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Historical topographic and cadastral maps of Europe in spotlight – Evolution of the MAPIRE map portal

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Summary

Four years ago, the MAPIRE (name comes from Historical MAPs of the Habsburg EmpIRE) has been launched to provide an exhibition surface of the processed and partially offline published georeferenced map products of the Habsburg cartography. After finishing the scanning, processing and georeference the first, second and third military surveys of the Austrian Empire, the collection and exhibition has been extended to the cadastral products of the same area (the former Habsburg Empire) and to maps compiled by the imperial surveyors about some territories of temporary occupations (South Romania, Italy). Later came the other collection items found in the military map archives in the Austrian State Archive in Vienna, such as the Cassini map of France, the Ferraris map of the Austrian Netherlands, maps covering the British Isle, the southern Germany, and, as our last publications, Norway and Southern Finland. Besides these products, large-scale city maps are also shown for major European cities. Our last metropolitan database is the orthophoto mosaic of the wartime Budapest from 1944.

All of the above maps are shown in a common map coordinate system, as an overlay on the OSM (OpenStreetMap) or the HERE satellite basemap. The georeferenced is usually based on the known or computed geodetic and projection metadata of the old map systems. However, the applied technology can be effective also if no precise metadata is given. Providing a real or virtual image mosaic of the map sheets, and defining ca. 100 ground control points, a correction grid gives a rather acceptable horizontal control, which can be further refined at the most important parts of the region.

Introduction

The historical maps of Central Europe got the attention of scholars of different science areas, such as history, ecology, hydrology, forestry, climatology etc. for decades. The most important historical cartographic item of the region was the different military surveys of the Habsburg Empire. The first two surveys have impressively large scale (1:28,800 in metric units), albeit they are available only in manuscript form and some copies in a limited number of archives. The first attempt to make them available for larger public was made by the Hungarian firm Arcanum in 2005 in form of a DVD issue. The published electronic database contained the scanned maps of the Second Military Survey (started by the order of Emperor Franz I in 1806 and carried out from the end of the Napoleonic war to the decade of 1860s) of the historical territory of Hungary but still without georeference.

Hence the geodetic and cartographic metadata of this map product, as well as its georeferencing algorithm were known that time, it was obvious to make a combination of the scanning and publishing capabilities with the scientific results of georeference. The first result of this cooperation was a new DVD issue containing the same cartographic material but in form of a geo-referred mosaic (Timár et al., 2006). It was followed by further ones, showing the first military survey (ordered by the Empress Maria Theresa but accomplished in Hungary during the reign of his son, Emperor Joseph II, between 1783-86, the combination of the geo-referred mosaics of the first and second military surveys of Transylvania, the third military survey (1863-1880) in two scales: 1:75,000 for the whole Habsburg Monarchy and 1:25,000 mosaic of the historical Hungary with Transylvania and Croatia. Later the focus was moved to historical cadastral maps of Hungary (such maps of 6 of the 19 counties of Hungary were published in DVDs) and larger scale city maps and the territory of Hungary during the WWII.

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In a few years it became obvious that a further publication has to be made in online manner. First, the second military survey mosaic was made available in the Internet on the Arcanum's own website. The whole second military survey was also processed and put in a covered part of the website, not open for the public. That time, legal issues slowed the territorial extension of the covered area. Since the sheets of the historical Hungarian territories could be published according to the permission of the national authorities, considerable part of the scanned material was from the Austrian State Archives (Timár et al., 2011). A meeting at an Italian workshop and presenting the 'hidden' material convinced the Austrian representatives to make a cooperation, which led to the MAPIRE initiative.

Nowadays, MAPIRE (originally from the expression 'historical MAPs of the Habsburg EmpIRE') covers considerable part of Europe by historical map mosaics of different times (Fig. 1). The former Habsburg core territories are covered twice or three times, while southern Germany, Italy, France, Belgium (the former Austrian Netherlands), Great Britain, south Romania, southern Norway and Finland are shown, with cooperation of data providers, opening to Habsburg historical cadastres, historical maps of different European cities and, as a newest development, historical airphoto mosaics (Molnár et al., 2017). Our present work shows the technical, legal and scientific progress of the project since our last report made to the 2014 Budapest meeting (Biszak et al., 2014).



Figure 1. Europe in different time windows, in the historical maps presented by MAPIRE.

Technical advances

The important modifications of the service in last 3 years were of two kinds: change of data storage and change in the base maps used. The first version of the MAPIRE was a simple continuation of a part of the Arcanum's own website. The content was stored and provided to the users from the servers of Arcanum. It seemed handy at first, however as the number of web requests were increasing and sometime occurred in peaks, it resulted some sudden stops and needed administrator activity, sometimes in uncomfortable hours. Since Arcanum runs no 24-hour system control, it was a problem. Therefore, with increased capabilities of the external cloud services, we decided to move our website content to the Amazon cloud system.

The base maps were originally used from Google Maps, also the Google API was applied for 3D presentation of the data. In 2015 we changed to the OpenStreetMap for vector and to HERE Aerial for raster background layers.

Legal environment, cooperation

In the first time, the Arcanum's projects, thus the MAPIRE was based on cooperation of our core contributors. In Hungary, they were the Map Collection of the Institute and Museum of Military History of the MoD, The National and the Budapest Archive and the Institute of Geodesy, Cartography and Remote Sensing, with their county outlets. Our main and base cooperating partner is the Military Archive of the Austrian State Archive in Vienna. The very first version of the MAPIRE was published as a sub-domain of the Staatsarchiv.at. Many other maps, outside of the former Habsburg Empire, were

scanned also in the Vienna Archive. We also made and are making strong cooperation with the Croatian National Archive.

After the first successes of our website, we were able to establish cooperation to more European archives, libraries and mapping authorities. Now the cooperation is live with also with the Royal Library of Belgium, National Library of Scotland, the National Archives of Finland (Kansallisarkisto) and the Norwegian Mapping Authority (Kartverket).

Scientific achievements

In the last years, we made interesting achievements in defining and applying geodetic datum and map projection parameters for some new historical map products. We published the Cassini map of France, based on the result of Timár et al. (2014a), the Walachian part of the Old Romania after Timár et al. (2014b), the Habsburg maps of Italy (Timár et al., 2017a) and the Norwegian Rektangelkart series (Timár et al., 2017b). However, combining the method of Molnár & Timár (2015) to estimate the best-fitting Cassini projection parameters, our applications were rather shifting to usage of virtual mosaics and their georeferenced, sometimes completed by correction grids (GSB; application description by Molnár et al., 2014). The Habsburg maps of Italy was the test area of this, and finally the whole map collection of southern Germany, Alsace and Sicily was geo-referred without knowing and even without estimating the appropriate GIS parameters, based on just virtual mosaics, ground control points and their resulted GSB.

A new feature in our city map series (Fig. 2) is the application of historical airphoto orthorectification (Molnár et al., 2017). We present the WWII wartime Budapest, before the severe siege, mostly intact, only with some bombing damages in the southern part with this method.

European cities

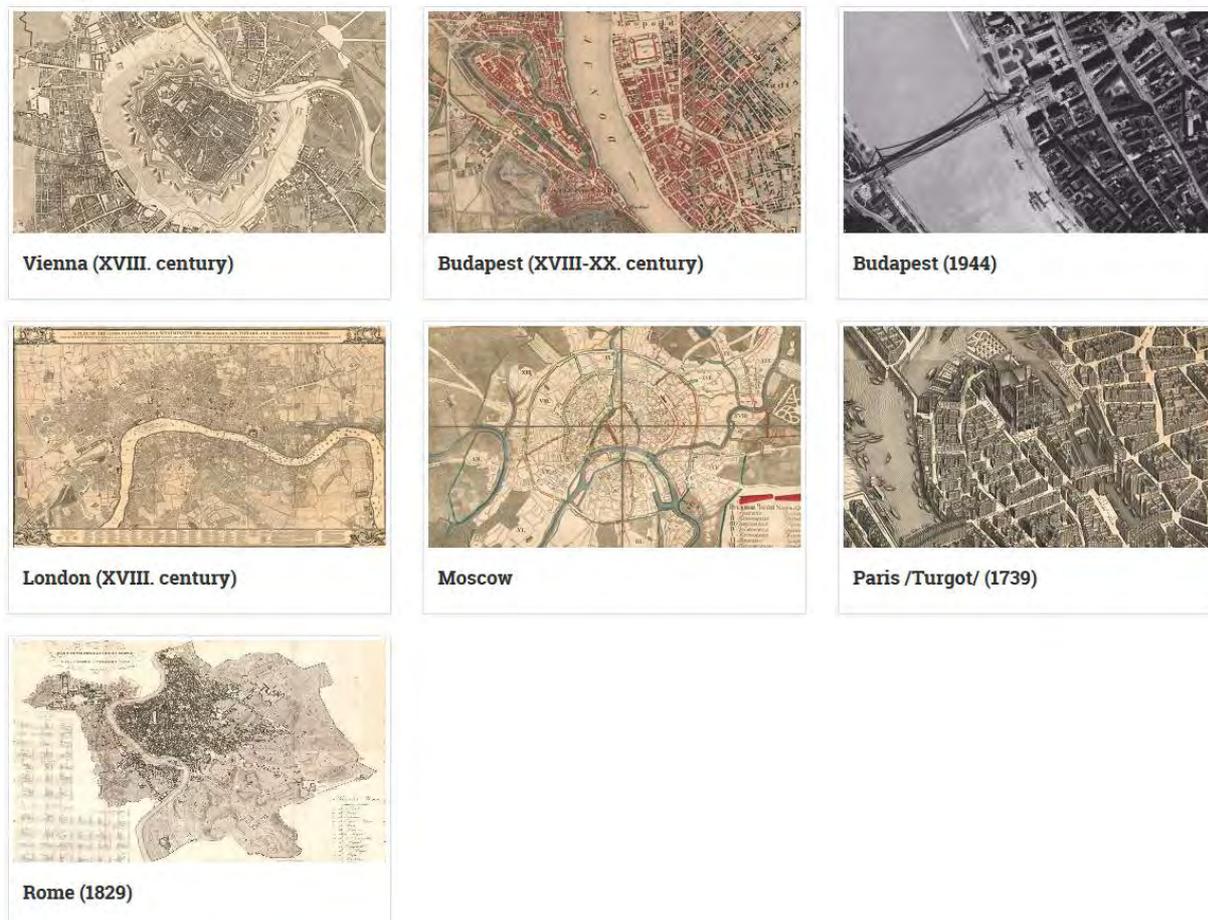


Fig. 2. The wartime Budapest airphoto among the MAPIRE city maps

Audience

Albeit of the rapid extension of the map-covered area, the present average reader of MAPIRE is still dominantly from Hungary. It is probably because of the popular presence in the Hungarian media. However, skipping this effect, we can see that readers of the countries, whose maps are presented in MAPIRE (Germany, UK, Belgium, Italy, Finland) have been also appeared (Fig. 3), as well as the readers from earlier Habsburg territories.

Country ?	Acquisition
	Sessions ? ↓
	564,455 % of Total: 100.00% (564,455)
1. Hungary	396,846 (70.31%)
2. Slovakia	25,219 (4.47%)
3. Romania	17,183 (3.04%)
4. Slovenia	15,297 (2.71%)
5. Austria	15,206 (2.69%)
6. Ukraine	14,329 (2.54%)
7. Germany	12,112 (2.15%)
8. Croatia	10,429 (1.85%)
9. Poland	9,044 (1.60%)
10. United Kingdom	7,744 (1.37%)
11. Serbia	7,260 (1.29%)
12. Czechia	7,120 (1.26%)
13. United States	5,514 (0.98%)
14. Italy	5,310 (0.94%)
15. Switzerland	1,556 (0.28%)
16. Belgium	1,434 (0.25%)
17. Canada	1,422 (0.25%)
18. Netherlands	1,405 (0.25%)
19. Finland	1,177 (0.21%)

Fig. 3. Page Impression figures (1 Jan-15 Mar, 2017) of MAPIRE, from the top twenty country domains.

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