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How to Understand the XVII-century-mappers? The I Military Survey of Bohemia Transformed into a Comprehensive Information System

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Summary: The First Military Survey is a unique historical source which informs modern researchers about the late XVIII-century landscape in the whole former Austrian monarchy. The First Military Survey contains both, maps and texts – the description is provided by cartographical and verbal means of expression. The German description of landscape according to the individual sections of the 1:28,800 map were created simultaneously, so we claim that we are obliged to study and interpret the source as a whole. The aim of the project we are carrying out is to turn this comprehensive topographic work into a digital library offering the user all the information contained in the original work in a comfort, on-line accessible environment. The old maps are carefully georectified into a seamless map and the descriptive information is processed into a database. The resulting information system will be available in Czech and German as all the texts are being edited and carefully translated.

The I Military Survey is an elementary historical source which enables us to learn about the Central-European landscape in the second half of the XVIII century. Moreover, due to the lack of older similar sources, it is often used to gain pieces of information about the territory even in previous years. The material was meant to meet the needs of the Austrian army and as such it was a subject of secret in the period of its origin.

What was the reason for undertaking such a demanding and long-lasting task? The Austrian army lacked reliable information about the territory of its state. The wars of 1740s and the Seven-year-War proved it clearly. Therefore the Empress, Maria Theresa, agreed to reorganize the army in 1763. Among others, a *Generalquartiermeister-Staab*, a unit responsible for logistics and providing information, was established. A systematic survey of the country started the same year. The Czech lands directly bordered with the Prussian enemy, so they came first to be surveyed.¹

The source has already attracted attention of many scholars, among them Polish researchers who concluded their long-lasting work with a large multi-volume book last year.² Nevertheless the first expert, who understood deeply not only the source itself, but also the circumstances of its origin, was Czech – a military historian and a director of the Map collection department of the State Military Archives in Vienna, Josef Paldus. His papers dealing with military surveys of the Austrian monarchy continue to be currently quoted by all scholars dealing with the topic.³ The territory of the Czech Republic lacks a modern scientific edition of the documents similar to the above mentioned Polish, Slovenian, Croatian and others. So, let us concentrate on the territory of Bohemia, the Western part of the Czech republic, in this paper.

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¹ For the process of the works see Dörflinger 1989, for the context of works undertaken in Bohemia see Kuchař 1967.

² Poland (Galicia): Bukowski – Dybaś – Noga 2012–2013; Slovinia: Rajšp 1995; Croatia: Valentia 1999; for the seamless map incl. Bohemia by Arcanum, Hungary, see: <http://mapire.eu/en/>.

³ Paldus 1919.

A complex historical source

In general, the I Military Survey is a set of archival documents called *KriegsKarte des Königreiches Böhmen, aufgenommen auf den Befehl eines höchlöbl. k. k. HofKriegsRaths in den Jahren 1764-1767*, which can be divided into two parts: maps and texts. Within the preserved maps, the map issued in the scale 1:28,800 and divided for the territory of Bohemia into 273 sections, is considered to be the fundamental part. The corresponding so-called textual commentary, or military-geographical descriptions, of the territory are stored in 19 volumes (entitled *Anhang zu der Kriegskarte des Königreichs Böhmeim*, approx. 11,500 pages of German text). The southern part of the Bohemian territory was re-surveyed in the early 1780s when the experience gained in other imperial countries proved the initial methods to be insufficient. The original sections of the map have not survived. The collection is thus formed by 130 original “South-Bohemian” sections and 143 rectified or re-surveyed “North-Bohemian” sections.⁴

The goal of the project is to make the source available using digital tools in an advanced way, e.g. to create an information system which would facilitate the use of the source by modern historians and other scholars as well as the general public (as it is intended to be published on-line).⁵

The starting point of our considerations when developing the methodology was understanding the way the source was created in the first place – reasons for its origin, methodology used, process of elaboration, etc. According to Josef Paldus and others, the description of the landscape was carried out simultaneously with the 1:28,800-scale map, according to its individual sections. The military men, educated in surveying and cartography (in Wiener Neustadt-Military Academy) were divided in several groups of six people. When working in the field, five of them were appointed to carry out a map-sketch, one of them was responsible for the description. No general instructions have been preserved. However, it was determined that the cartographers used à la vue method and put their notes, e.g. sketched the landscape into a copy of the only map covering the whole territory of Bohemia in a rather convenient scale which was available: the map of Bohemia in approx. 1:132,000 scale by Johann Christoph Müller (1720)⁶. The sketches were redrawn in the winter months and the so-called *Reinzeichnungen* originated. Unfortunately, no map key has been preserved, so it had to be reconstructed.⁷ It shows clearly that the essential problem of the cartographers was the terrain. The map itself provides the user with general information only which is insufficient for military movements. That was, we assume, the most important reason for employing a soldier who would occupy himself with describing the same territory.

There must have been a rather detailed instruction for this part of the work as well. The texts in every section are strictly structured into the description of municipalities, “Extract” where the entire region is summarized by subjects (water courses, farm-tracks, forests, marshlands, ponds, land, roads, and surface) and an index of places. The section also includes the description of the

⁴ Österreichisches Staatsarchiv – Kriegsarchiv [Austrian State Archives, Military archives], Vienna, Map collection, sign. B IX a 92.

⁵ A joint project of The Institute of History of the Czech Academy of Sciences, the J. E. Purkyně University in Ústí nad Labem in collaboration with the Faculty of Arts of Charles University in Prague, has started in 2010. The aim is to make available the source as a whole. The texts are edited and translated from German into Czech, the necessary explanatory notes are added. The mentioned localities are connected with the relevant map sign via geographical coordinates.

⁶ The map of Bohemia by Johann Christoph Müller, printed in 1720 in Nürnberg. See e.g. http://mapy.vugtk.cz/pages/index_eng.php?rs=2&lg=eng (the copy preserved in the Institute of History, Czech Academy of Sciences, Prague, Map collection, sign. MAP A 11, made published on the Web Map Portal of the Institute of research Institute of Geodesy, Topography and Cartography).

⁷ Brůna – Buchta – Uhlířová 2002; Brůna – Buchta – Uhlířová 2003.

municipalities, states, the distances from neighbouring villages, position, general characteristics of buildings, waters and vegetation. In general, the text provides a picture of the landscape from the point of its exploitability or, eventually, military risks and provides the information which the cartographers were not able to draw.

The erroneous approach of the separation of either the text or a map, which affects the results of interpretation of the source in a crucial way, can be illustrated on the up-to-now made attempts in the publication of the I Military Survey of Bohemia. The collection of the I Military Survey is stored in the Austrian State Archives in Vienna. Besides others, it means that it had been hardly accessible for Czech scholars in the period of communism. On one hand, the value of the source was known to the researchers' community thanks to the above mentioned papers by Josef Paldus and several illustrations incorporated into sythetical works on historical cartography of the Czechoslovak Socialist Republic,⁸ on the other hand, they were perfectly aware of the fact that a systematic research of the source, especially maps, was not possible without access to the originals. The texts were easier to handle, so the 19 books, e.g. more than 11,500 pages of the manuscript, were photographed sometime in the 1960s or the 1970s and in the form of more than 300 microfilm scrolls, were stored in the National Archives in Prague, while the maps were known in a few examples only and black-and-white copies of poor quality. It allowed Olga Kudrnovská, a geographer and one of those who at the beginning of their career lived in a period when Czechoslovak scholars were involved in international research community debates and life, to publish in the 1970s and the 1980s three papers analysing the texts. She limited herself to a detailed analysis of one selected section in each.⁹

The perspective changed radically in 2001, when the Laboratory of Geo-informatics of Jan Evangelista Purkyně University in Ústí nad Labem had copied all the sections of the 1:28,800 map in Vienna. These 1:1 colour copies were subsequently scanned and via Zoomify technology made available on the internet. Shortly, the "oldmaps.geolab.cz" became one of the most visited web pages dealing with Central-European cartography.¹⁰ With no regards to the texts, the map started to be widely used and interpreted. Only recently an approach which takes into consideration both parts of the set started to be applied again and was provoked by the papers of the co-author of this article.¹¹

To sum it up, keeping in mind the original purpose, which was to provide the army with structured and reliable complex of information about the territory, and the state of knowledge in cartography in Central Europe in mid-XVIII century, the authors had no other choice but employ both, cartographic language – map signs – and verbal description – the words – to meet the requirements. In accordance with this, should the interpretation of the source be correct, we are obliged to take into consideration the set of documents, whatever their nature is, as a whole. The publishing of the source can be the first step and we find it useful to apply interdisciplinary approaches and create an information system.

⁸ Kuchař 1959; Boguszak - Císař 1961.

⁹ Kudrnovská – Kuchař 1975; Kudrnovská 1982; Kudrnovská 1985.

¹⁰ Brůna 2010.

¹¹ Chodějovská 2011; Chodějovská 2012; a lecture given by Eva Chodějovská in the „Geisteswissenschaftliches Zentrum Geschichte und Kultur Ostmitteleuropas – GWZO“ in Lipsia, Germany, in 2013: *Ist Military Survey of Bohemia. A complex historical source in the "digital era"*.

Old maps and texts going digital

Creating such a comprehensive information system is not an easy task and requires the application of different methods for data processing and technologies for data storage and publication.

Processing (georectifying) the maps of the I Military survey maps was very problematic as these maps have no geodetic basements. A unique method introduced by Cajthaml¹² based on polynomial transformation was used for georeferencing the I Military survey map sheets and preserving the neighbouring map sheet continuation. A large set of hand-identified identical points and the weighted least square method was used for the map sheet transformation.

All the maps sheets will be georeferenced¹³ into the Czech national S-JTSK coordinate system and visualized by the ESRI file geodatabase mosaic dataset which is used to mask the map frame information producing a seamless map.

The processed old maps will be accessible online for two different groups of users – editors and end-users. Editors will be able to identify all the places described in the maps of the I Military Survey in the textual material and acquire their coordinates. Users will be able to use the web-mapping application for viewing/searching the places described within the textual material.

The two different groups of users require two different types of web-mapping applications to be created. The applications are built using the ArcGIS API for Flex and are based on the ArcGIS Viewer for Flex. This technology is very flexible and presents the data in a very effective and feasible way.

The data are published using ESRI technology and the processed maps are stored in a file geodatabase. Online accessibility is secured by data publication by ArcGIS for Server 10.3. Two types of data are published – *basemaps* and *operational* layers. The *basemap layers* (old maps, orthophotos) are published as tiled (cached) services allowing faster data viewing by the end users. The *operational layers* (vector layers – objects from the textual description) are published as dynamic layers. All the published data are protected, so the user is allowed to view, query or print the data, but not to save them to a hard drive.

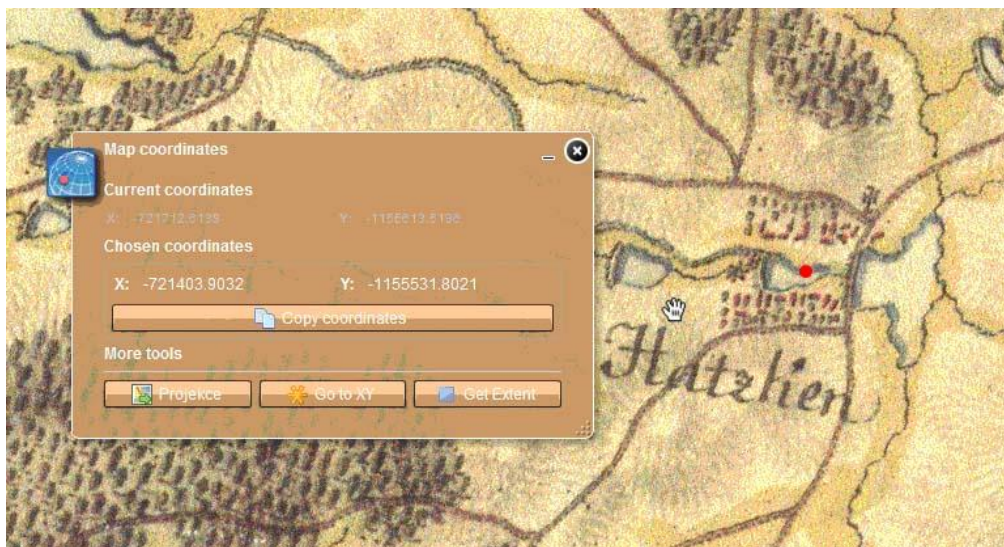


Figure 1. The tool for precise reading of selected features coordinates.

¹² Cajthaml 2012.

¹³ Only the North-West part of Bohemia has been processed so far.

Web mapping application for editors

The web mapping application for editors offers the user the ability to go through the processed maps sheets of the I Military Survey and visually compare it to a current map in the scale 1:10,000. This is highly required as the I Military Survey map is, due to its origin, processed with very low positional accuracy. The current map is thus used for faster identification of desired objects. A special tool was implemented into the web-mapping application to allow the editor to precisely acquire the coordinates of the desired object. The map coordinates tool is presented in Fig. 1. The coordinates for all of the mentioned objects are then saved into the database. The usage of a web-mapping application avoids the requirement of a desktop GIS license and allows the editor to work on any computer.

Web mapping application for end-users

All the objects mentioned in the textual description of the I Military Survey have its coordinates assigned in the database and thus can be easily visualized in the web-mapping application. The user's web-mapping application offers different types of processed old maps as *basemap layers*.

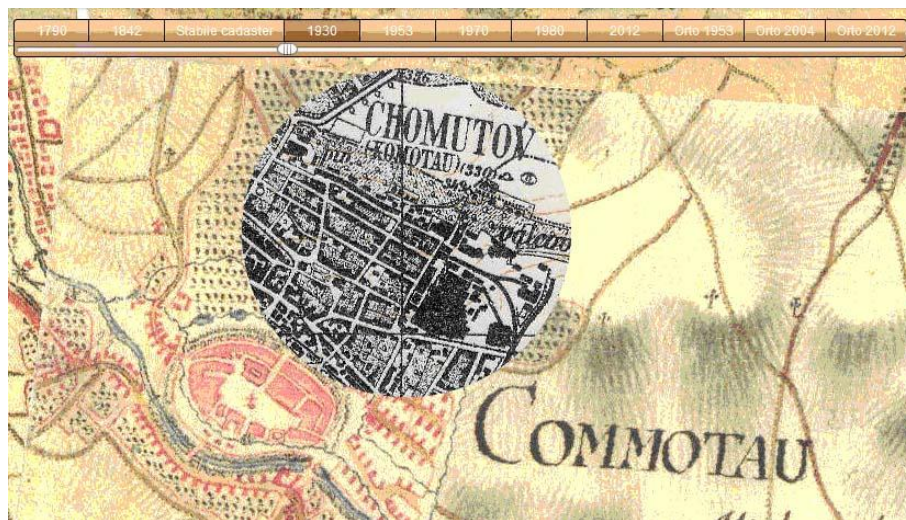


Figure 2. Basemap switcher tool and visual comparison of the I and III Military Survey Maps within the web mapping application.

Within the web mapping application, the user can view different types of processed old maps as base layers, switch between them and change their transparency. This allows the user to visually compare the development of the site from the 1790s until now. Other tools available are implemented for visually comparing the data – for example a swipe tool or a “magnifying glass”. The user is allowed to export the currently viewed data to different graphic formats. The web-map environment is presented in Fig. 2 where the layer comparison tool is shown (map of the I and the III Military Survey) and the basemap switcher ribbon.

Storing textual data

The database was designed with respect to the project requirements: (i) an editable database with multi-user access allowing data entry in the Internet environment, (ii) store text and image files (the original scans of the textual part of the 1st Military Survey), (iii) easy publication of the entered text data in PHP language.

Two database tools were chosen fulfilling the above described requirements. The database itself was created using the FileMaker Pro software which can model databases, data input, data search and simple internet interface for data handling in the World Wide Web. The server based database tool FileMaker Server is further used for accessing the database from the internet environment. This allows data entry from any computer world-wide and data presentation using PHP language as web pages.

The database structure strictly follows the original textual descriptions. The simplified database structure is introduced in Fig. 3.

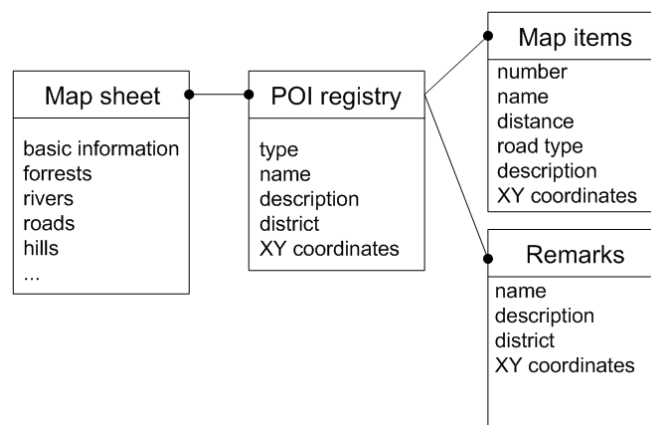


Figure 3. Simplified database structure.

As we have already mentioned, the I Military Survey of the Czech lands contains 273 map sheets. For each of the map sheets there exists a record of the type of “Map sheet” within the database. In this record, the general conditions within the map sheet area are described and these include the following sections - rivers, valleys, forests, swamps, lakes, hills, roads and paths. Here we may find, for example, information which hill gives the best overview over the landscape, the road conditions, where to cross a river or how to circumvent a forest.

The POI (Point Of Interest) registry consists of all the objects mentioned within the text. Included are towns, villages, lakes, forest, rivers, etc. All of the database items are assigned an X and Y coordinate to connect to the web-mapping application.

The Map table items are partly filled based on the POI registry table. The name and the coordinate attributes are inherited. The other information is filled, based on the textual material. Here we may find a detailed description of the map items (mostly the settlement). The settlement structure and the surrounding landscape is described in detail with respect to military tactical requirements. Distances to other towns/villages and the type of roads are described as well.

The Remarks table is filled with remarks found in the original text. Here we may find the general description of the POIs mentioned in the text. Some of the POIs may be contained repeatedly as the structure of the original text is strictly followed.

All of the above described information has to be filled into the database. The FileMaker Server environment offers Instant Web Publishing technology for accessing the database online. Layouts, menus and scripts are prepared within the database allowing the database to behave online as an autonomous information system. The simplified scheme of the database structure and workflow is presented in Fig. 4.

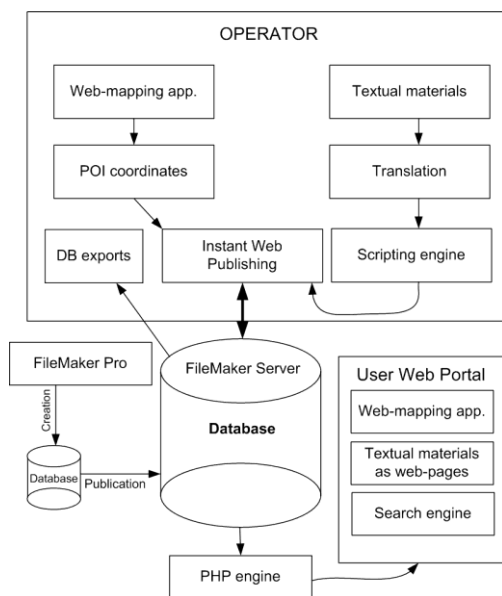


Figure 4. Simplified database and workflow structure.

One of the project requirements is that the resulting web-page presenting the textual materials on the Internet will have exactly the same form as the original textual files. The database may contain only plain text and thus a complex scripting engine (macros in MS Word) was implemented to handle the automatic text formatting. This macro engine transforms standard formatting and pre-defined character strings into standard HTML tags further used for web outputs. An example of the database output in the form of a web-page is presented in Fig. 5.

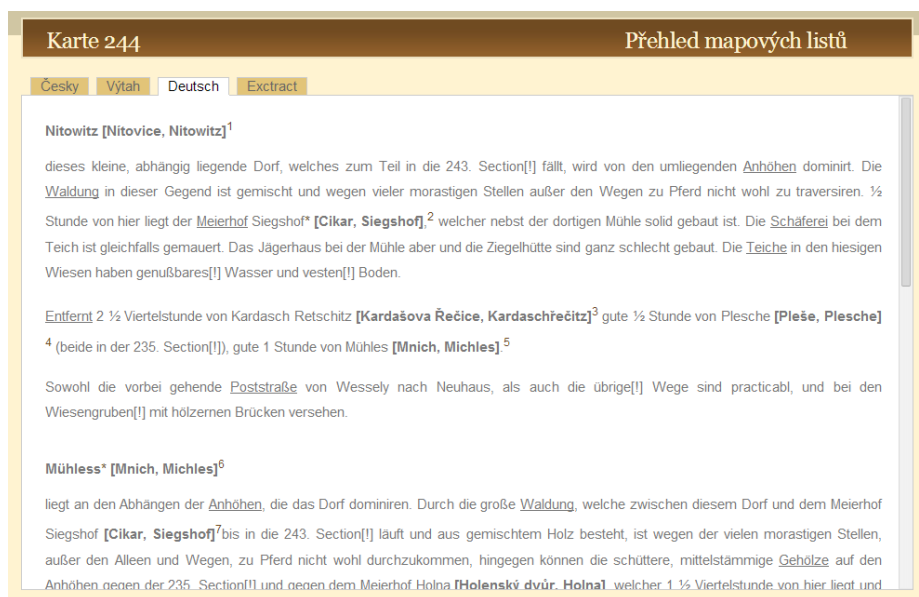


Figure 5. Database output in the form of a web-page.

Conslutions

Taking into consideration the above mentioned circumstances of the research in communist Czechoslovakia as well as further attempts in making available the I Military Survey using scientific means of publication, we believe that the discussed information system and the way we have handled the source clearly indicates how digital technologies can be beneficial to a scientific publication/editor's work which seems to be limited on written historical sources. It should be stressed once more that discovering the circumstances of the origin of the source as well as making sure about its completeness and understanding the links and connections among the parts of the source is crucial. To sum up, the document – a map, a text, a picture or whatever it is, was not a source of information in the moment of its origin. It is only a modern historians' perspective. The authors might have had completely different goals in mind than we have and expect to learn from the source. When making available or interpreting it, omitting a part would mean a misinterpretation and erroneous understanding of the past. Moreover, in the most general perspective, we claim that complex historical sources, such as the I Military Survey, have a great potential to become inspiration for developing advanced methods of publishing texts using digital tools. Much has been done in the field of cartography – in making available and analyzing old maps. On the other hand, archivists and historians limit themselves with classical “analogue” procedures and outputs. The sources which include both, maps and texts, can stimulate thinking about texts (narrative sources) in the digital/on-line sphere.

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