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Interactive map of movable cultural heritage

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Abstract. The paper presents the results of a research project connected with using 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 on-line access to them from one common level – from an on-line map.

Digital archives contain a lot of movable heritage which content has no simple relation to geographic space: manuscripts or old prints can be created in one place, they can describe other places and now they can be stored still in another place. Moreover, each archival object could have been stored in many different places in the past.

Presented paper propose the method of creating movable heritage map, based on all geographical places connected with digital collections. The starting point of the study was the international standards for describing digital collections. They provide metadata which are the source of spatial information about archival objects and about spatial, temporal, typological and semantic relations between them. All these aspects were integrated in the GIS and presented as the prototype of an on-line interactive map. Proposed solutions as well as practical applications of the map are presented in the paper.

Keywords: digital heritage, archives, GIS, on-line map, application, public access

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1. Introduction

People interested in the past of large cities have rather easy access to the information required. There are numerous archives in such cities that store many documents concerning them. When the Internet became widespread, many people from small villages started to look for information about their familiar surroundings. They were, however, in worse situation. Archival resources concerning such places are mostly limited and are kept in archives in remote cities. What more, for person from the provinces, familiar surroundings means not only village or town where he/she grew up but also neighbouring villages where his/her friends lived or neighbouring town where he/she attended to school. Like for citizen the part of his/her childhood is the district where he/she had school, for village's inhabitant they are neighbouring villages that often have changed their names in the space of years, do not exist anymore or are located beyond present borders.

Users who look for archival resources concerning their provincial familiar surroundings have a difficult task. To find archival materials that interested him/her, he/she has to write down names of the cities several times. What more, he/she has to know historical names, sometimes in foreign languages. It is time-consuming and not always gives an expected effect.

2. Objectives

The users' needs concerning the access to archival resources based on geographic information were defined on the basis of opinions of active Internet users, people searching information about digital cultural heritage in Internet, and also thanks to the professional advices of experts from academic environment, culture and research institutions.

To meet their expectations the authors have started works on developing the on-line map. Thanks to this map users could find archival documents, concerning the city they are interested in, and analyse them (their digital copies /images/) on large scale without leaving home. The aim of the project performed was not only to provide an access to archival documents but also to other monuments there. Therefore, the main purpose of it was to develop the on-line map that let users search and watch digital copies of various types of mobile monuments that are located in the cities.

Undertaking such a task, the authors' aim was to develop the map without preparing new data bases of monuments, but using the descriptions of monuments that are international standards of monument description.

The subject is difficult because it concerns movable historical monuments that can have many different places connected with them. Immovable historical monuments, for example architectural monuments like churches, castles, palaces, have unchangeable geographical location – they are located in one place in the space. Movable historical monuments are the monuments that are not related to one place in the space – they can easily be moved from one place to another. Most of the movable historical monuments are created in one place, in the past they could be kept in different places, and now are stored in other place (archive, museum or library). What more, such monument, e.g. a written document (manuscript, old print) can refer to other places in geographical space (it can describe different places).

In connection with it the authors have made an attempt to work out the idea of geovisualization information on movable historical monuments (Moscicka and Marzec, 2008a, 2008b). The main task was to develop the system of geographical information (GIS) on movable historical monuments and visualization of data gathered in it on the on-line map in the way that allows to search and find movable historical monuments using geographical information. Crucial element of new presentation was also a timeline, integrated with the application, that allows to select historic and artistic periods, and define the time period of our search.

The task was complicated because so far this kind of research has not been undertaken. There are neither Polish nor international sources that describe this problem and the way of its implementation. The functionality of the on-line map was developed on the basis of the results of the research of Internet users' needs and consultations with experts. The main aim was to meet users' expectations. Further research of their needs that will help us to define the directions of application development, will be conducted on larger scale, using the pilot application.

The main aspect of the project was a concept of using GIS – as a technology and as a tool – for integrating different digital archival collections, presenting their content in one space and providing on-line access to them from one common level – from an Internet map (Moscicka and Marzec, 2010).

The GIS technology was used because of its large abilities, also in the managing the cultural heritage and historical researches (Box, 1999; Gregory and Ell, 2007; Knowles, 2002). The GIS, unlike the other databases, defines the objects using spatial and descriptive data at the same time. The use of this technology extends the range of descriptions and gives larger range of information about the object. It also gives possibilities to search objects using additional factors, based on spatial descriptions of the objects. What more, the visualization of spatial descriptions of objects increases the perception of given information. The basis of the cartographic methodology says that information presented on the map is much more attractive and easier to understand for recipients.

One simple map can present as much information about digital collections as one would need to write on several text pages (Ratajski, 1989). Relation archival resources to the map makes the search easier. The only thing one has to do is to choose an adequate fragment on the map and one can see the cities and their archival documents. What more, users do not have to know the historical names of the cities, but only their location on the map. Data concerning historical names, nationality of cities is entered to data base by historian or archivist that has specialist knowledge.

3. Methodology used

The starting point of the research was that Polish archives are spread all over Poland and also all over the world. As a rule archival documents were created in one place, describe the other, and today can be kept in places far away from the place they were prepared. What more, the parts of the same collection can be kept in different archives. Complicated Polish history caused that it is necessary to look, e.g. for the plan of Wieliczka (near Krakow) in Gdansk (more then 500 km north of Krakow), and the plan of Zabludow (near Bialystok) at the Warsaw University of Technology (more then 200 km west of Bialystok).

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

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

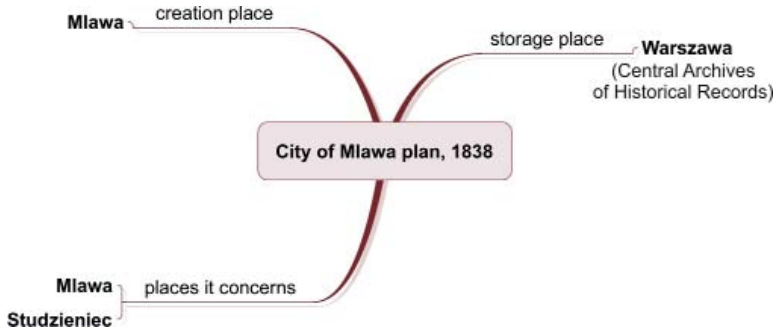

Fig. 1. Multi-spatial object - few space relations of one monument

Moreover, one single document can be connected or have relationship (typological, thematically, temporal, spatial) with other document. The reason for it is that documents concerning various places are housed in the same archive, various documents can present the same place or the place of creating particular document can be the place of housing another. In the project the basic source material was digital collections of original records. These high quality scans were the material to prepare electronic documents presenting monuments called the digital copy of the monuments.

The digital copies of the monuments, are described by means of metadata that facilitates searching, controlling, understanding and managing them (Ordinance, 2006). The metadata 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 requirements for electronic documents. Moreover, such descriptions are used by archivists or historians, so they are understandable for all - data deliverers, GIS creator and the final users.

The digital copies of the archival maps used in the project were described using the EAD (Meissner, 2002; URL; Wajs, 2000, 2003) and Object ID standards. These standards, beside basic information identifying a monument, contain also data that enables to link it with the geographical space. Moreover, they also contain data which allow to define relations between documents.

With the use of standards of describing the monuments, the Internet application for presenting cultural heritage on the map was developed. It is based on the GIS, and its functionality is mainly

the elements of selecting the resources, presenting the documents on the map in different ways and finding their images. The result of the research is the solution for presenting in one common surface – in one application – not only archival documents but also their history, all places connected with it, descriptions of the monuments as far as their images. Monuments are presented in such way that enables studying historical documents in comparable degree as during the visit in archives (Wajs and Marzec, 2009).

4. Results

On the basis of created methodology the pilot GIS system was developed. As the source collections two types of resources were used:

- ·part of collection "Cities in archival documents", presented so far in the portal Polska.pl; more than 130 written documents, described in xml files in the EAD standard were prepared;
- ·works of art from the church in Zorawina (Dolnoslaskie Voivodship); almost 100 works of art, described in xml files in the ObjectID standard were prepared.

As the background cartographic data digital map of Poland in scale 1:200 000, developed at the Institute of Geodesy and Cartography, Warsaw, was used.

Together with the descriptions of the above monuments, dictionary of historical and artistic periods, types of monuments, institutions, people were created. There was also prepared the dictionary of geographic places connected with the monuments. In this dictionary, connections with the places used in monuments descriptions and coordinates of these places were defined. Coordinates were determined in the coordinate system of the digital map of Poland applied. Use of dictionaries allows to connect monuments with the geographic space and, consequently, to build geographic information system about movable heritage.

The result of the project discussed is a web application for the presentation of the heritage on the map. It is accessible in the Internet at the www.GEOHeritage.poland.pl (English version) and www.GEOHeritage.polska.pl (Polish version). The start page of the application is presented in Figure 2.

The elements of selecting the resources, presenting the documents on the map in different ways as well as finding their descriptions and images reflect the main functionality of the application. The major parts of the application developed are:

- the main window – map window, where monuments are presented, together with the tools necessary for zooming and moving map;
- the top menu with the additional tools as history of presented maps, link to the present map view and icon for printing them, and – very useful – full screen option;
- interactive timeline, based on time of creation resources presented on the map;
- the left menu with the main tools for searching and presenting thematic data.

In the left menu, first of all, there are located tools for selecting the resources. Searching the resources is possible at two levels. *Easy search* contains text searching of all elements of monument description based on entered word, e.g. searching in the name or comments on the monument. *Advanced search* contains both: elements of *easy search* and also gives possibility to extend the selection criteria – to the type of the monuments, dates or creation period, institution of storing, and also to selection of geographic criteria.

Resources can be searched by dates or period of creation. There are two types of periods: historical periods – based on Polish historical events, and artistic periods – based on styles in art. Moreover, this search is linked with the *timeline*. By choosing a period from the list or by entering the dates in the menu, one automatically changes the timeline settings. This feature works both ways: timeline is interactive and is divided into years, historical and artistic periods. It is possible to choose historical or artistic period by clicking in a colourful line that symbolizes exact period, as far as moving arrows pointing years on the time scale. Any change on timeline, as far as using search menu, results in reducing or extending the amount of monuments presented on the map.

Searching using *geographic criteria* is possible by choosing name of a place and also by choosing an administrative unit (on different level). What is more important, it is possible to select what kind of places we would like to find: place of creation, storage place or places which are connected with

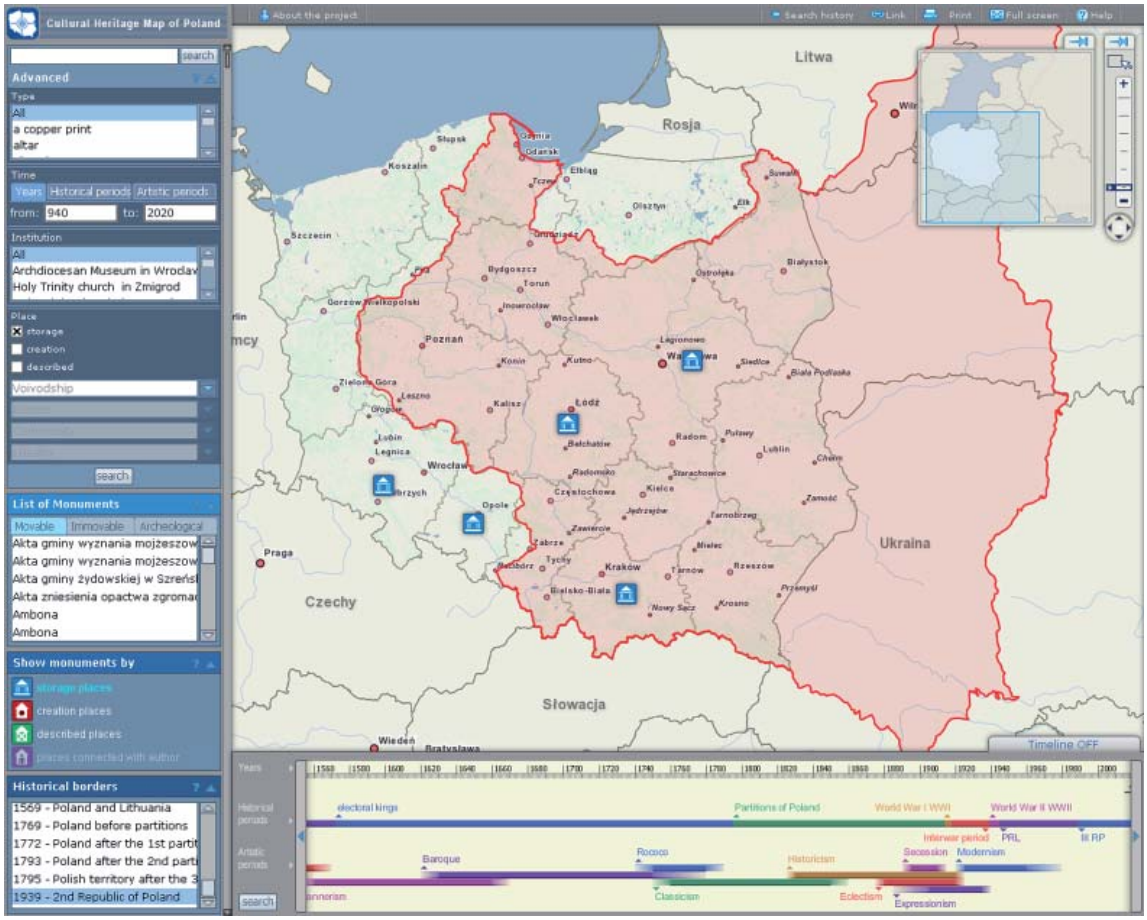

Fig. 2. Starting page of the GEOHeritage application

the document topic. Below the search tool *list of monuments* is located. It is a list of all objects currently presented on the map.

The resource presented on the map can be enriched by choosing the view with *historical borders* of Poland and visualize the historical context of creation or storage the resource in the selected period. Below the list of monuments, one of the most important tool – a tool for changing thematic content of the map, is located. It was assumed that the way of presentation resources on the map depends on users' needs or interests. So, the tool for changing aspect of presentation resources, which allows to *show monuments* by: *creation places*, *described places* and *storage places* is provided. Each of them works as a separate independent thematic layer. What is the most important, each of them is based on the same set of monuments but present them in different spatial aspect. It is possible to move between layers and change the aspect of presentation on the map of the same set of monuments in any time.

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 moves a mouse cursor on them – the number of monuments in chosen place will be shown, together with the name of place or administrative unit to which resources symbolized by the icon are related. When the user clicks on the icon, the menu with the additional options related to changing thematic map content or aspect of resources presentation, will be shown. There is an option which shows all (or selected) monuments created in pointed place. If this option was chosen,

the list of chosen monuments will be presented in a new window. These chosen monuments are listed in a new window and they can be presented on the map as the new collection – in such case monuments' list will be replaced with the selected monuments' list and new collection will be presented on the map. If one object from the list was selected, its image and its description will be shown in a new window.

Functionality presented so far is related to a set of monuments. In the application there are also solutions for the presentation of spatial information about one single object. By choosing one object from the *list of monuments* all places connected with that monument – the place of its creation, its storage place and – if they appear – places concerning its topic – are presented on the map. In some cases there is possible to present on the map additional spatial information about topics connected with the presented objects, e.g. places of activity of this monument's author.

As in the case of presentation monuments' collections, the icons presenting spatial information about one single object are also active. When the user clicks on them he/she will see menu from which the other options can be chosen. There are the same options as in case of icons representing a set of monuments, as well as, e.g. possibility of selecting monuments connected with the chosen one (e.g. monuments from the same collection). From this one single object icons' menu the users can also go to monument description and to its image. Because monuments described with the use of international standards were used as the source data for monuments description, the scope of the information about each object is the same as in the standard (EAD or Object ID). The way of image presentation was one of the most important aspects in the project. The authors assumed that the user should be able to study archival documents in comparable degree as during the visit in archives. Thus, Erez Imaging Server is used for the presentation of objects.

5. Benefits

The main benefit of the application developed is to present the heritage resources on the on-line map, and – on the other hand – to provide an on-line access to the resources from this map. The on-line map gives the possibility:

- to show the resources on the map in different spatial context, dependent on the users' needs;
- to search resources with the use of interactive map;
- to show distributed collections and monuments selected in terms of type, time of creation etc.;
- to obtain additional information about them.

In the project, mainly movable heritage were used but the solutions can be applied to the other kinds of heritage, e.g. immovable and archeological heritage. So the result of the research is the solution for presenting in one common environment (in one space), e.g. in one application, not only all different places connected with all kinds of monuments, relationships between them, but also descriptions of the gathered objects and their images.

Until now GISs were mainly used in immovable heritage management. Movable heritage GISs were created hardly ever and were based on heritage storage places only. Movable heritage maps developed were thus maps of archives or museums. The authors propose the method of creating real movable heritage maps, because it is based on all geographical places connected with digital collections: places of creation, storage and content relation. The use of proposed map can simplify access to archival digital collections and extend the range of heritage usage.

Moreover, the use of international standards for describing digital collections as a source data allows to add to the system developed any collections from any institutions, if they only contain heritage described in known standards.

The proposal of using the on-line map as the platform of an access to digital resources of cultural heritage can be important for a few main groups of recipients. Firstly, this tool can be useful for users who search archives about his/her neighbourhood. Secondly, the application can play educational role and encourage children and teenagers to learn the history of their surroundings. Thirdly, the application can be used as a research tool for people who are engaged in analysing historical data based on the geographical data, e.g. journeys of artists, dispersal of collection (Knowles, 2008; Moscicka and Marzec, 2009; Szady, 2008).

Potential implementation of the application developed is very wide. It can be used by different institutions of both local and central range that have digital copies of cultural goods and are willing to share them in the Internet. The map application can be the tool to popularise these resources and to fulfil educational and social tasks. Institutions can create their own resource maps and promote them in a modern way. The possibilities of implementation the application mentioned above show that the project has really important social values, mostly as a tool to raise the social awareness on cultural goods of the nation. Popularisation of the national goods, for example in educational system is one of the main goals of activities in cultural institutions.

6. Conclusions

According to the project's assumptions, it was developed the methodology of preparing maps of mobile monuments, and afterwards the application that gives an access to mobile monuments from the on-line map. Thanks to that users have access to digital copies of cultural heritage resources gathered in the database. The application is available on web sites www.GEOHeritage.poland.pl or www.GEOHeritage.polska.pl

The authors have not known other (the same or similar) solutions. No information on similar solution has been found in the specialist literature. During international conferences concerning digital cultural heritage (including cartographic) the application developed by the authors was the only one that presents this topic in such complex way.

Close cooperation between the experts from different institutions was one of the most important factors that enabled the realisation of the project. It ensured an interdisciplinary approach to the problem and professionalism in every stage. Planning stage and also research on behaviour and needs of users were very important parts of the project. They allowed to define the functionality of the application. The element that ensures effectiveness of the works is the implementation of modern information technology. Also truly important is to ensure enough time for testing the final version of the application before its implementation. Applying the international standards of monument descriptions is the only way to develop, promote, exchange and enlarge the database.

The main directions of the application development should include:

- enlargement of the application functionality by giving users the possibility to enter data to the database and to publish the resources (according to the procedures);
- enlargement of the number of object's types that would be published on the map, e.g. adding immobile monuments;
- enlargement of information on presented objects.

The last but not least is to pay attention to a precise procedure of managing the resources. It should include information on safe log-in, system of privileges, controlling and moderating the activity of logged-in users, verification of entered data, accordance of the entered data with the standards, and also efficiency of technical infrastructure, types and quality of the software.

The key problem in developing such initiatives is unwillingness to share the resources (also the digital copies) and low level of digitalization of Polish archives. Access to digital copies of monuments and their descriptions in the international standards is the only way to enlarge the data resources available from on-line map and to develop the functionality of the application.

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References

Box P., (1999): *GIS and Cultural resources Management: a Manual for Heritage Managers*, UNESCO Principal Regional Office for Asia and the Pacific, Bangkok.

Gregory I.N., Ell P.S., (2007): *Historical GIS. Technologies, Methodologies and Scholarship*, Cambridge University Press, Cambridge, UK.

Knowles A.K., (ed.), (2002): *Past Time, Past Place. GIS for History*, ESRI Press, Redlands, California, USA.

Knowles A.K., (ed.), (2008): *Placing History. How Maps, Spatial data, and GIS Are Changing Historical Scholarship*, ESRI Press, Redlands, California, USA.

Meissner D., (ed.), (2002): *RLG Best Practice Guidelines for Encoded Archival Description* (translation: H. Wajs, AGAD), Research Libraries Group, California, USA.

Moscicka A., Marzec M., (2008a): *Methodology for mapping movable heritage – assumptions of the project* (in Polish), Conference "Digital meeting with monuments – the status and development prospects of contemporary methodology", 19 September 2008, Wroclaw, Poland.

Moscicka A., Marzec M., (2008b): *The advantages of geovisualization* (in Polish), NASK Review 3,Warsaw, Poland, pp. 33–35.

Mościcka A., Marzec M., (2009): *Cartographic heritage in the scientific research on the example of Polska.pl resources* (in Polish), Conference „Former cartography of cities „, XXIII National Conference of Historians of Cartography", "From the History of Cartography", t. XV, Warsaw, Poland (in print).

Mościcka A., Marzec M., (2010): *Old maps as a part of movable heritage accessible from the online map*, 5th International Workshop on Digital Approaches in Cartographic Heritage, Vienna, Austria, 22–24 February 2010.

Ratajski L., (1989): *Methodology of the socio-economic mapping* (in Polish), Polish Cartographic Review, Warsaw-Wroclaw, Poland.

Ordinance of the Minister of Internal Affairs and Administration, (2006): *Structure of the necessary elements of electronic documents*, Journal of Laws, No 2006, pos. 1517, 30 October 2006, Warsaw, Poland.

Szady B., (2008): *The use of geographical information systems in historical geography* (in Polish), Polish Cartographic Review 40(3), Warsaw, Poland, pp. 279–283.

[URL]: http://www.dlib.indiana.edu/services/metadata/activities/EADManual.pdf

Wajs H., (2000): *EAD – basic information* (in Polish), http://www.agad.archiwa.gov.pl/ead/ead.ppt

Wajs H., (2003): *Polish road to the standardization of archival description* (in Polish), Digital Archives, E. Rosowska (ed.), Warsaw, Poland.

Wajs H., Marzec M., (2009): *Dynasty on the Internet* (in Polish), NASK Review 2/2009, Warsaw, Poland, pp. 27–31.

Interaktywna mapa ruchomego dziedzictwa kulturowego

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Streszczenie. W artykule przedstawiono wyniki projektu badawczego, związanego z wykorzystaniem GIS – jako technologii i jako narzędzia – w celu zintegrowania różnorodnych kolekcji archiwaliów, zaprezentowania ich treści w jednej wspólnej przestrzeni i zapewnienie dostępu do nich z jednego wspólnego poziomu – z poziomu mapy internetowej.

Archiwa cyfrowe posiadają wiele zasobów dziedzictwa ruchomego, których treść nie posiada prostego odniesienia do przestrzeni geograficznej: rękopisy lub starodruki mogły powstać w jednym miejscu, dotyczyć mogą zupełnie innych miejsc, a obecnie mogą być przechowywane w jeszcze innych miejscach. Co więcej, każdy z archiwalnych obiektów mógł być przechowywany w wielu różnych miejscach w przeszłości.

Zaproponowano metodę opracowywania map zabytków ruchomych, bazującą na wszystkich miejscach w przestrzeni geograficznej, które mogą być związane z zabytkiem lub cyfrową kolekcją. Punktem wyjścia do podjętych badań były meta dane zabytków ruchomych przygotowywane zgodnie z międzynarodowymi standardami opisu zabytków. Dostarczyły one informacji przestrzennych o obiektach, a także o przestrzennych, czasowych, typologicznych i znaczeniowych relacjach pomiędzy nimi. Wszystkie te aspekty zostały zintegrowane w systemie informacji przestrzennej i zaprezentowane na interaktywnej mapie internetowej. Artykuł przedstawia zarówno proponowane rozwiązania metodyczne, jak i ich praktyczne zastosowanie w opracowaniu pilotażowym.

Słowa kluczowe: cyfrowe dziedzictwo, archiwa, GIS, mapa internetowa, aplikacja, dostęp publiczny