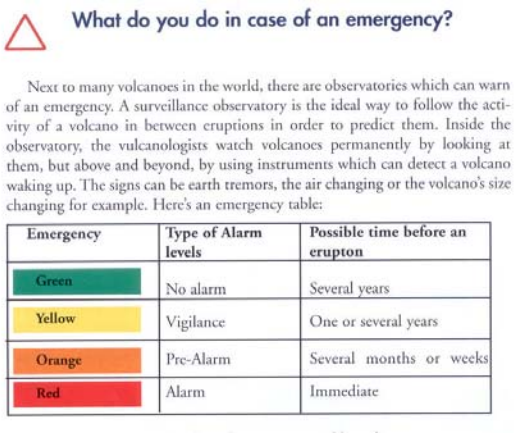
Symbols should:

- cross cultural barriers as much as possible;
- relate to each other in a hierarchical or tiered structure;
- be based on common cartographic standards and perceptual research;
- display effectively in both low- and high-resolution computer displays.

Such designed symbol system, according all above rules and requirements, should be also responded to area mapping, scale, map dimensions and way of visualization, as well as user's requirements.

Colors

Color standardization could be defined using computer definitions of colors for paper presentations in CMYK color system and for screen presentation in RGB color system.



What do you do in case of an emergency?

Next to many volcanoes in the world, there are observatories which can warn of an emergency. A surveillance observatory is the ideal way to follow the activity of a volcano in between eruptions in order to predict them. Inside the observatory, the vulcanologists watch volcanoes permanently by looking at them, but above and beyond, by using instruments which can detect a volcano waking up. The signs can be earth tremors, the air changing or the volcano's size changing for example. Here's an emergency table:

Emergency	Type of Alarm levels	Possible time before an erupton
Green	No alarm	Several years
Yellow	Vigilance	One or several years
Orange	Pre-Alarm	Several months or weeks
Red	Alarm	Immediate

Figure 6: An example of risk variations visualization. Source:UN ISDR Secretariat

One example of this is shown here. United Nations ISDR Secretariat publishes many books and information brochures to intend teachers' and students' attention "what to do in case of an emergency". Figure 6 shows an emergency table. The four colors correspond to the four risk variations, minimal, low, moderate, or high, defined by the General Clinical Research Center (GCRC). They are widely used and should be also defined as a map standard in visualization of risks and disaster processes.

Working with paper and screen visualized cartographic products we could propose the standard colors. They are defined in Table 1.

Table 1: A meaningless table, added to show the basics of formatting.

Colors/ Color systems	RGB – screen	CMYK - paper
Green	R = 0 G = 153 B = 61	C = .90. M = 0 Y = 100 K = 0

Yellow	R = 255 G = 245 B = 30	C = .0. M = 0 Y = 100 K = 0
Orange	R = 231 G = 120 B = 23	C = .0. M = 60 Y = 100 K = 0
Red	R = 218 G = 37 B = 29	C = .0. M = 100 Y = 90 K = 0

Using the same logic in color presentation we could define color presentation of different main disasters for map of the world or some region.

On Figure 7 the main disasters (draughts, earthquakes, floods, volcanoes, windstorms, avalanches and others) are mapping on a map of the world. They are summarized for Sub-Regions, defined by UN. The same diagrams can show situations in the world or regions by country or in a country by districts.

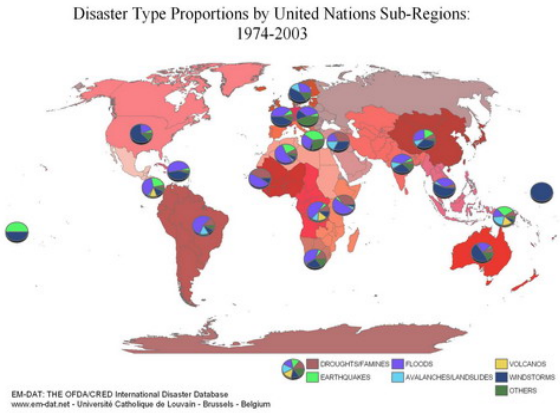


Figure 7: A Main Disasters Presented by Color Diagrams on Map of the World.

Color definitions could help not only cartographers and map-makers but also users when they get used to use such cartographic information by mobile phone, screen equipments, paper versions of visualization of computer generated ubiquitous maps.

The proposed colors could be seen in Table 2. They are high saturated because the diagrams should be well visible on the map background. The second colors are defined to be used as area symbols, or on their base could be crated map or screen backgrounds.

Table 2: Computer generated colors for disasters presentation in cartographic products.

Disasters/ Color systems	**RGB - screen**			**CMYK – paper**			
Draught	R = 255	G = 250	B = 60	C = 0	M = 0	Y = 80	K = 0
Earthquake	R = 0	G = 155	B = 80	C = 90	M = 0	Y = 90	K = 0
Flood	R = 90	G = 90	B = 160	C = 70	M = 70	Y = 0	K = 0
Volcano	R = 220	G = 35	B = 45	C = 0	M = 100	Y = 90	K = 0
Windstorm	R = 35	G = 41	B = 122	C = 100	M = 90	Y = 0	K = 0
Avalanche	R = 0	G = 125	B = 195	C = 100	M = 20	Y = 0	K = 0
draught – area	R = 255	G = 250	B = 150	C = 0	M = 0	Y = 40	K = 0
earthquake – area	R = 100	G =185	B = 95	C = 50	M = 0	Y = 80	K = 0
flood – area	R = 140	G = 130	B = 180	C = 40	M = 40	Y = 0	K = 0
volcano- area	R = 230	G = 110	B = 105	C = 0	M = 65	Y = 50	K = 0
windstorm – area	R = 160	G = 170	B =200	C = 30	M = 20	Y = 0	K = 0
avalanche – area	R = 90	G = 190	B = 240	C = 50	M = 0	Y = 0	K = 0

Standardization in coloring for symbol systems and maps is a long process and it could continue in many directions. The work here is only a first step and shows the way of the processing. Every color system could be improved to be more clear and readable for users. The human vision also could be researched in direction of how people react of different colors in emergency situations.

A Proposed Technology for Creating and Updating Navigation Maps

Symbol system and colors are only two map elements which could be considered according to many national and international cartographic rules. Other map elements as data base, software and hardware platforms, map accuracy, generalization, and map projections also should be developed on scientific base. The technology could be named **"Navigation maps for special users, needs and conditions"** and have the following steps:

1. Source gathering: cartographical base on environment, climate and society. The sources will be gathered by space/air images, GPS measurements, and topographic maps;
2. Database creation: GIS platforms- map projection, generalization, accuracy definition;
3. Visualization of graphical database: suitable software modules for visualization should be used;
4. Symbol system creation and using in visualization modules;
5. Climate data and its suitable visualization;
6. Combined cartographic and climate visualization;
7. Updating of changed features, elements of environment and climate.

Figure 8: A Child Uses a Mobile Phone

Figure 9: A Navigator as Example to be Used in Crises Management. Source: www.gpsmagazine.com.

If we have a navigation map, produced by this special technology, we can simply use it in crises management for children. Children can react after receiving the necessary information, for example sms. What is the possible behaviour and children instruction if they are supplied with mobile phone, GPS, navigation maps?

1. A child receive sms for dangerous situation (for example: flood is coming; you should follow your navigation system, see Figure 8);
2. Activation of crises situation management by receiving of point (coordinates: latitude and longitude) where the child should go (Figure 9);
3. Navigation of child by voice; an alarm informs if the child is going in wrong direction;
4. Sms instruction what to do when the child get to a safety place.

This is only the first step of technology for creating and updating navigation maps. But the purpose is it to be useful for children in crises situation. Still we need a lot of work to specify, work out in detail and finalise the proposed ideas.

Conclusion Remarks and Directions for Future Work

The tasks of all organizations caring for nature risks and disasters are to reduce them and when they occur – ensure safety of human lives. The ICA and many cartographers work in this field of mapping phenomena connected with nature risks and disasters. Showing the way how to draw and read the maps, they are included in the processes of standardization. The way for data capture, collection, classification and visualization is proposed and many different ways for management with cartographic presented data are known.

All efforts could be directed to the international standardization process: it could start from data standards in some aspects:

- data classification;
- data content;
- **data symbology or presentation;**
- data transfer;
- data usability [Batuk, F at al, 2004].

According to the same authors process standards could be considered in the following directions:

- general (specific) data transfer procedures;
- existing data access procedures;
- **classification methodology;**
- data collection;
- storage procedures;
- presentation standards;
- data analyzing procedures;
- data integration;
- quality control and quality assurance.

In the report we proposed a methodology of a standard in two of above pointed directions: symbol system and color representation and the second one – a proposed technology for creating and updating navigation maps for children purpose in crises management. The researches could be continuing in International Commission of standardization of different International organizations. Specialists in different branches of geo-science are needed to achieve final results of presented topics.

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