Minutes of the ARRE technical meeting
Museum of King Jan III's Palace at Wilanów, 20-21 February 2014

Object: « Using GIS (Geographic Information Systems) to Improve Maintenance of a Historic Residence »

Participants:

Museum of King Jan III's Palace at Wilanów
Paweł Jaskanis, Art Historian, Archeologist, Museum Director
Konrad Pyzel, Art Historian/ Sociologist, Communication Department
Wojciech Bagiński, Conservator, Architecture and Environment Department Manager
Małgorzata Przeździęk, GIS senior specialist, Documentation and Digitalization Department
Diana Święcka, Archaeologist, Architecture and Environment Department
Ewa Jakubowska-Smagieł, GIS senior specialist, Documentation and Digitalization Department
Waldemar Markiewicz, Documentation and Digitalization Department Manager
Elżbieta Grygiel, Art Historian, Communication Department Manager

Ministry of cultural Heritage in Italy, Piedmont Regional Direction
Flavia Castagnato, Architect responsible of WEBGIS S.I.Re UNESCO- Geographic information System of the Royal House of Savoy, member of UNESCO group of Piedmont Regional Direction

Château de Versailles
Elise Legrand, Heritage and Gardens Department, architecte du service des plans et affaires patrimoniales
Sylvie Montillon, Heritage and Gardens Department,
chef du service des plans et affaires patrimoniales
Gabriel Novello, Deputy Chief of Fountains Service- Project Manager
Daniella Malnar, In charge of the development of a Patrimonial Information System
Annick Heitzmann, Archaeologist
Frédéric Khelil, Head of IT Department

Historic Royal Palaces- Hampton Court Palace
Fiona Keith-Lucas, Assistant Curator, Archaeology and Historic Buildings

Stiftung Preussische Schlösser und Gärten Berlin-Brandenberg
Beat Laus, Person in charge CAD/GIS

Royal Castle in Warsaw
Anna Czarniecka, Head of Historical Research Department
Agnieszka Bocheńska, Junior Curator
Isabela Gibaszek, Trainee
Grzegorz Słowikowski, Head of IT Department

ARRE, France
Céline Delmar, Coordinator-Secretariat
Niamh Quinn, Trainee

20th February, 2014

Why GIS in a museum - some technical aspects

Wojciech Bagiński

GIS in Wilanów

Why GIS in a museum? In ANY museum.
The presentation included a short history of GIS in Wilanów, to present what is most valuable about GIS in maintaining a historical residence.

The essence of a curator and restorer's job is evaluating conservation risks. Inventory numbers and inventory databases are essential in museums. But the inventory number doesn't tell you where the item is located and what it looks like, and the first thing a restorer asks when there is a problem with an object is where it is located. The inventory number is less important on that stage of a conservatory intervention.

The GIS was introduced to Wilanów by two projects (2003–2008). Archaeological excavations – documentation recorded in GIS software, archaeologists used GIS. Restoration of facades (vertical facade was used as a base map) – phenomenas observed on the facades – then worked in a studio and provided documentation in the form of a spatial database. Conclusion: GIS provides a good reflection of reality. ARCgis used by archaeologists – was the museum's choice.

Next step, 2008: intern from Versailles, the Patrimoine at Jardin Dept., came to check roof surfaces in Wilanów (as there was no architect in Wilanów) and has been trained in 3 days how to use GIS to record phenomenas and descriptions. It proved how easy and helpful is GIS software to work with.

Next step, 2010: the Wilanów intern came to Versailles to see which sculptures were at risk of falling in the next 4 years (as there's no a stone restorer in Patrimoine at Jardin Dept in EPV). It was neat and quick job done in just 4 weeks. As there was a language barrier GIS was the quickest mean of communication, it was used to show each location and risk level (risks for 36 sculptures worked out in 4 weeks could be presented immediately and very clearly).

Next step in Wilanów: evaluating risks for buildings by using a map of the property after looking at the state of each building, using colour codes. This supports productive managing decisions.

Another step in Wilanów was to evaluate the state of the palace interiors in relation to the collection sheltered in. GIS provides a risk management matrix in form of the palace interiors layout – it is better to monitor locations than risks themselves. Twice a day restorers receive Excel table of temperature and relative humidity with list of rooms linked, so restorer should be able to check immediately on the map what's in danger.

How does GIS help maintain a museum's state of preservation? Thanks to the database of architecture department – combined with climate and inventory database. Palace is georefered in its geographic position (NSEW exactly as it is) we can see immediately what's happening on the site, e.g. high humidity in some galleries due to large windows can cause an effect of unclear air what explains immediately why fire alarms used to start there in wet but sunny days.

Universality of the concept: any museum can use GIS in relation to its particular collection, interiors, or all the property.

How GIS works as a system - some technical aspects

Małgorzata Przeździęk

The resources of the Museum are: the palace-garden complex with Morysin Nature Reserve (ca 89 ha), historical buildings, baroque gardens, historical objects in park (monuments, sculptures), trees, bushes, water, nature monuments, decoration on the Palace's elevations and inside the Palace, interiors of the Palace and other building, art collection.

In Museum for the last number of years there's been a lot of works: conservation, preservation, restoration, revitalization, modernization and archeological works. All these works made a lot of documentation of different kinds: archeological explorations, historical analyses, restoration and maintenance documentation, geologic and hydrologic investigations, maps, plans, photographs, conservational and architectonic documents. This documentation can be in various formats, 2D and 3D, digital and analog. The number of these documentation is growing, so it was essential to build a system which allows to integrate all these kinds of documentation. We decided to build a GIS system – a geographic information system.

GIS system in the Museum is going to store data concerning: archeology, park and gardens, buildings, interiors, elevations and vegetation. It is based on the CAD documentation – a base map and plans of the buildings and it has got a coordinate system PL 2000.

Now there are five modules in GIS system. First geodatabase is the park module, which includes future classes like: parcels, buildings, green areas, alleys, water, gardens, fences and sculptures. All the elements of park are the reference layers for our system. All of the features have basic attributes. The advantage of the GIS system is that all attributes are stored in a database, and features are georefered and can be visualized on a map.

Next module of the GIS is the interiors geodatabase. The layouts of the buildings where converted from CAD to geodatabase, and every room is a polygon feature and has attributes. There are elaborated 41 layouts of 14 buildings, 520 interiors. Attributes allow to analyze and visualize data, e.g. calculating an area of the floor to cleaning. It is possible also to visualize conservational monitoring – the condition of the Palace's interiors and the temperature in the interiors.

Next part is a geodatabase for elevations of the Palace. There was an inventory of the decorations on elevations – in conclusion in a geodatabase there are over 1200 objects like: reliefs, sculptures, paintings, inscriptions and architectural decoration. Every object has got attributes and attached various documentation, like new and old photography, iconography and conservational documentation. In the similar way we are working on the database for decoration of the Palace's interiors.

Last year a geodatabase for trees and bushes in the park was built. And the last part of GIS is an archeology geodatabase. All of the archaeological excavations are georeferenced, there is ability possibility to visualize all of the archaeological excavation on the map of the Wilanów residence.

The GIS system has a lot of usages in the Museum: it integrates and stores data and documentation, supports to manage all of the Museum resources, supports conservational monitoring and preservation works, allows to perform many spatial analyses, visualize all the information and share all data with other people through the Internet.

Using GIS for archeological activity in Wilanow

Diana Święcka

How to use GIS in a museum which is also an archaeological site? Before and after activities there is need of managing resources from contractors. An archaeological site was found in 1955 by accident, there have been regular excavations since 2003, producing remnants since the early Iron Age. The goals are protection and resources management. The land is under state protection, the estate is obliged to prevent it from being destroyed. GIS can map which areas of a zone have already been searched. It shows an up to date map with the transparency of the museum's archaeological activity via internet.

GIS allows to plan restoration, renovation, and repair works without having to pore over reports. It allows to integrate spatial and non-spatial data – garden, restoration, repair and water system. Archaeological Resources Management - GIS allows management and storage of different archaeological information, photographs; post excavation reports, layers, finding samples. E.g. for medieval objects and their attributes we have easy access to these parts of reports and information about particular objects.

GIS gives immediate access to visual data. One can make enquiries, e.g. trenches with medieval objects which were found in 2008, and share data resources via internet. Results can be found on website regarding all excavations. User can read reports, look at profiles and their descriptions and plans on the website. There is a queries tool, a small tool box, allowing to draw or write. Plan for future is to integrate GIS with Mona (collections of objects, also archaeological finds and their location).

Using GIS for decoration on palace's elevation in Wilanow

Małgorzata Przeździęk

Historical decorations on the Palace's elevations are very important elements in Museum's resource. There are a lot of sculptures, reliefs, paintings and architectural elements: capitals, portals, pilasters, etc. That's why we decided to build GIS system for these decorations. In this geodatabase a view of elevation is a reference surface for the decorations.

The vector representation of decoration objects is based on the documentation: vector documentation in dwg format, archival fotogrametry (scans), orthophotography in a grey scale, and for several elevations there is color orthophotography. Every documentation was convert to GIS format, referenced, and has local coordinate system, thanks to which there's a possibility to display all kind of documentation for the particular elevation and see changes and differences.

Every part of the Palace's elevations is elaborated – there are 32 parts, every part has got an unique ID number. Over 1200 objects are created as representations of the decorations and architectonical elements. These are polygon objects, every object has got an unique ID number and is described by the attributes: name, author, type, kind, date, technique, material etc. There are also attributes, which support conservational works, e.g.: condition of object. One record in the database table is connected with one object on the map. Thanks to these attributes it is possible to: select objects and visualize data; create various maps and visualizations; make a symbology for objects by the attributes, e.g. the material which the object is made of.

To every decoration object there is attached various documentation: conservational documentation, archival photography, iconography and actual photos. Every documentation is described in database, it has got its own attributes, and is connected with the objects it concern by the database relation. So for every object we can get information about it and we can see document connected with this object. It is also possible to: make a lot of analyses, measure elements (distance, height, area), make statistics and aggregate data, e.g. areas of objects, which can be helpful to plan conservation works.

Using GIS for the gardens in Wilanów

Ewa Jakubowska-Smagieł

Museum's inventory control includes the Wilanów Park (35 ha). The database structure: every object has its position in its line database and attributes: ID number, species name in Polish and Latin, circumference of the trunk/trunks in centimetres, diameter at breast height in centimetres, diameter of the crown in meters, height in meters, age of the tree, past ID numbers from the old registry, natural monuments with all registry numbers and attachments like documents, photographs.

In the program user can use map, ArcCatalog (the application to manage geographic information in workspaces and geodatabases), table of contents and feature class (layers). Different types of display helps to improve clarity of visualizations and printouts, introduction of particular symbolization and legibility of information on the map. The same information can be displayed for example in a graphical symbol or in a particular symbology like species symbol.

Following feature classes are defined in the database: trees, bushes, baroque terraces, irrigation systems, street lamps, benches deposited on a ground, lawns, paths, garden architecture, water system, natural monuments, protected zones, geodetic control network (reference network). Database information management is implemented through: analyses, summaries, calculations, research. Historical analyses give us possibility of: attaching raster graphics to archival maps with georeferencing adjustment, making detailed analyses of historical compositions on the basis of archival maps, e.g. historical compositions of garden paths, buildings, vegetation, etc.

In detailed area analysis e.g. in case of the Służewiecki Brook overflow, GIS helps in precise calculation of flooded area (in square meters), trees in danger (ID number, species, age, etc.), natural monuments in danger (ID number, species, age, etc.). Example of GIS summary: specification of the number of trees of particular species (Latin names, descending sort). Age calculations: using database we can establish the number of trees of particular age. After calculation we know that in Wilanów garden there are 228 trees in the age group of 0–10 and 98 trees in age group 120–140.

We can organize all documentation and include it in the database e.g. as attachments (files can be in different formats). While working directly within the application we can load the wms layer of services and work on data online (GIS Services like Warsaw city and Geoportal provide data e.g.: land and building registration, cadastral data, elevation model, thematic maps – orthophotomap etc.). It is possible to export data to other applications – they can be shared with architects, archaeologists, designers and users of other programs, e.g. CAD, Excel – as well as import data from other applications (copy – paste).

Wojciech Bagiński, Summary

GIS as a building information system. It is possible to make a geographic scale of country, continent, even planet, but GIS can be used also for other thinking in smaller scales.

Another GIS usage is Land Information Sysem (LIS), so why not BIS (building information system)? A good example of how simple it can be for an end user: map and location allow to get the information very easily, you can switch on and off what you need, e.g. table containing objects, attributes and list of rooms, names and map work together, it is very user friendly. All the data are digitalized, scanned and connected to the area. GIS is a useful tool for all departments. e.g. for fire security and events management;

Another example: a view showing new vs old windows of a ground floor – there is represented not just age but also the level of UV protection. It helps to analyse conditions, and explain why an item or room is so hot, dry, etc. Another advantage is that different interfaces are working on one software – useful because maybe some departments would prefer some designs more suited to their departments.

Discussion and questions:

Q. Is there an aim for a plan of maintenance? **A.** Following from monitoring – risk management is of course an aim. An idea for the future is to work with tablets in the palace or park, and put all info directly into server.

Q. In terms of photography. Can you compare old photography with new? **A.** Yes. There are layers in front of the elevation.

Q. If unsure of date can you find it? **A.** The problem with dates is they are on the attributes table, as they are approximate, but yes.

Q. In terms of date searches, can you get various results with approximate dates searches? **A.** If there is a complicated field, it is possible, but you need to know how to use the database (Like any database, it's a question of habit, becoming accustomed to it).

Q. In terms of applications for general public – what data is offered? **A.** Not all but a lot (not sensitive/when security is concerned). Wilanów GIS database is shown publicly, because it came from EU funding; Topographic map and layers are shown, as well as palace interiors, but not the ones in other buildings, the number of floors and archival homes of the rooms.

The importance of documentation in Poland is very high (approximately 80% of Old Town in Warsaw was destroyed during the World War II)

21st February, 2014

SPSG's management of water networks and trees

Beate Laus

The Prussian Palaces and Gardens Foundation Berlin-Brandenburg is compiled of 17 parks, 150 historic buildings in 6 different places, 30 museums. 1995, started letting parts to external companies. Since 2000 data with AutoCAD map, a small application of GIS. Based on AutoCAD from the company AutoGIS, this data has been related to their 300+ historic maps and old air photos. Using AutoCAD, different attributes could be digitally incorporated to maps, like time and materials. Because data was small it could only be fuelled in internal tables, for an external database a big GIS would be needed on the base of AutoCAD. In 2005 they decided on a new solution, their AutoCAD map enterprise was renamed to AutoCAD map 3D, but in the background it runs on a regular database, now it is in the version Autocad map 2013.

They have 65,000 trees in their gardens; these are taken up with similar attributes to Wilanow, pictures, diameters of circumference, etc. Trees must be checked twice a year. For scientists the development of the trees is important- analysis of each end function.

This year the input of the objects and not the upgrading of the models should come first. The data is public, you can charge photos, by putting in a catchword etc. An attribute of the objects is the topographic information, uniform names and numbers for the parks, buildings, rooms etc. In the background there is still the connection to the historical names and numbers, this information should be connected with the geometrical information in the GIS. Connection should have been realized in 2010 in the building database, connection with GIS and the MMS. However there was not enough funding. Now they have come to the conclusion that it is better if they develop the models themselves.

The Museum System TMS, Navidoc, SamFM, Palace of Versailles

Sylvie Montillon

Knowledge and Maintenance of the Estate of Versailles, there are 120 buildings and the large dependency of gardens. They don't have GIS, info is always located on the map. (Hydraulic Networks use GIS). They have a pragmatic approach to the software they use; Navidoc geographic navigation, SamFM and TMS (The Museum System) document management software is not interactive, but room code is the common input key. The database currently contains 800 files- can update, plan PDF and word, updates made by file department. Navidoc is used by all departments- for local departments, the size of a room, construction works, plans.

Elise Legrand

SamFM has been used since 2012 for the maintenance of service requests. It allows seeing the history of work by building work, maintenance, location etc. Majority of technical equipment exists in database; 10,500 rooms, 17,000 pieces of equipment, 1,500 maintenance contracts. TMS: The Museum System, is the document software for the museum, each item with a subject; inventory number, location; description, photos and tracking.

They are continuing to enlarge the existing databases. Each object has an inventory number, location ID, description ID, photos, tracking. Continuing to enlarge interactivity with maps and plans.

Prospective GIS Fountains for all Sites (Versailles, Marly and St. Cloud Areas including the exteriors)

Daniella Malnar

SI Fountains is a collaborative project, started because of the management of a hydraulic network that is over 300 years old. Because of the *Grandes Eaux* show, there is a great need for water. Would like to reconnect networks from various underground aqueducts, streams, therefore need to find the sources. Has an interior network which constitutes numerous hydraulic objects dating from the 17th century, lead and iron pipes need to be taken care of and repaired using the original historic techniques. Object dating and condition information will be integrated into the GIS in order to anticipate means of preservation.

Interior collaboration such as the archaeological department, and exterior like Versailles School of Architecture. Help in elaborating projects, work will be useful on online info, public tool to avoid accidents or destruction of a network. With partners can develop plans, indicate a hydraulic network that used to exist but was destroyed, or those that do not function or are no longer linked.

In terms of works between different services and collection of Estate data- GIS tool will allow department to control exterior or interior networks (to rediscover chronological history of these network and allow to talk to the public who are fascinated with fountains and fountaneers)

Would like to highlight with creation of a museum, objects dealing with hydraulics. In the park, restoration projects are taking place, maps, plans and manuscripts allow to see the different stages of the fountain conditions, in particular with those networks that are current and historical and need to plan and foresee the works. Need to remove certain hydraulic elements from the current fountains, objects that will become collections, such as pipes, so will need an inventory, as a result would like to incorporate TMS in IS Fountain,

Have gathered a collection of photographs and maps, the theme of water could be integrated into the image database of the Research Centre of the Palace of Versailles. An old map over a contemporary map using ArcGIS, have been able to rediscover water source routes. Helps with restoration, can recreate lead pipes that existed, go back to the fountain's original state, because the choice to install iron pipes in the 19th century caused durability problems.

Functions and Markets incorporated into the SamFM tool. Also uses WEBSEF created with a service company allows to have an inventory of all materials linked to the function of electro mechanic and intervention system, the object is to integrate all of this into SI fountain. There will be a common identifier for each object will allow to link the 3 databases.

The big question is independence or integration of different softwares? In function GIS will allow to facilitate work; to realize modifications on mobility, and historical and technical knowledge.

Fountains Department is the only department to have GIS tools so far. The IT department is in the process of taking an inventory of all the GIS needs in the palace. They would like to collaborate with all departments in order to create compatibility and coordinate the common needs of all professionals, like how well Wilanow have succeeded with GIS.

The WEBGIS S.I.R.e UNESCO Rezidenze Sabaude

Flavia Castagnato

Works in Piedmonte- UNESCO residence of SAVOY, she is working on this on-going project as an architect whose speciality is in landscape planning. This is a Web GIS system called S.I.R.e (Sire- the King) covering the complex of Savoy Royal Family. S.I.R.e is not a GIS but a web GIS, there are different requirements in an online platform. There are municipality managers and they exchange the website with different residences. Human/ economical/ events/ tourism- would like to have all aspects they need for management of site. Incorporates with management to upload and update the 22 residences which are divided into 3 groups. It is a large both natural and urbanized area. There are possibilities for projects in common areas, to improve incorporation in management and to connect existing data and websites to different levels of access.

The plan is urban and symbolic- The Savoy Kings, in 1730 took over administrative and cultural power, the residences were for hunting and recreation. The villages and surrounding countryside are inside UNESCO site. (With slides explains all the residences belonging to “Royal Residences of Turin and of the Piedmont, Italy” For more information **www.residenzereali.it**)

Web GIS- Architecture; Organized in 2 structures- content manager (data), and Web GIS (cartography). Management and protection tool for landscape planning and to collect and interrogate data of different levels. Comparing data is one of the main partners of GIS with a large map and data identifiers.

In terms of the study of historical landscape- 7 different landscapes is their issue. There is a mock, TMS and GIS, map is georeffered so can make comparisons. Using the census to get useful information, there are different links with estate archives. Classification, collocation etc, Italian census (property of their ministry). CMS part can search for example historic events and restoration.

Another link from website is more like GIS, it links more towards single buildings. If you want to project a visitor guide or connect one room to another, there is a service of uses of rooms using different colours. Monuments are protected but not the area, so want to see risks. There are productive agricultural landscape features. Queries and examples are interrogated by all levels. The importance of trying to monitor surrounding area. It is not yet online but use open source software, so that municipality can use it.

Sobiesciana: extraordinary use of GIS http://www.wilanow-palac.pl/sobiesciana

Konrad Pyzel

Sobiesciana is an Internet database for all art objects, monuments, souvenirs, facts, events etc. related to the Polish King Jan III Sobieski (John III Sobieski) and Sobieski family. Every object is presented in various forms: short text with images gallery (and recommended resources below), location on the Google Map (with Google Street View, if accessible), timetable.

Search engine gives many possibilities: one can write a word, a phrase or choose a tag from the list. There are many categories of objects: paintings, sculptures, prints, decorative arts, monuments, tombstones, facts, events, streets and many more. One can choose also a subject related to Jan III: education, love, family, battles, arts, patronage, legend and many more.

Sources of information: Museum has an agreements with other institutions and has right to put information gathered by these institutions in Sobiesciana database. Museum also works with volunteers – but they do not have access to the edition of the database (access to the administrative panel of database is limited, only 2 people have full access and can edit all data).

Concerning the future: Project depends on people cooperating with Museum. Due to the voluntary work and agreements with other institutions it has started to be a kind of social network focused on history of Jan Sobieski and Sobieski family.

Discussion

This topic was suggested by our Polish colleagues. Thanks to them, very technical and interesting meeting. Every year various technical meetings are organized by ARRE, and every technical meeting attracts new colleagues. The association was created in 2001, thanks to the website you can follow activity and news, there is a members section, you can discover and visit the website of each member. Would like to promote the website **http://www.europeanroyalresidences.eu** so you can use it in the future.

The last technical meetings were about web and social media in Hungary, and about visitors in Versailles, the next technical meeting will be in Portugal about accessibility of historical sites, next May. Everything is indicated on the web page.

Concerning this GIS meeting, we have understood the scales and needs of our residences are quite different, all use AutoCAD and different databases, but GIS is not used by all the residences in the same way.

-What sort of databases do you use in HRP? There are years of finds and reports at present. Trying to acquire GIS or a better system that can be used to improve archaeology and bring it to its full potential. Have just had an assessment of all finds and a new digital strategy coming up, there will be funding and will have to redo all catalogues, image library etc, everything is getting redone. Now is the time to work out what system to use. Is GIS best? How easy is it to take GIS from autoCAD? GIS would be very useful for the parks and is used a lot in archaeology for area analysis. In terms of building elevations and different storeys, is it so appropriate? There are building info systems, BIM, hoping for feedback how they interface with GIS and what might be best, is there one system that works for everything, or do you have to have GIS for the grounds, BIM for the buildings for instance, because in Wilanow the elevations are in 2D, not fully 3D.

-This is because there is no programme yet, there is no perfect 3D programme for this.

Concerning the BIM system, is there any info?

Building Information Management, it was designed for modern construction. Recently there is HBIM, Historic buildings Management…When have 4 lines, its square. If we know always draw a polygon from

now on it will be easier, if work with GIS in mind. Must give ID numbers, in the base, all of it that has same ID numbers you compare. This system gives you everything; and when change system it changes everything around. The question is do you need to control every brick or every wall, with a number, it is a management decision, not forced by the possibilities of the software.

-Royal Castle is Warsaw, last member to join the network. In the process of organizing their database inventory, at the beginning, last year started with their new website. Currently the Royal Castle is in process of great change.

-GIS Tool is interesting for internal and external purposes (also the public).