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## Old maps as a part of movable heritage accessible from the online map<sup>1</sup>

*Keywords:* digital heritage, cartographic heritage, spatio-temporal GIS, online map

### *Summary*

The paper presents some aspects of a research project where the main idea is to use a Geographic Information System (GIS) - as a technology and as a tool - to integrate different digital archival collections, present their content in one space and provide online access to them from one common level – from an online map. The paper concentrates on cartographic heritage as a part of movable heritage, which has no such simple relation to geographic space, as it looks like: they can be created in one place, they can present other places and now they can be stored still in another place. Moreover, each archival map could have been stored in many different places in the past. Access to such maps is not easy and it depends on how precisely they are described in the archival collections.

Digital archives contain a lot of old maps, which now are described with the use of the international standards for describing digital collections. They provide metadata which are the source of spatial information about archival maps and about spatial, temporal, typological and semantic relations between them. In our research, all these aspects were integrated in the GIS and presented as the prototype of an online interactive map.

### Introduction

Digitalization and sharing the rich cultural heritage on the Internet, causes an increasing interest in archival cartographic material. Old maps, closed in archives, libraries and museums for years, suddenly have become available for everyone. The growing interest seems to be natural because the old maps always have been fascinating, being the pride of rich libraries and wealthy houses initially and afterwards of archival collections.

Archival maps are extremely useful cognitive material and interesting basics for conducting multi-directional research and development works. First of all the complexity of such research means that it is necessary to take into consideration various ways of reading old maps, because each archival cartographic study is not only a mapping of space but also historical material and document of the expansion of cartographic science. Therefore, detailed research on old cartographic materials should contain not only studies examining the map as the cartographic material that presents the scientific progress at a given epoch, but also the analysis of its geomatics and its historical content (Niescioruk 2007).

Comprehensive study of cartographic archives is impossible without complex, interdisciplinary research demanding close cooperation among specialists from various scientific areas. Old maps

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can be excellent research material both for the cartographer and the historian (Szady 2008). Cartographers will be interested in metric reliability, techniques of map preparation and methods of cartographic representation. Historians will focus on content of the map as source material so the most important will be information concerning old place names, borders, physical features, changeability of places in years.

The ability to find the resources needed is the first step of research. As it is mentioned above, the Internet gives us the possibility to examine archives without leaving home. However, we should take into consideration that using Internet resources effectively requires easy access to information about them, about the place where they are kept and way of searching for them.

The project titled “A methodology for mapping movable heritage” is an example of activities that aim at using archival resources both in research and management (Moscicka and Marzec 2008). The project is financed by the Polish Ministry of Science and Higher Education and realized by the Institute of Geodesy and Cartography in cooperation with the Research and Academic Computer Network, the Central Archives of Historical Records and Department of Art History of the Wrocław University.

The project aims to use spatial information as one level integrating various initiatives providing users with easy access to digital resources of mobile cultural heritage. It is an interdisciplinary task that integrates environments engaged in information technology, cartography, history and archival science. Cartographic heritage, included in the project, was admitted to be one of the most interesting resources both for cartographers and historians.

### **Cartographic heritage in the project**

Today portal Polska.pl, administrated by the Research and Academic Computer Network, is one of the richest digital sources of the national heritage archives in Polish Internet. The resources gathered in this portal were the main thematic source used in the research activities; the pilot application developed in the project will also be published there.

The cartographic resource in portal Polska.pl contains 63 maps, 82 plans and 12 sea atlases. Most of them are kept in the Polish National Archives (29 maps and 65 plans), mostly in the Central Archives of Historical Records (16 maps and 29 plans). Many of them (27 maps) are held in private collection. The oldest maps presented on the portal are dated back to the 16<sup>th</sup> century, with among them the *Map of Ducal Prussia* from 1576. The oldest plans published on the portal are from the 17<sup>th</sup> century, for example the beautiful *Plan of Wieliczka city and three levels of mine* 1645. Both of them are kept in the Gdansk Library Polish Academy of Sciences (BG PAN). This institute is also the owner of 12 sea atlases – each of them has several hundred pages.

Polska.pl resource contains archives that present all cartographic techniques developed in the course of years. One can find hand-painted parchment cards (e.g. *Map of the western Gdansk Gulf* from 1596, copperplates (e.g. *Plan of the castle and monastery in Wisnicz* from 1696), manuscripts (e.g. *Plan of the marketplace in Bolimow* 1849), lithography (e.g. *Cadastral map of Brzozow* from 1851) and prints (e.g. *Plan of Gdynia Seaport construction* from 1931). The variety of archival materials on the portal lets the users not only admire the cartographers’ craft in the different periods but also study the techniques for presenting the geographical space.

The project is also based on the Polska.pl archival documents concerning the history of the Polish cities gathered on the website “Cities in archival documents” (miasta.polska.pl). It presents the places that were important cultural and economic centers but they declined in importance as a result of historical events. Before being published in Polska.pl the archival documents were

known only to archivists. Currently the project “Cities in archival documents” includes archival documents concerning the history of 47 cities, gathering over 800 documents, among them about 60 maps and plans. The maps and plans gathered on the website “Cities in archival documents” are often the only available cartographic material for these places, so they are a unique material for studying the spatial pattern for these cities, examining its development and the various ways of representing it on maps. Beside plans the project is also based on the cities’ panoramas and perspective plans that give information on historical urban space and are prepared not by cartographers but artists. The research studies also examine written documents such as registers, location documents, illustrations and statistic registers. About 100 archival documents concerning 6 cities were used in the project.

### Visualization of cultural heritage on the map

#### *Essence of the project*

The basic assumption of the project was that the systematizing of information concerning heritage resources and their connection with geographical space increases the chance of effective search. Beside scientific goals concerning the methodology of preparing maps for mobile historical monuments, the project aims to develop the application that allows using the map as an interface for searching the archival collections in the Internet, including rich collection of old maps.

The starting point of the research conducted in the project was that Polish archives, including cartographic materials, are spread all over Poland and worldwide. As a rule maps are created in one place, present another, today can be kept in places far away from the place they depict when prepared, and even more the parts of the same collection can be kept in different archives. Complicated Polish history caused that it is necessary to look for the plan of Wieliczka in Gdansk, and the plan of Zabłudow at the Warsaw University of Technology.

The essence of the research is to present on the online map a mobile historical monument (archival map) as a multi-spatial object (Fig. 1). The base of this assumption is that most of monuments, especially mobile ones, can have several places in the geographical space that are connected with them (several various space relationships).

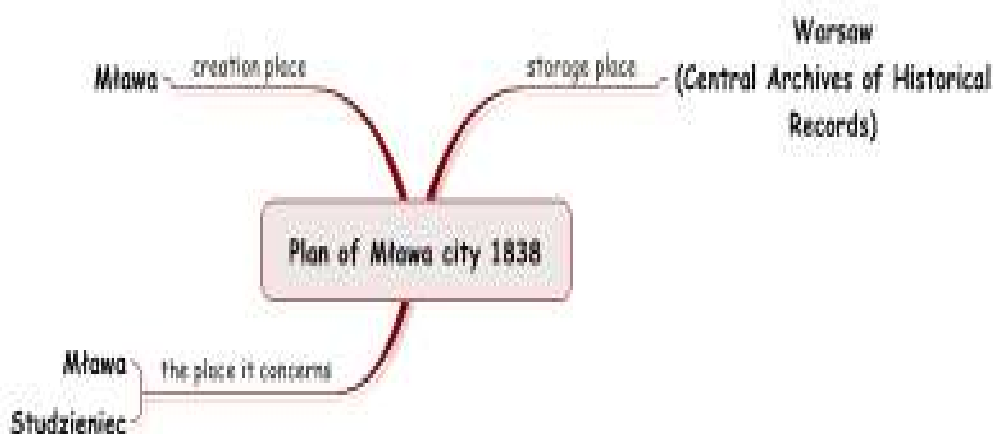


Figure 1. Various space relationships of one object.

They are:

- place where the monument was created
- place or places where the monument was housed in the past
- place where the monument is kept now
- the place or places connected with the monument thematically – in case of maps it is a part of space presented on them

The essence of the project is also that particular space relationships of a single map can be connected or have a relationship (typological, thematically, temporal, spatial) with other relations to the same or the other map. The reason for this is that maps concerning various places are housed in the same archive, various maps can present the same place, or the place of creation of a particular map can be the place of housing another.

The pilot application was developed on the basis of proposed methodological solution. The application is based on spatial information and allows visualizing information about mobile historical monuments on the online map.

#### *Description of digital copy of archival map*

To prepare an online map it was necessary to have digital archival resources. In the project the basic source material was digital collections of original records. These high-quality scans were the material for preparing electronic documents presenting monuments called the digital copy of the monuments.

The digital copies of the monuments used in the project, as electronic documents, are described by means of metadata that facilitate searching, controlling, understanding and managing them (*Dziennik Ustaw* 2006). The metadata of the digital copies of the monuments are defined in the international standards of monuments' description. It describes which elements can or should be used in the electronic description of the copy of the monument to get basic characteristics of the monument and meet the requirements for electronic documents.

The digital copies of the archival maps used in the project were described using the EAD standard (Encoded Archival Description). The Encoded Archival Description is an XML standard for encoding archival finding aids, developed in the USA in cooperation with the experts from the International Council on Archives and representatives of the European Archives. The EAD has been implemented by the British, French and German archives and in Poland by the Central Archives of Historical Records (Wajs 2000 and Wajs 2003). The example of the archival document and its description in the EAD standard is presented in Fig. 2.

The EAD standard, besides basic information identifying a monument, contains also data that enable linking it with geographical space (Fig. 3).

In the EAD standard all geographical entries are encoded by using tag <geogname> (Geographical Name). To define the relationship of the geographical name with the described document it is necessary to add the attribute "role" that defines the character of this relationship.

In the case of defining the place of creation of the monument the value of attribute "role" is filled with "Creation-Place". The way of coding the place of creation is presented below:

```

<controlaccess>
    <geogname role="Creation-Place">Lviv</geogname>
</controlaccess>

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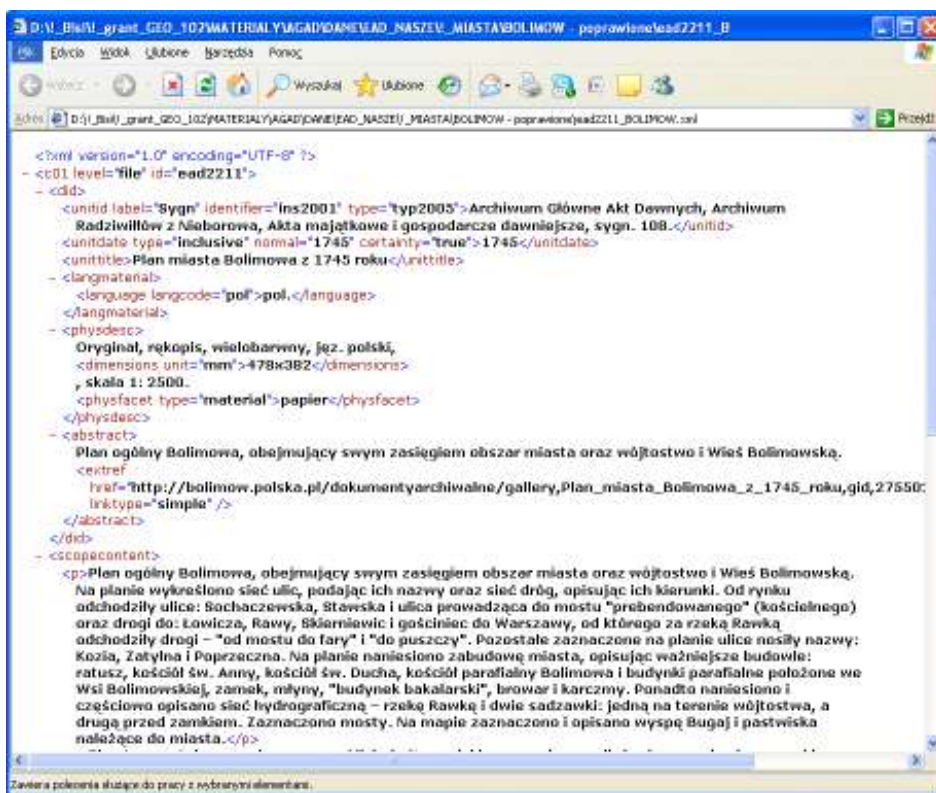


Figure 2. Description of the Bolimow city plan in the EAD standard.

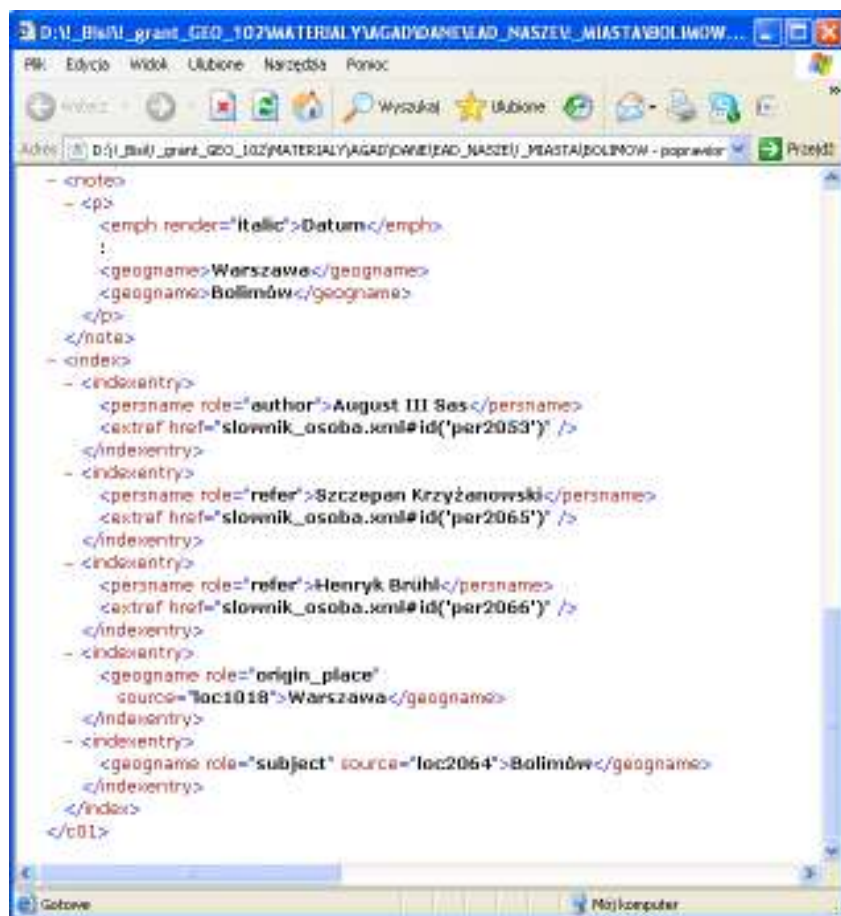


Figure 3. Geospatial relationships in the EAD standard (city ID refers to the cities dictionary).

In the standards of monuments' description the place of storing is mainly encoded in the tag of each object, recorded in numeric or alphanumeric text string. The EAD standard exactly specifies how to identify the archival monuments by employing unique tags. This tag is an alphanumeric text string that defines the described object. This information includes the attribute "ID of the unit" described as the tag <unitid> (Meissner 2002). The attribute contains the country code describing in which country the monument is kept ("countrycode" for Poland – PL), number of archive, collection, series and even page or card. Information describes the country of origin of the source and allows linking the monument with geographical space by the storage place. The place of storing the monument can be defined by putting the tag <physloc> (Physical Location) identifying the place where the described materials are kept, such as the name or number of building, room, stack, shelf or other tangible area.

The standardized description of monuments, meant as historical objects, also contains a lot of information concerning the past of the monument. In the EAD standard the history of storing the monuments is defined by using the tag <custodhist> (Custodial History). Both physical possession and intellectual ownership can be described, providing details of changes of ownership and/or custody that may be significant in terms of authority, integrity, and interpretation. This information is extremely worth in research on the spatio-temporal information system and includes the time changes and historical conditionings that had an influence on the storage place of the cultural heritage resources.

In the EAD standard the theme of the monument (information on what the monument represents/ describes) is described by assigning key words. The geographic names, for example defining areas shown on the map, are defined by using the tag <geogname> (Geographic Name) and define the character of the relationship of the name to the document being described.

In the case of defining the area, shown on the map, the encoded text of the geographic entry connected with the map will look as below:

```
<controlaccess>
  <geogname role="subject">Lwów</geogname>
</controlaccess>
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The geographic index should include geographic names, topographical names, administrative divisions, that can be found in the titles and registers. Using the name later and looking them up is much easier if the name dictionaries are compiled (Fig. 4.)

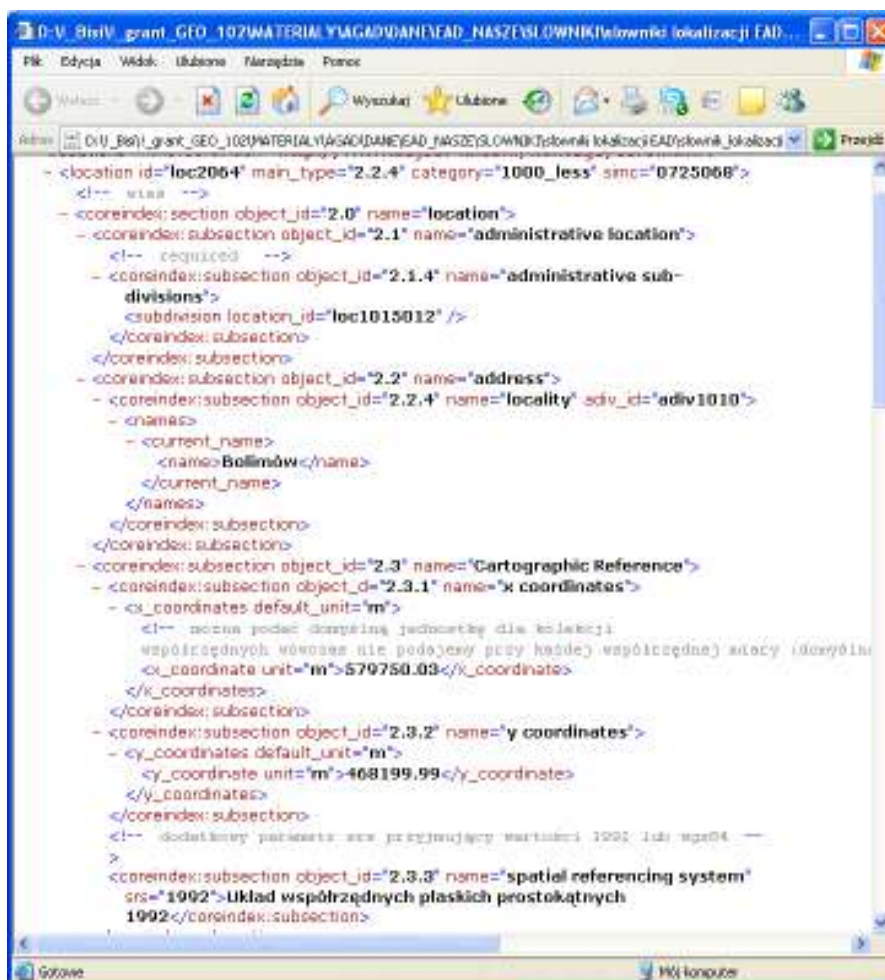


Figure 4. The example of the cities dictionary used in the project.

#### *Access to the old maps from the online map*

The application was developed using digital copies of historical monuments. It was based on the Geographic Information System (GIS), relating monuments to the places where they were created, the place connected with the theme of the monument (for example the places shown on the archival map) and also these places where the monument is housed now.

The online map visualizes the resources gathered in the system. It allows presenting various aspects of the cultural heritage resources in the geographic space and provides access to digital historical objects. The result of the research is the solution for presenting in a common environment - in one application (Fig. 5) - not only an archival map but also its relationships as a monument to its history and all places connected with it.



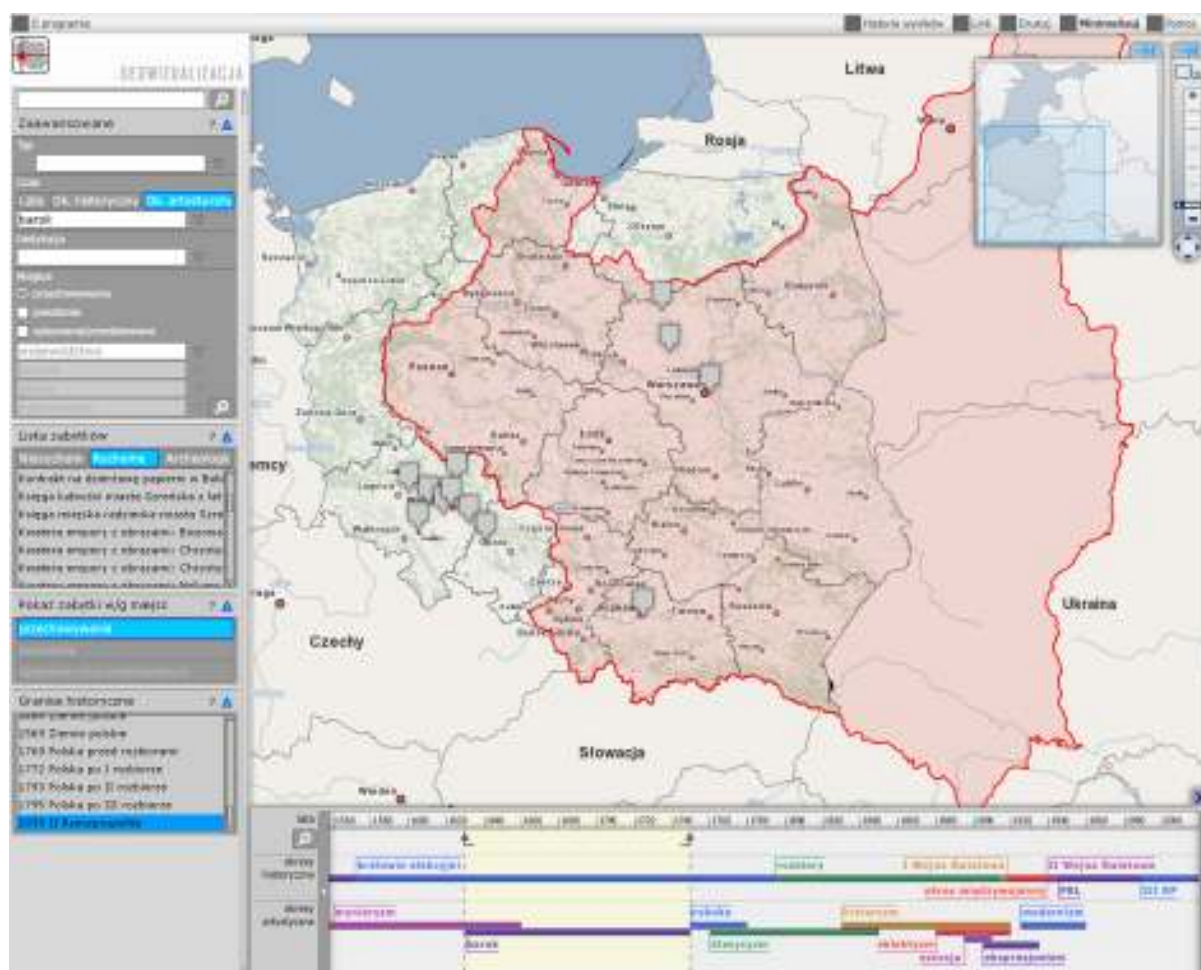


Figure 5. Main application view (testing phase).

The functionality of the application concerns mainly the elements of selecting the resources, presenting the documents on the map in different ways and finding their images.

Searching of resources is possible at two advanced levels. *Easy search* contains text searching of all elements of description of digital copies based on entered word (i.e. searching in the name of comments on the monument). *Advanced search* contains both elements of easy search and also gives possibility to narrow down the selection criteria – to the type of the monuments, institution of storing, dates or creation period, and also to selection of geographic criteria (place of creation, storage etc.). To search by geographic criteria is possible by choosing the name of a place and also by choosing an administrative unit.

The presentation on the map of the resources retrieved depends on users' requirements and interests. He/she can choose *Presentation by creation place, storage place and place concerning the topic* of selected resource. Each of these aspects is presented on the map as separate independent theme layer (change of a layer on the left menu). It is possible to move between layers and change the aspect of presentation on the map the same set of monuments. Moreover, by choosing one object from the *monuments list* it is possible to show on the map all places connected with it, its history and theme.

The resource presented on the map can be enriched by choosing the view with historical borders of Poland (*Historical borders* on the left menu) and visualizing the historical context of creation or storage of the resource in the selected period. The solution allows receiving much more



information on the monument and its history than in case of traditional approach that focuses only on the place the monument is being kept now. This is one of the reasons why the application can be used in the humanities, especially in historical research.

When we focus on old maps we cannot forget that as historical objects they are closely related to time and one of the most important features describing the archival map is its creation date. With the objective of providing the users with complete information about monuments it was necessary to use a four-dimensional data model. The system was enhanced by an additional coordinate describing time – in this case the creation date. Thanks to that improvement it is possible to visualize the monuments depending on the time they were created or kept in the past.

In the application the time of monument creation can be chosen on the basis of the interactive *time bar* (Fig. 6). The timeline is divided into years, historical periods and artistic periods. One can choose the date or period by using the arrows pointing to years on the time scale (one can get the same result by entering the date in the *advanced search*). It is also possible to select the monuments created within the exact historical or artistic period by clicking in a colourful line that represents a specific period (or choosing the name of the period in the *advance search*).

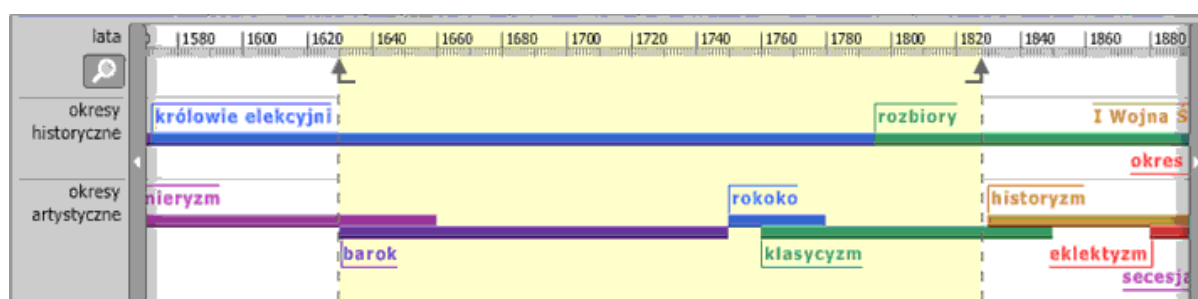


Figure 6. Interactive time scale (testing phase).

The functionality of the application is also connected with the interactivity of the map. The icons that appear on the map and symbolize the places connected with the monuments are active. When the user clicks on them, she/he can select additional options – the change of range (amount) or aspect (type of spatial relations) of resource presentation, enlargement of map or pointing the monuments relating to certain monument (i.e. other monuments from the collection).

The result of the solutions mentioned, concerning both application functionality and map functionality, is a variety of ways for visualizing the archival resources on the contemporary map. What will be present on the map depends on the range of gathered resources and needs (also creativity) of users. She/he decides what to watch and how to present the resources on the online map.

For users who look for the archives it is important not only the possibility of visualization of the resource on the map but also the quick access to an image of the monument. After selecting the monuments users can go to their description (in the EAD standard) and to their image (Fig. 7).

It is also possible to save the *link* to the map, look through the *history* of search or *print* the map. Each stage of work in the application can be in *full screen*.

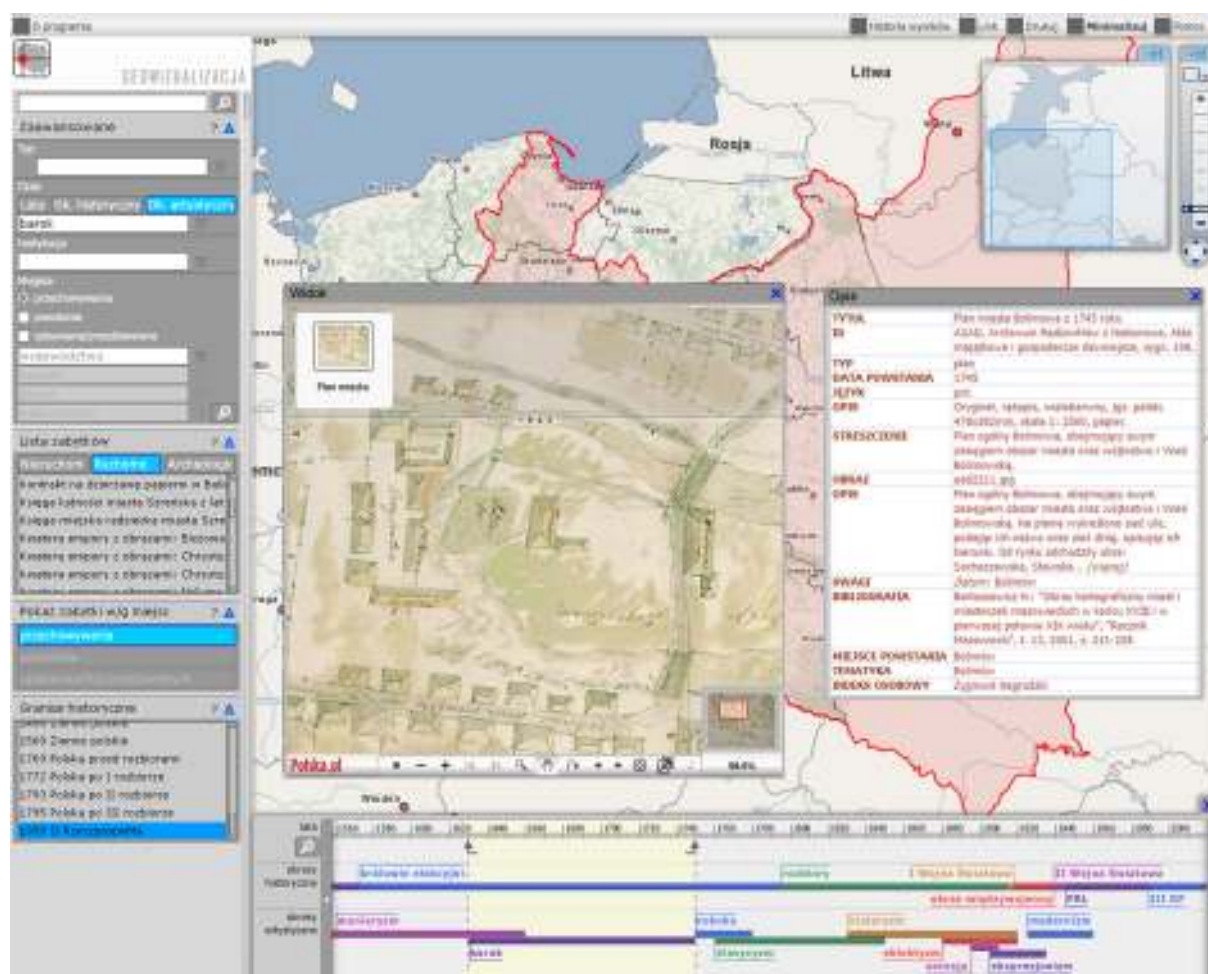


Figure 7. Map description and its image are accessible in the same application (testing phase).

### *Unique resource – special presentation*

One of the most important assumptions of the project was not only to provide the wide public with easy access to the monuments but also to enable studying historical documents in a degree comparable to that during the visit in archives.

To present the digital copies of monuments the *Erez Imaging Server* software was used, which allows publishing, browsing and examining documents in the Internet (Wajs and Marzec 2009). The software uses the technology and functionality that has not been employed to publish archives. Using *Erez Imaging Server* does not require any additional software on user computer. It uses dynamic image presentation based on a single, high-resolution image that allows presenting a whole image and any selected part in various scales, size and quality.

The central, biggest part of the window is dedicated to present the exact document that can be studied by using the function buttons placed on the bar at the bottom. These buttons allow moving and using all functions of the software. The bar of the main functions contains: zooming in/out, moving and rotating the document.

It is worth paying attention to the full screen view button (Fig. 8). This function enlarges the window in which we watch and zoom in the document to full screen mode. Enlarging the window improves comfort work with archival documents (Fig. 9).



Figure 8. Plan of Wieliczka city and three levels of mine from 1645 – full screen view.



Figure 9. Plan of Wieliczka city and three levels of mine from 1645 – full size of zooming in full screen view.



## Conclusion

Geographic information systems and interactive maps are tools that ensure and improve access to cultural heritage, valuable scientific, cultural and historical resources (Moscicka and Marzec 2008a). Using spatial information helps gain easier perception when passing on information (Ratajski 1989), which is extremely useful for promoting less popular resources. Moreover, employing modern technology raises the prestige of cultural institutions by presenting unique works in an attractive way.

The presented results of the project constitute the first stage of research that aims at developing a complex application allowing managing and giving access to cultural heritage from the online map. The project carried out concerns mobile monuments, but the received solutions allow for introducing the results for immobile monuments as well.

The application used a map in scale 1:200 000 that allows presenting the locations of all, even the smallest places in Poland. The information on monuments refers to these definite small places. Even plans of cities are related to the signatures of the city, not to the part of space presented on the map. Surely, in future the maps will be much more detailed to present the areas of cities shown on archival maps.

Taking into consideration the cartographic heritage, the following important stage of application development is to broaden its functionality in order to present archival maps occupying larger regions (i.e. maps of geographic lands, administrative units, countries). This demands to work out the method of relating old maps to current geographic space, especially maps dated back to 15<sup>th</sup>/16<sup>th</sup> century having no cartometric qualities. Cartographers will have to face the challenge to work out methods of presenting on an online map the parts of geographic space shown on old maps.

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