

Müller's Map of Bohemia and its Detailed Analysis

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Müller's map of Bohemia is one of the most important maps in Czech history. It is not just beautifully and well made, but it shows many characteristics of historical landscape in surprising detail. This map was created and finished in 1720 by Johann Christopher Müller and is the last piece of "one-man cartography era" in Czech lands. J. Ch. Müller was outstanding cartographer. During his works, he used instruments which he named "instrumenta mathematica". Distances were measured by viatorium (measuring wheel) behind a chariot, directions by compass, and astronomical measuring was made by a big astronomical quadrant. His greatest work Map of Bohemia was finished in 1720, but originally printed in 1723, after author's death in 1721.

Müller's map of Bohemia is printed on 25 sections in the scale approx. 1 : 132,000. The size of one map section is 473 x 557 mm and the entire map size is 2,403 x 2,822 mm. Map content can be interpreted by very wide legend. Towns and villages are represented by many point symbols characterizing additional information about settlements (e.g. churches, monasteries, mines, spas). With line symbols there are depicted rivers and streams, administrative boundaries and some roads. The scales of geographical grid are displayed on the map frame. The map has two graphic scale bars (Czech miles and hours of march). The whole map is decorated with allegorical scenes in the corners.

In [1] authors made basic cartometric analysis of this map. All 25 map sections were scanned and digitally merged together. Due to map material distortion, every map section was transformed into its original size 473 x 557 mm. Resulting image displays the whole map without gaps between sections. The size of the image is 2194 MB. The aim of cartometric analysis was to get more precise values of the map scale. There were used several methods (measuring scale bars, measuring geographical grid, getting the scale from transformation of identical points). The updated scale has value approx. 1 : 134,000. The most precise method of scale determination is undoubtedly getting the value from transformation of identical points. Unfortunately, authors in [1] used only a few identical points. Different types of transformation were not used also.

The research on Müller's map of Bohemia is now funded by Czech Science Foundation for following three years. Now it is enough time to make more precise analyses of this map. The aim of this research project is to make cartometric analysis, to create vector database model of the map and to make these data more accessible for public.

In the first phase of the project, all 25 scanned sections were transformed into real paper coordinates in ArcGIS software (size 473 x 557 mm). For later thorough analysis it is necessary to create vector model of the map. ArcGIS geodatabase was designed to store this data. After cleaning and revising all 25 databases, they were merged into complete vector geodatabase of Müller's map of Bohemia. Once we have this data, we are able to test many types of transformation with different structure of identical points. After this we will be able

to choose the best method for georeferencing the map into some well defined coordinate system (e.g. national S-JTSK). The scale of the map will be computed more precisely. The other method of map scale determining is described in [2, 3]. On the map can be displayed isolines of the map scale using MapAnalyst software.

From the vector database we can derive very interesting data. We can count numbers of churches, monasteries, spas, mines. We can find disbanded villages; we can compare lines of rivers flowing with contemporary state. Many landscape analyses will be very easily accessible. After georeferencing the data into well defined coordinate system, we will be able to compare the state of 300-years old landscape with current situation. Very easily can be analyzed the relation between Müller's mapping and later First military mapping of Austria-Hungary discussed in [4].

The aim of the project is also to make the data of Müller's map of Bohemia more accessible. Merged image of the whole map will be available in the web application based on Zoomify software. This application is running already for image created as the result of [1]. As the data will be georeferenced, they can be also distributed in real coordinates. The raster image will be served as WMS service; the vector database will be served as WFS service. Using these web map services the data will be very easily accessible from any GIS software keeping the standard of Open Geospatial Consortium for web map services.

The project of detailed analysis of Müller's map of Bohemia is standing at the beginning. After creating the geodatabase and deriving analyses outputs, detailed workflow process will be described for possible other old maps analyzing. Old maps are full of interesting information about the environment and this project can show how to get them.

References:

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