

Different Views on a Digital Map in the Late 20th and Early 21st Century

Stanislav Yu. KATSKO, Russian Federation

The late 20th and early 21st century is marked by the transition to the Information Age. It is characterized by highly developed information area, which includes the human activity on creation, processing, storage, collection and transfer of data, information and knowledge.

Owing to the society's computerization developed several models of spatial data are formed: digital (geoinformation) model in Geomatics, digital and electronic maps in geoinformation mapping.

The analysis of Russian authors (Berlyant A.M., Zhalkovsky E.A., Koshkaryov A.V., Tikunov V.M. and others), as well as relevant state standards for cartography and geoinformation mapping showed that a great deal of attention in these works is given to the definition of digital maps.

In [1, 2, 3] the digital map is defined as “a digital model of the Earth's surface”.

Berlyant A.M. in his work [4] says that the digital map is “a digital map model created by digitizing cartographic sources, photogrammetric processing of remote sensing data, digital registration of surveying data or by any other way». He points out that the «a digital map is not a geoimage ... but only a digital geoimage model, it is the data used for geoimage creation being its analogue”.

Zhalkovsky E.A. [6] gave a definition of the digital map having no recommendations that the map is a model. The digital map is: “a) the map, whose content is represented in digital form; b) presentation of map features in digital form, which allows a computer to maintain, manipulate and display the values of their attributes. The digital map is a database or a file that will become a map when creating a hard copy or image display”.

Koshkaryov A.V. considers that “the digital map, as a phenomenon of digital environment, is not the direct perception of humans as well, as visualized, ceases to be digital. It is neither a map nor a cartographic image in the traditional sense, because it can not be perceived visually or in touch”. [5]

In [4, 7] the authors pointed out that a digital map is the basis for production of paper, computer, and electronic maps. It is a part of a cartographic database and can serve as a basis to generate computer and electronic maps. Besides, it is one of the sources of spatial data in GIS and used as a digital map base.

In [8] the digital map is defined as “digital display of map content recorded on a magnetic tape or any other storage medium”.

In addition to the definition of “digital map” should consider the classification of computer maps. According to this classification is allocated two main types of computer maps: electronic and digital.

An electronic map is visualized using computer equipment. It consists of graphic primitives in raster or vector data format, which are converted into cartographic images.

When using the electronic cartographic image, only a man is able to extract cartographic objects from graphic primitives and to compare them with terrain objects by means of the map's legend. Special software allows the user to edit map's image, thereby altering cartographic objects.

The display and perception of geoinformation by a man from electronic cartographic images are performed on the analog image basis. Cartographic image of electronic map, without regard to the map's legend is merely a set of graphic shapes or primitives do not give a person any information about objects. A trained professional perceives not the separate graphic pieces but using the legend, he is able to extract cartographic objects, to understand their properties and to create cartographic images of real objects. The information transfer is happened only in one direction that is from the image to the user.

Advanced hardware and software made it possible to realize the principle of feedback based on the separation of object's geodata, the rules for constructing an image and the cartographic image. As a result, *a digital map* was appeared, which combined geoinformation terrain model and cartographic images created on the basis of the spatial objects from the database containing geodata and cartographic objects.

Digital cartographic image is a dynamic object and there is no constant exists. It is formed as a result of the visualization of data obtained in response to a user's query to the database geodata.

When working with large volumes of geodata is not necessary to display (visualize) the entire geoinformation from the geodatabase on map. Digital cartographic images provide the representation of terrain model in a computer format, but they are intended for direct human perception. It ensures the participation of people in geoinformation processing and analyzing data, solving spatial problems, the preparation and adoption of spatial solutions. In doing so, they are no longer a direct source of geoinformation, as a means of visualizing the content of databases and/or developed spatial objects. As a result, there is a change in the role of the cartographic image, which carries out the role of the interface between man and geodatabase.

Let's consider the appointment of digital map and digital cartographic image.

A man works with a digital map image. It serves as a tool for interaction between user and database (as interface), as a means of visualization of geodata using base

graphics primitives. This cartographic image is losing its past as a repository of geoinformation for analysis and spatial solutions.

Digital maps, integrated with GIS, is used to implement management functions of a person in finding, processing and analyzing spatial data in virtually all industries, wherever decisions are taken in the process of working with spatially distributed data. The development of electronic networks and the emergence of a number of new technical capabilities for the visualization of computer cartographic images contribute to improving the management of spatial data.

The specificity of the perception of digital cartographic images is reflected in the different from the traditional cartography approach. It is the approach to resolving the contradictions between the demands of their visibility and readability. The solution of this issue is to use one map instead of a series of map images (layers) and a dynamic generalization of the geometry, and the semantics of digital cartographic images, allowing for greater visibility and readability on small screens.

Based on the analysis of works of different authors and formalize the essence of digital maps offer the following definition.

The digital map is a dynamic geoinformation model that integrates geoinformation terrain model and cartographic image created on the basis of the data about spatial objects from the database. It contains cartographic objects and manages by the GIS, which provide interaction the user with information from the geodatabase.

Digital cartographic image (cartographic image of a digital map) is computer image, which contained cartographic objects and created on the basis of the data of spatial objects from geoinformation terrain model. It made the conversational (interactive) mode of interaction the user with information from the geodatabase.

REFERENCES

1. Berlyant, A.M. Cartography: Textbook for high schools / A.M. Berlyant; - Moscow, 2001. - 336 p.
2. State standart 28441-90. Digital cartography. Terms and definitions - Moscow, 1991. - 18 p.
3. Halugin, E.I. Digital maps / E.I. Halugin, E.A. Zhalkovsky, N.D. Zhdanov / - Moscow, 1992. - 419 p.
4. Geoinformatics. Explanatory dictionary of key terms / Berlyant A.M., Koshkaryov A.V. – Moscow, 1999. – 204 p.
5. Koshkaryov, A.V. Overview of electronic maps and atlases / A.V. Koshkaryov // GIS-obozrenie. - 1999. - №1. - p. 26-29.
6. Digital Cartography and Geoinformatics. Summary terminology / Zhalkovsky E.A.; - Moscow, 1999. - 46 p.
7. Basics of Geoinformatics: textbook for university students / E.G. Kapralov, A.V. Koshkaryov, V.S. Tikunov и others – Moscow, 2004. - 352 p.
8. State standard 21667-76. Cartography. Terms and definitions - Moscow, 1982. - 192 p.

CONTACTS

Stanislav Yu. Katsko, PhD
Siberian State Academy of Geodesy, SSGA
Department of Cartography and GIS
10, Plakhotnogo Ul.
Novosibirsk, 630108, Russian Federation
Tel: +7 923 244 47 29
E-mail: stanislav.katsko@gmail.com

© *S. Yu. Katsko, 2009*