

3D art cartography in Belarus: The historical development and achievements in the modern period

Anna German

*The Belarusian State University, The Geographical Faculty, the Department of geodesy and cartography, Minsk, Belarus.
ar.artmap@gmail.com*

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Abstract:

Three-dimensional images of the area were begun to create in the middle ages. The discoveries of new territories had led to the necessity of their mapping. On the perspective-panoramic maps of that time cities and fortresses were often depicted as they could be seen by an approaching traveler, usually from the most impressive side, from "bird's eye view". Cartographic images were performed manually, by the method of engraving on wood or on copper.

One of the first panoramic maps of Belarusian cities was a cartographic image of the city of Grodno, presented in The Large Atlas of Cities called "Civitates Orbis Terrarum" ("Cities of the world"). The Atlas was published by the cartographer Georg Braun and engraver of maps Franz Hogenberg in Cologne in 1572-1617. The main method of presentation of the cities in it was a picture.

A significant contribution to the development of cartography in Belarus was made by cartographer, artist, engraver and printer, the creator of the map of The Grand Duchy of Lithuania (1613) Tomasz Makowski. For many years Makowski were traveling all over the country and thoroughly studying its features as a topographer, historian, artist and geographer. He examined and sketched the most outstanding objects, as evidenced by his panoramic images of some cities. In particular, he created panoramic engravings of Nesvizh, Grodno, Brest and other cities of modern Belarus.



Figure 1. Belarusian cities on medieval engravings. On the left - the panoramic image of Grodno in The Large Atlas of Cities "Civitates Orbis Terrarum". On the right – the map of Nesvizh made by Tomasz Makowski, XVII century.

Nowadays, the traditions of medieval art cartography in Belarus have received a new development in the works of artist-cartographer Ruben Atoyan. Initially, cartographic images were made manually with ink and watercolors. Panoramic maps of the main cities of Belarus, including Minsk, Grodno, Gomel, Mogilev, Mir, Nesvizh, Novogrudok, etc. were created in a such way.

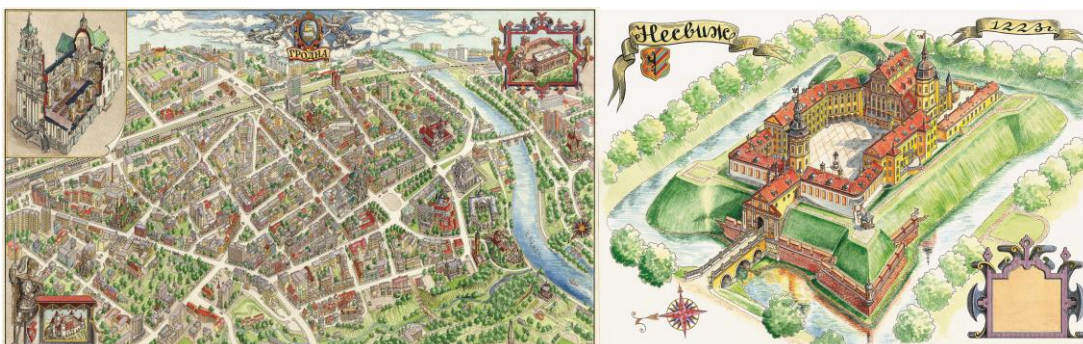


Figure 2. Panoramic maps of Grodno (on the left, 2004) and The Nesvizh Palace and Park complex (on the right, 2015). Artists: R. Atoyan and A. German.

With the usage of computer technologies at the present stage, the technique of creating of artistic cartographic images has significantly changed. The majority of types of work which was performed previously by creating on paper, now is possible to implement using a personal computer, graphics tablet and vector and raster graphics programs. During this process - and it's very important – the handwritten style of images is kept and the ability of operative update of the content is provided. However, there are some types of artistic and cartographic work which easier and faster to accomplish manually than on the computer, for example, drawing of different types of trees, grasses, waters of rivers and lakes. In this case it's possible to speak about the combined handwriting-automated technology of artistic map image creation which includes elements made manually and the separated stages and elements which advisable to perform on the computer.

The construction of the perspective image of an urban landscape according to the method developed by the author conditionally consists of several stages.

The first step includes the selection of the projection direction and determination of the territory coverage by remote sensing images of the Earth and the city plan. The previously developed template of perspective (central) projection is used to build a perspective grid on the sheet of the drawing paper. Then the road network and configuration of the structures are drawn.

The second stage is the construction of buildings' frames of complex configuration (for example, architectural monuments) and drawing them in ink.

The third stage includes the color design (with watercolor) of significant parkland, forests, and water areas. It was determined empirically that this type of work is more appropriate to perform manually.

The handwritten component of this technique is completed by scanning of the image in high resolution. Further, the creation of a panoramic map is carried out with the usage of vector and raster graphics programs.

The fourth stage involves the detailing of the facades, i.e. filling the frames with structural elements from the pre-created library of signs (different types of windows, doors, arches, balconies, etc.) (using the vector graphics program Adobe Illustrator).

At the final, the fifth stage, the concluding color design of the panorama is realized according to the library of colors and textures (using the raster graphics program Adobe Photoshop).

The similar steps are performed in graphic editors during the creating of a panoramic map using the automated technique. This method involves the usage of computer technologies only. Thus, at the first level of visualization the plan of the territory based on an aerial photograph of the city is created in the program Adobe Illustrator. Then this scheme is transformed into a perspective projection using the tool "Perspective Distort" in the Free transform toolset. The construction of all buildings' frames (including structures of complex configuration) is also implemented in vector format with the tools "Pen" and "Line Segment" (the second level of visualization). At the third and fourth levels, the frames are filled with structural elements, and then the whole cartographic image is made in color according to the libraries of textures and colors.

Operational updating of the content of panoramas created earlier is carried out mainly by the combined technique with the usage of Adobe Photoshop: new buildings which were drawn manually or on a computer are combined with the scanned original, the colors of facades and roofs are updated, park spaces and road junctions are added. For these purposes the following tools are used: "Polygonal Lasso", "Brush", "Clone Stamp", "Color Replacement", - as well as the options "Curves", "Color Balance", "Hue/Saturation" of the section Image/Adjustment.

The combined handwritten and automated method of constructing of three-dimensional cartographic images was tested by the author during the creating and updating of the panoramic maps of cities not only of Belarus, but also other world-class cities: Berlin, Moscow, Yerevan, Astana.

Currently, the author is working on the practical usage of this method of creating of artistic cartographic images for the development of electronic multi-scale applications for the cities of the Republic of Belarus.