Cartographic Design Issues Utilizing Google Earth for Spatial Communication

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Abstract

Google Earth is a very powerful tool to visualize global as well as local spatial information in an interactive virtual globe environment. It has the capability not only to quickly transport predefined information that is made available through the program but also to disseminate individually processed geodata to produce distinctive maps for visual communication.

However, a map made available or individually produced through such a tool does not per se have to be efficient in a (carto)graphical sense.

Three cartographic examples in different scales with diverse thematic (mountainous) backgrounds will be presented to focus on the proposition that cartographic design is essential for visual spatial communication and map production when utilizing such a tool.

1. Introduction

How do we deal and cope with the competence of communicating with graphics? Do we learn to utilize this capability at all efficiently? In everyday life we are constantly confronted with manifold information. This then gets filtered, processed and utilized leading finally to a decision that in many cases can or should trigger an action. Much of this information is stored in graphic forms.

The proverb "A picture is worth a thousand words" refers to the concept that complex information can be transported efficiently in just a single image. This has been and still is the case in cartography. However, it is important to be aware of the fundamentals and their functionality. Not all pictures, graphics or maps communicate efficiently. The following example (see Fig. 1) shows a (maybe) correct geo-information depiction; however a hopelessly overloaded cartographic representation that is insufficient of communicating geo-spatial information efficiently.

The distinguished Swiss Cartographer Eduard Imhof once stated that cartography is like music (Imhof, 1972). You have single notes with specific attributes connected to them. These resemble the fundamentals of cartographic depiction – the graphic variables. Each note is then aligned and combined in such a way that the arrangement can harmonize to produce pleasing music or disharmony.

Graphicacy could be described as the ability to understand and use symbols, graphics, maps, plans, in other words to communicate visually.

2. Examples

Cartographic products are manifold and with current technology many different kinds of representations are possible to communicate spatial information. However, all cartographic artifacts do have a similar if not common structure.

Every map has at least one layer that contains information for orientation. This topographic-orientation layer serves as a base for locating the thematic information in a spatial context. It can vary from a very simple depiction all the way to a multi-dimensional complex base map. Superimposed on this layer thematic information is then included. This can be either single or multi-dimensional depending on the information density and depth.

Keeping in mind the cognitive limits the simple rule of thumb not to exceed seven, plus or minus two objects is helpful when evaluating the effectiveness of a map (Miller, 1956). This does not mean that only seven, plus or minus two objects are allowed in a map. Objects can be grouped together to create "chunks" that help structure and organize the overall cartographic representation.

Fig. 1: Google Earth Africa

The following examples show three different types of complexities. They all utilize basic cartographic methods based on the conventional graphic variables. Furthermore, different ways of depiction are used to illustrate the diverse methods of communicating spatial information.

2.1. "Global Awareness in School – Understanding the World with Maps"

The goal of this applied project utilizing Google Earth that is being undertaken at the University of Vienna, Department of Geography and Regional Research in close collaboration with interest groups within the educational sector and school cartography is to facilitate scholars to understand the world with maps and to make use of interactive mapping tools. The main educational goals were therefore defined in three domains:

Affirmative Domain: to assist topographic navigational knowledge

Cognitive Domain: spatial navigational perception, combination of knowledge with content

Instrumental Domain: topographic capabilities and skills for independent action

In order to demonstrate the educational purpose of global awareness utilizing maps with Google Earth as well as to focus on the three postulated domains an example of the global vegetation distribution with a tailored base map for orientation was implemented. The first task was to assist the scholar in the acquisition of topographic navigational knowledge. For this reason an individual administrative base map distinguishing the political boundaries, land and sea areas as well as the major circles of longitude and latitude was depicted. The main objective was to visualize a clear and understandable navigational layer for orientation and to link this geospatial layer with the thematic information (Fig. 2). Thereafter the main thematic vegetation information was applied. Comparing and analyzing already existing installations available through Google Earth (Vegetation Programme Animation, 2008; Global Landcover, 2008; Global Vegetation Map, 2008) it was obvious that a cartographic refined product was necessary. The objective of the thematic layer was to communicate the very heterogeneous global vegetation coverage in an efficient and clear manner.

Fig. 2: Global navigational layer for orientation

Fig. 3: Global vegetation

Therefore an adapted generalized version of the complex global vegetation had to be accomplished. Associative coloring as well as area symbolization was used to achieve an understandable cartographic depiction (Fig. 3).

2.2. "Decision Support System Tool – Avalanche Information System in Tyrol"

The joint project "Decision Support System Tool – Avalanche Information System in Tyrol" between the Avalanche Warning Center Tyrol (Innsbruck, Austria) and the University of Vienna, Department of Geography and Regional Research is now ongoing for several years. Its goal has been and still is to develop and maintain a complex and very powerful database driven online decision support system for cartographic visualization and analysis of current avalanche relevant factors in the Tyrolean Alps. In order to understand the avalanche situation, it is important to have real-time spatial coverage of meteorological and snow pack factors as well as information covering the avalanche danger scale. Besides the "classical" map orientated depictions that are being daily produced (Fig. 4) a new 3D map depiction is being evaluated (Fig. 5). This new form of representation is based on the traditional daily produced maps and draped as an overlay on to the current Google Earth terrain. The user has now the possibility to combine both "photo reality" and avalanche relevant geospatial topics utilizing transparency to interpret the thematic information. However, it still has to be clarified to what extent the overlaid thematic information must be adapted in order not to produce mis-

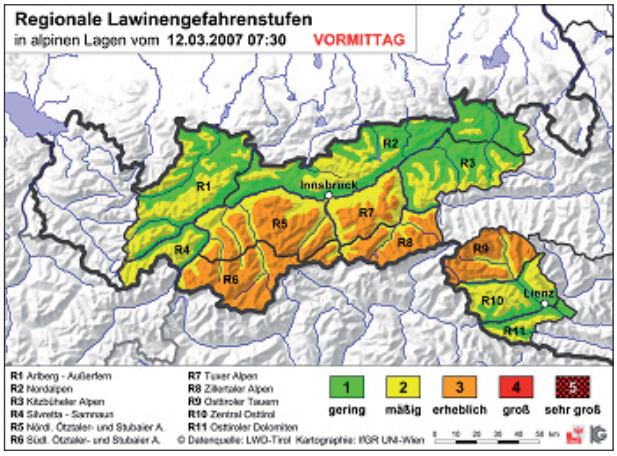

Fig. 4: "Classical" map depiction

Fig. 5: 3D map depiction

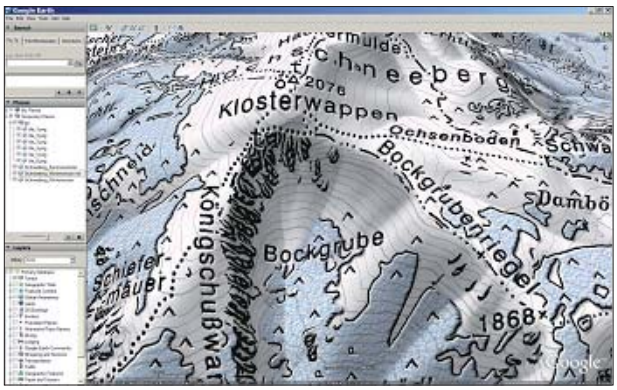

Fig. 6: Google Earth Winter map

interpretation that can in some cases lead to unforeseen circumstances.

2.3. "Optimizing Topographic Maps – Skitour Information System"

The main objective of the project "Optimizing Topographic Maps – Skitour Information System", a project that is being undertaken at the University of Vienna, Department of Geography and Regional Research to analyze the use and limits of raster maps used as overlays in 3D systems, is to offer the user of the Google Earth driven system a navigational and planning instrument based on an optimized topographic map. The framework for the incorporated maps is the official Austrian cartographic raster model of the base map 1:50,000. This map was adapted to a winter version, eliminating scree, modifying the standard coloring to a bluish "winter look", emphasizing rock and minimizing the otherwise very dominant contour lines.

3. Conclusion

It is apparent that cartography has the potential to promote spatial communication in our society efficiently - if utilized correctly. It depends on the one side how cartography is able to communicate its products based on cartographic knowledge acquisition as well as cognitive design rules. On the other side the user must be capable of understanding and interpreting the symbolized cartographic reality that is being transported. In order for this communication process to function it is essential that graphicacy becomes an integrative part of our societal system. Graphicacy is an important asset that, if applied and understood correctly, can have a strong impact on modern communication within our society.

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