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EUROPEANA DATA MODEL IN GIS FOR MOVABLE HERITAGE

MOŚCICKA, A. (2015): Europeana Data Model in GIS for movable heritage. Geografie, 120, No. 4, pp. 527–541. – The paper proposes to use European resources in GIS as a set of multi-spatial objects with semantic relations to the space. It improves the analysis and visualization of geographic or contextual associations between various items. This paper aims to integrate the Europeana Data Model with GIS for movable heritage based on semantic relations of movable objects with the space. All classes and properties of the EDM were analyzed. Classes and properties containing spatial information were examined and their semantic relations to the space were proposed. All aspects of the relations of movable heritage objects and space were taken into consideration, and examples of the GIS-based pilot resources saved with the use of EDM rules are proposed.
KEY WORDS: historical GIS – digital humanities – movable heritage – geographic information system (GIS) – Europeana Data Model (EDM).

1. Introduction

The Europeana is one of the most important initiatives in access, promoting and integration of cultural heritage sources. It contains unlimited sources of knowledge about the past, which provides an infinite number of information about historical places, people or events. Data are physically stored in many locations, but are accessible from one platform and from anywhere in the World. The only problem in the wide use of such resources is the fast and effective access to these objects, what is important for the potential user. To find relevant data is time-consuming in most databases and hence the potential for their use is limited.

In order to effectively gather and manage huge collections of heritage data as e.g. Europeana is, information prepared by specialists to document them, are now used. Specialists who document heritage currently used metadata which are systematised information about object, which facilitates their retrieval, control, understanding, and management. Metadata are specified in international standards of monument description, which define what elements (and in what way) may (or should) be present in the description of an electronic copy of a monument in order to achieve the basic characterisation of a monument and meet the requirements of electronic documents. This solution enables efficient expansion of the databases in the future, as well as integration of scattered sources from various countries and institutions.

Different institutions develop or use different metadata standards. The famous standard is Encoded Archival Description (EAD) developed by The

Library of Congress, USA (URL 1). The essence of EAD is Document Type Definition (DTD) which is a standard for encoding archival finding aids using Extensible Markup Language (XML). The standard is maintained in the Library of Congress in partnership with the Society of American Archivists. EAD was adopted by British, French and German archives.

Different type of metadata standard is ObjectID (URL 2) used for describing works of art. This standard is developed by International Council of Museums and is the result of collaboration with the museum community, international police and customs agencies, the art trade and insurance industry. It is recommended by FBI, Scotland Yard, Interpol, UNESCO etc.

Probably the most famous metadata standard is Dublin Core (URL 3) that is used to describe web resources as well as physical resources. Dublin Core metadata can be used for simple resource description, to combining metadata vocabularies of different metadata standards, to providing interoperability for metadata vocabularies in the Linked Data cloud and Semantic Web implementations. Metadata records would use Dublin Core together with other specialized vocabularies to meet particular implementation requirements. This standard is used in digital libraries among which the best known is Europeana.

Dublin Core became one of most popular vocabularies for the Resource Description Framework (RDF) developed by The World Wide Web Consortium (URL 4). RDF is standard model for data interchange on the Web and it has features that facilitate data merging even if the underlying schemas differ, and it specifically supports the evolution of schemas over time without requiring all the data consumers to be changed. Using RDF allows knowledge organization systems to be used in distributed, decentralized metadata applications. A common data model for sharing and linking knowledge organization systems via the Web is Simple Knowledge Organization System (SKOS; URL 5). It provides a standard way to represent knowledge organization systems using the Resource Description Framework (RDF). Encoding this information in RDF allows it to be passed between computer applications in an interoperable way.

Cultural heritage objects described in different metadata standards need to appear in a meaningful way in a cross-cultural, multilingual context such as Europeana. Numerous cultural heritage resources such as thesauri exist worldwide and have the potential to add valuable content at low cost when reused. Duplication of effort, however, needs to be avoided. The Linked Open Data environment lacks authoritative data from the cultural heritage community to contribute to the development of new knowledge. To bridge these gaps in the Europeana context, the Europeana Data Model (EDM) was developed (Isaac, ed. 2013). It facilitates Europeana's participation in the Semantic Web, basing itself on an open, cross-domain, semantic web-based framework.

EDM is a data model that brings more meaningful links to Europe's cultural heritage data. Data from partners or external information resources with references to persons, places, subjects, etc., will connect to other initiatives and institutions. This will result in sharing enriched content, adding to it and thereby generating more content in ways that no single provider could achieve alone.

The information integrated in Europeana is typically distributed over a vast range of domains, formats, and languages, reflecting the many different

perspectives to be considered – the movable monuments, collected in thousands of cultural institutions and databases are spread over the world. One of the most powerful information integrators of such data is a spatial and temporal reference (Janowicz 2010). Understanding and analysis processes through spatial thinking are nothing new, but today there are some spatial turns in the humanities and social sciences (Kofroň 2012; Warf, Arias, eds. 2009). Therefore, integration of movable heritage in spatio-temporal databases can result in new opportunities of historical research and heritage management at more sophisticated levels.

Today, spatially referenced data are collected in geographic information systems (GIS), which allow the study of historical (Moscicka 2008) and geographical events or phenomena (Cunningham 2013) as well as inventory and management of monuments collections (Berg 2012). The collection, visualization and analysis of movable data are at the forefront of geographic information science research (Long, Nelson 2013), although this is not reflected in studies of movable heritage. Unfortunately, this subject, is undertaken only in the context of using movable heritage as a source data necessary to study of immovable monuments (Cataldo et al. 2005), archeological sites or protected areas (Freire et al. 2013).

Preliminary work related to the mapping of Europeana resources (Korb 2010), as well as building data-oriented services to support geographical information-based user interfaces in the Europeana portal (Freire, Soares 2011) was undertaken by EuropeanaConnect and other initiatives. The Athena project was intended for movable cultural heritage and has a special focus on aiding museums, libraries, archives and other cultural institutions, which are introducing geographic information systems (URL 6). The Carare project brings digital information of immovable cultural heritage to Europeana (URL 7), where the geographic location is a core part of the data for these collections.

The above studies focus only on the immovable monuments or places of the current storage of movable monuments. Some work in the area of the relations of movable heritage and geographical space and resource integration with the use of spatial information have been already undertaken by the author (Moscicka, Marzec 2010).

In the paper, Author hypothesized that Geographic Information System (GIS) can simplify access to the Europeana resources because it gives users one parameter more than traditional database and traditional searching engine. This parameter is spatial information. Moreover, movable cultural object has many different meanings relations to the geographical space. Therefore, data model used in GIS for movable heritage should include these semantic relations. Such model was developed by author and was named multi-spatial data model.

Research issue undertaken in the paper is to integrate EDM structured information with geographic information system for movable heritage providing the semantic relations of movable heritage to the geographical space. This is a step into mixing GIS and Europeana worlds with the use of semantic contextualization for the object representations. The contribution of the research in not only an improvement of spatial querying and analysis methods of movable cultural heritage items on a web-based platform, but also the analysis and visualization of geographic or contextual associations between various items.

Solutions proposed in the paper can result in developing professional GIS software, which currently do not have tools dedicated to humanities research.

2. Methods

In order to develop rules for implementation Europeana Data Model into a GIS for movable heritage empirical and comparative research methods were used. Methods of brainstorming and idea reduction, as well as drawing sketches of results were used to support development of the concept of integration model, determination of the rules necessary for the integration of EDM properties with the types of spatial references used in author's GIS data model. A formal description of the arrangements was made using object-oriented modelling language UML.

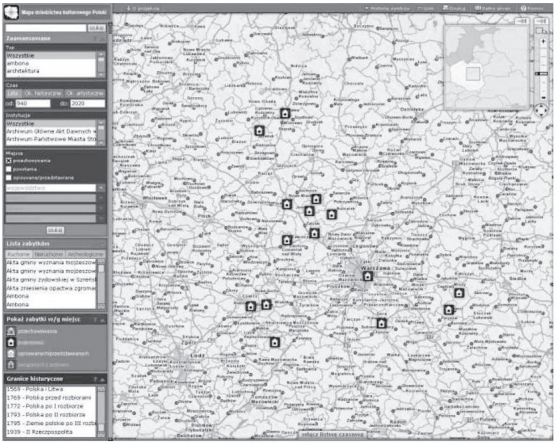
Empirical methods were applied to determine the EDM elements used to express the spatial information related to cultural heritage objects. Comparative methods were used to compare two different data models: author's data model used in pilot GIS for movable heritage and Europeana Data Model. The aim of the comparative studies was to determine of similar or identical characteristics and features distinguish compared models. Studies have been limited to the features associated with spatial information.

The essence of the methodology used is to collect movable cultural heritage as multi-spatial objects in the geographic information system, as well as to provide access to them with the use of different kinds of places. These places are dependent on semantic relations of the cultural object to the geographical space. This assumption stems from the fact that European archives are spread all over the world. As a rule, archival documents that were created in one place, and describe another, can today be kept in places far away from the place they were prepared. Moreover, parts of the same collection can be kept in different archives.

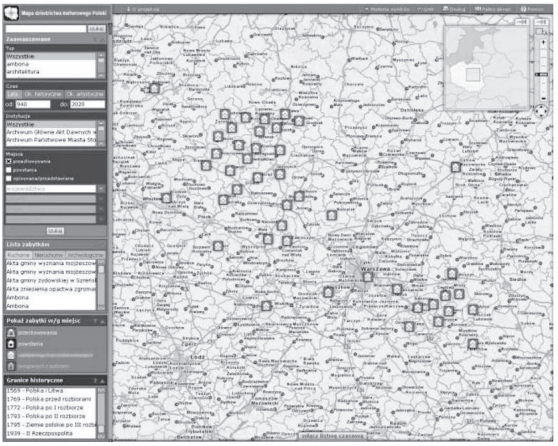
During the research project titled "Methodology for mapping movable heritage" (Moscicka, Marzec 2010), financed by the Polish Ministry of Science and Higher Education in 2008–2010, multi-spatial data model as well as an architecture and functionality of the geographic information system for movable heritage (called GEOHeritage from "GEOreferenced Heritage") were developed by author. In this solution, each movable object can have several places in the geographical space that are connected with them (several space relationships). They are:

- the place where the cultural heritage was created (place of origin)
- the place or places where the cultural heritage was housed in the past (places of storage in the past)
- the place where the cultural heritage is kept now (place of current storage)
- the place or places connected with the cultural heritage thematically – e.g. in case of maps it is a part of space presented in them (places related to the topic).

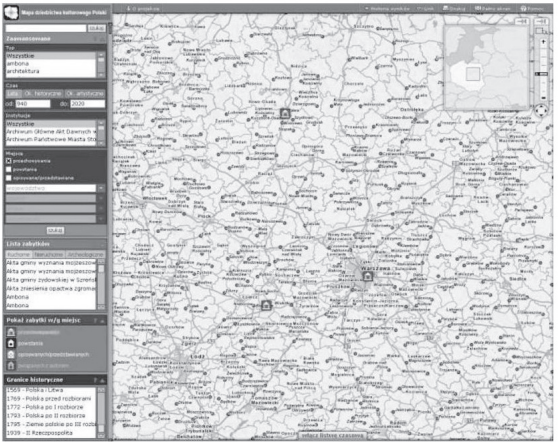
The way of presenting resources collected in GEOHeritage on a map depends on users' needs or interests. Thus, objects are presented on the map according



places of origin



places related to the topic



places of storage

Fig. 1 – The same set of monuments presented in different spatial aspect (places of origin, places related to the topic, places of storage)

to their semantic relations to the space, which can be as the mentioned above. Different types of places are presented in the form of independent thematic layers. Each of them is based on the same set of movable resources, which is presented in different spatial aspects. 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 (Fig. 1).

In the research undertaken, study on implementation Europeana Data Model into GEOHeritage was conducted. Europeana documentation (Bardi et al. 2013; Isaac, ed. 2014), precisely described EDM elements and rules, has been used.

The idea of EDM is to constitute a framework for collecting, connecting and enriching metadata (Clayphan, Charles, Isaac ed. 2013). EDM is a theoretical data model that allows data to be presented in different ways according to the practices of the various domains that contribute data to Europeana. For its internal working Europeana utilizes a different set of classes and properties. Class is a group of things that have common properties, where property is an element that expresses the relationship between two resources. Property can be seen as the attribute or characteristic of a resource.

Main assumption of the research was that in Europeana Data Model properties, the meaning of heritage object relations to the places in space can be found. According to the EDM rules, these semantic relations of object described in EDM should be connected with the place in space by EDM class.

The most important EDM classes are currently implemented core classes representing the cultural heritage object and contextual classes that may be associated with it. Because EDM separates the cultural heritage object from its digital representation, the core classes are to represent the core object. The contextual classes are provided to allow these entities to be modelled as separate entities from the cultural heritage object with their own properties if the data can support such treatment.

Contextual class important for geographic information purposes is *edm:Place.* It is defined as an area in space, in particular on the surface of the Earth, in the pure sense of physics: independent from temporal phenomena and matter. Places are identified by the content provider and named according to some vocabulary or local convention, and possibly normalized by Europeana at enrichment or at ingestion time. Places can be cities, regions, countries etc. *edm:Place* contains a list of properties describing the place, which can give us their basic characteristic. The juxtaposition of *edm:Place* properties is presented on Figure 2.

Class *edm:Place* defines spatial location in WGS84 reference system by using latitude and longitude in decimal degrees, as well as altitude in decimal meters above the reference. Thus, the exemplary spatial location is saved as:

<wgs84_pos:lat>51.5075</wgs84_pos:lat>
<wgs84_pos:long>19.1231</wgs84_pos:long>
<wgs84_pos:alt>21</wgs84_pos:alt>.

The preferred form of the place name is saved by using *skos:prefLabel* property. Although the maximum number of names is stated as 1, this can be interpreted as 1 per language tag. The exemplary name is recorded as:

<skos:prefLabel xml:lang="pl">Warszawa</skos:prefLabel>.

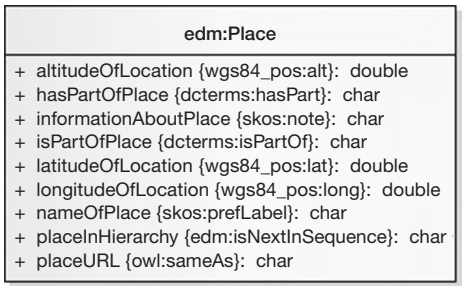


Fig. 2 – Properties of *edm:Place* class

In *edm:Place* class, additional information about described place can be also saved. It uses *skos:note* property and is defined as information relating to the place. The example can be information about population recorded as:

<skos:note xml:lang="pl">Pop. 38m</skos:note>.

Important property of the place is information about relations described place with other places. It is defined by using three properties: *dcterms:hasPart*, *dcterms:isPartOf* and *edm:isNextInSequence*. *dcterms:hasPart* is reference to a place that is part of the place being described, as in example of Grochów, which is one of districts in Warsaw:

<dcterms:hasPartrdf:resource=

"http://www.geonames.org/771452/grochow.html"/> (Grochów).

Analogously, *dcterms:isPartOf* is reference to a place that the described place is part of. The example is Warsaw as a part of Poland:

<dcterms:isPartOf rdf:resource=

"http://www.geonames.org/798544/republic-of-poland.html"/> (Poland).

To represent a sequence of place entities over time is saved in *edm:isNextIn Sequence* property. It is used for objects that are part of a hierarchy or sequence to ensure correct display in the portal. Final element records URL of a place using owl:sameAs property as in the following example

<owl:sameAs rdf:resource=

"http://www.geonames.org/756135/warsaw.html"/> (Warszawa).

3. Results

As the result of the research undertaken, EDM elements saving geographical information were identified. These information are defined with the use of EDM properties.

To implement Europeana Data Model into GEOHeritage, EDM properties have been referenced to semantic relations of movable cultural object to the

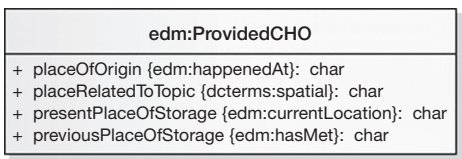


Fig. 3 – EDM properties as a semantic relations to the space

space. The idea of identity EDM properties and GEOHeritage semantic relations of movable cultural object to the space is presented on Figure 3.

Figure 3 shows that there is a similarity between EDM properties and semantic relations to the space defined in GEOHeritage. The meaning of EDM properties together with their references to the GEOHeritage spatial relations are as follow:

3.1. GEOHeritage: place of storage

In most cases, a cultural heritage object has a well-known place of storage, meaning the place where it is now physically located. Probably only the stolen objects have an unknown current location. Therefore, the place of storage is one of the basic pieces of information about the real cultural objects in the GIS for movable heritage.

In EDM, information about objects' place of storage is recorded with the use of the property *edm:currentLocation*. It is used in EDM for the contextualization of resources and for answering "where" queries. Current location is defined as a geographic location and/or name of the repository, building, site, or other entity whose boundaries presently include the resource. This information should be registered in *edm:ProvidedCHO* class as a one of mandatory property. The example of entering e.g. Warsaw as a place of storage in EDM is presented below:

<*edm:currentLocation rdf:resource*=
"http://www.geonames.org/756135/warsaw.html"/>.

Each physical object may have 0 (unknown) or 1 place defined as "current location", while digital resources may have 0 to many current locations. Each place in space may be the location of 0 to many resources and objects.

In EDM, there is one more property, which can relate to the physical location of the object. This is the property named *edm:hasMet*. It relates to a resource with the objects or phenomena which have happened to or have occurred together with the resource under consideration. History and the present are treated as a series of "meetings" between people and other objects in the spatio-temporal continuity. This relationship is named for the things the object "has met" in the course of its existence. These meetings are events in the proper sense, in which other people and things participate in any role.

edm:hasMet can identify an agent, a place, a time period or any other identifiable entity that the CHO (Cultural Heritage Object) may have "met" in its life. *edm:hasMet* can define the location of an object due to transport, move to a place, or because it has been created at that location (see also in "Place of origin" section). A resource may have met 0 to many places, and a place may be met by 0 to many resources. The example of the Church of the Holy Cross in Warsaw as a place which an object "has met" is presented below:

<*edm:hasMet rdf:resource*=
"http://www.geonames.org/8643198/parafia-sw-krzyza-warszawa.html"/>.

The places of previous storage of an object may be identified in relation to the different types of places and relations to the geographical space, as places defined with the use of *edm:hasMet* property.

edm:hasMet allows for querying historical relationships without specifying simultaneous correlations to other things, such as the specific constellations of people and things at a particular event. It allows for "who, when, where, what" queries, without specifying if the "who" matches the "when". In addition, it supports the integration of all properties used within the descriptions contributed by content providers to Europeana that capture the notion of meeting in the sense outlined above. To this end, any such properties should be declared to be a (direct or indirect) sub-property of *edm:hasMet*.

3.2. GEOHeritage: place of origin

The next type of spatial relation of movable resources and geographical space in GIS for movable heritage is place of archival or cultural heritage creation (place of origin). As has already been mentioned, information about an object's place of origin can be stored with the use of *edm:hasMet* property.

However, the property place of object creation can be defined in EDM in more adequate ways. The property is called *edm:happenedAt* and is described as a property that associates an event with the place at which the event happened. The example of using *edm:happenedAt* is presented below:

"The creation of Map of Bialystok edm:happenedAt Edinburg."

An event may have happened at 0 (unknown place of creation) to 1 place, and a place may have 0 to many events that happened at it (many objects created in that place).

This property is useful for supporting discoveries concerning places ("where" query), since it relates a place to the events which happened there. In addition, it can be used to browse specific (other than creation) events. For example, the place of excavation can be also defined in such a way (e.g. *"The excavation of … edm:happenedAt Rome, Italy"*). It is a valuable solution from the assumptions of the GIS for movable heritage, which proposes the integration of all kinds of resources – immovable as well as archaeological – in one space and access to them with the use of one common platform.

3.3. GEOHeritage: places related to the topic

One of the main advantages of GIS for movable heritage is the possibility of accessing the resources using the places connected with the objects' subject. This means places mentioned in the text or image of the cultural object. Using EDM, this type of relation with the geographic space can be realized by the use of Dublin Core properties, specifically *dc:coverage*.

Coverage is the unqualified spatial coverage of the original analog or "born digital" object. It defines the spatial or temporal topic of the resource, the spatial applicability of the resource, or the jurisdiction under which the resource is relevant. In case of places, it can be a named place, a location, a spatial coordinate, a named of a region or administrative unit:

<dc:coverage>

name=Poland; northlimit=54.0; southlimit=49.0; westlimit=14.0; eastlimit=24.0

</*dc:coverage*>

In the context of rich EDM data, this property is expected to be used with instances of *edm:Place*, although this is not mandatory.

Use of the more specific *dcterms:spatial* (spatial coverage) property is preferred where possible. It provides spatial characteristics of the resource of the original analog or born digital object, e.g. what the resource represents or depicts in terms of space. It also may be a named place, a location, a spatial coordinate or a named administrative entity. As in the case of *dc:coverage* in the Europeana context, expected *dcterms:spatial* is to be used with instances of *edm:Place* also, although this is not mandatory. An example of using *dcterms:spatial* property is presented below:

<dcterms:spatial>
<dcterms:Point>
<rdf:value>
name="Warsaw"; projection=WGS84; north=52.23; east=21.01
</rdf:value>
</dcterms:Point>
</dcterms:spatial>

Both *dc:coverage* and *dcterms:spatial* may supply from 0 (topic not related to the space) to unbounded number of places.

The above results shows that movable cultural heritage object described in Europeana Data Model can be also defined as a multi-spatial data object, it means as an object related to many different places in space at the same time. Multi-spatial object can be adopted into the GIS for movable heritage, for example into GEOHeritage. This is because of the fact that with the use of the presented mapping rules, each object described in EDM can be described with the use of GIS for movable heritage data model and conversely. The example of description of manuscript ("Book of Szrensk City Council", in Polish: "Ksiega miejska radziecka Szrenska") with the use of EDM properties is presented on Figure 4.

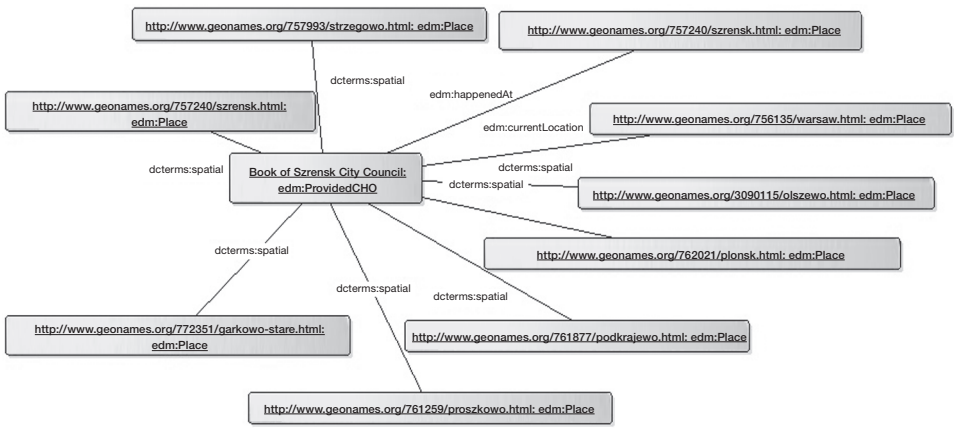


Fig. 4 – Implementation Europeana Data Model to the GEOHeritage on the example of XIX century manuscript titled "Book of Szrensk City Council"

On the basis of the above analysis, the conclusion is that Europeana Data Model can be implemented into the GIS for movable heritage. GIS architecture can adopt EDM properties, as well as EDM classes. Consequently, GIS functionality based on different spatial presentation of the same set of monuments, can be realized as a whole when EDM is used.

It is worth mentioning that both analysed data models, as well as GIS architecture based on them, are scalable. They can be developed towards presentation in geographical space additional information related to the cultural objects. The example of such information can be places connected thematically with monument's author. In GEOHeritage, places connected with works of arts author's activities are already presented. The same can be done with the use of EDM. Property *edm:hasMet* together with the contextual classes allows users to define and connect e.g. authors of objects (*edm:Agent*) with places (*edm:Places*), and as a result, present e.g. places of their activities on the map.

4. Discussion

Europeana Data Model is proposed by the one of the biggest online cultural digital heritage initiative. The result achieved in the research means that EDM can be adopted into data model used in geographic information systems. Moreover, the added value lies in possibility of extension of the traditional relation of the heritage object into geographical space of semantic aspect of these relations. It can develop into new solutions in GIS software and spatio-temporal research.

The results can extend traditional Europeana searching services into searching with the use of Internet interactive map. User looking for archives related to city, village, areas etc. uses now traditional searching engine. They have to type name of the place of interest many times, using its different form. Moreover, if place changed his political affiliation, user has to know past names of the place, often its form in different languages. In proposed solution, based on the map and spatial information, user would only select place of interest on the map to find archives related to them and chose context (e.g. places related to subject). Professional or historical knowledge would be minimized. Any other additional search criteria would be realized as in traditional search engine. Furthermore, this solution can work in distributed architecture, because it makes no difference whether the information is collected on the local server or in remote institution. In accordance with Europeana idea user will receive information about resources independently on the object place of storage. Therefore, the biggest value of the solution lies in the ability to search resources of all institutions from one common, user friendly level – from the map.

Above solutions may be relevant for people involved in historical research using spatial information. They receive tool which allow conducting study with one additional element: spatial relation of archival document to the space. The possibility of reaching the heritage resources from the map and taking into account the context of these relationships will facilitate access to archival resources related to places in space.

Although valuable results achieved in the research there are some doubts according Europeana Data Model. First and the most important problem lies

in the contextual class *edm:Place*. It contains a list of properties describing the place, which can give us their basic characteristic. Unfortunately, in some elements there are not precise explanations of the given notes or given explanations is limited only to some kind of data. It can results in possibly incorrect identification of the place.

The most important doubt in this case is description of spatial location with the use of *edm:Place* class. It is described by the use of only two coordinates in WGS84 reference system. They are defined as a latitude and longitude in decimal degrees. Such definition of spatial location is reserved only to point feature, e.g. city presented with the use of point symbol. According to such definition there is no possibility to describe line or polygon features, although EDM author's declare the possibility of using them into description of "the region of space occupied by Nazis in 1940" or "the region of space covered by the 19th century map of Paris". This information is not consistent and should be corrected or defined more precisely.

The same doubt is related to the altitude of a spatial location used in *edm:Place* class. It should be saved in decimal meters above the reference. But which point should be recorded in case of line (e.g. river) or polygon (e.g. the region of space occupied by Nazis in 1940) feature?

The final doubt is connected with the EDM structure and complexity. With so many classes and properties there is an anxiety that most of them will never be filled. Moreover, common metadata standards have a much smaller range. Import already described sources also not to fill all the EDM elements. Describing the resource again or supplement existing metadata is time consuming. Therefore, there is apprehension if EDM will be really used in practice.

5. Conclusion

Research undertaken so far hardly ever concern GIS for movable heritage. The only aspect of collecting heritage in GIS was related to the place of objects storage. It gives very limited possibility of collecting, managing and access to such object with the use of map. Study presented in the paper expands this point of view, additionally proposing new solutions based on a common data source.

The results of the research present the possibility of linking cultural data with the geographical space, with the use of semantic spatial relations. The implementation of EDM in the GIS results in the ability to present the heritage resources on an online map, and – from the other side – providing on-line access to the resources from this map. The on-line map gives users the possibility of showing the resources on the map in different spatial contexts, dependent on their interest, as well as searching the resources with the use of an interactive map, dependent on the spatial context.

Research presented in the paper suggests the need for further work in the area. These are primarily description geometrically more complex objects in EDM class or implementation commonly used metadata standards (e.g. ObjectID, EAD) into EDM. Referring cultural objects into the places in the past requires spatio-temporal database of geographical object names as well as

database of past geometry of spatial object (e.g. country borders in the past). The need to obtain comprehensive information about archives on a particular topic or related to a specific location will require the development of resources and network services.

In the research movable objects were examined, but solutions can also be applied to other kinds of heritage. Immovable and archaeological heritage can be included in the same solutions and the same system architecture and functionality. Therefore, the contribution of the research is the integration into one common environment (one space) of not only all different places connected with all kinds of monuments and the relationships between them, but also descriptions of the gathered objects and their images.

Heartfelt thanks go to Native Speaker of English Paulina Bozek for language correction of the text.

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Summary

DATOVÝ MODEL EUROPEANA V GIS PRO MOVITÉ KULTURNÍ DĚDICTVÍ

Europeana představuje jednu z nejdůležitějších iniciativ v oblasti přístupu ke zdrojům kulturního dědictví, k jeho podpoře a integraci. Informace obsažené v Europeaně se zpravidla týkají širokého rejstříku oblastí, formátů a jazyků, přičemž odrážejí četné různé aspekty, jež se mají vzít v úvahu. Jedním z nejdůležitějších informačních integračních hledisek u takových údajů je odkaz na prostor a čas.

V tomto příspěvku vyslovila autorka hypotézu, že Geografický informační systém (GIS) může zjednodušit přístup ke zdrojům Europeany, protože uživatelům poskytuje o jeden parametr víc než tradiční nástroje pro databáze a vyhledávání. Oním parametrem jsou prostorové informace. Navíc movitý kulturní objekt má mnoho různých významových vztahů ke geografickému prostoru. V důsledku toho by měl datový model používaný v GIS pro movité kulturní dědictví obsahovat tyto sémantické vztahy. Jeden takový model sestavila autorka. Dostal název multiprostorový datový model.

Účelem výzkumu provedeného v tomto příspěvku je integrovat strukturované informace z EDM do geografického informačního systému pro movité kulturní dědictví, přičemž se nastíní sémantické vztahy movitého kulturního dědictví ke geografickému prostoru. Tento příspěvek představuje krok směrem k propojení prostředí GIS a Europeana s použitím sémantické kontextualizace k zobrazení objektu. Příspěvek tohoto výzkumu nespočívá pouze ve zkvalitnění prostorového pátrání a analytických metod, pokud jde o předměty movitého kulturního dědictví na internetové platformě, ale také v rozboru a vizualizaci geografických nebo kontextuálních vztahů mezi různými objekty.

Jádrem použité metodiky byl sběr movitého kulturního dědictví jakožto multiprostorových objektů v geografickém informačním systému a také poskytnutí přístupu k nim pomocí různých druhů míst. Tato místa závisí na sémantických vztazích kulturních objektů ke geografickému prostoru. Objekty se proto mají na mapě zobrazit podle sémantických vztahů k prostoru, jež vypadají takto:
– místo vytvoření,
– místo vztahující se k tématu,
– místo uložení.

Ve snaze definovat sémantický vztah movitého kulturního dědictvi ke geografickému prostoru byly podrobně analyzovány prvky EDM. Každé místo ve struktuře, kam lze uložit prostorové informace, bylo prozkoumáno a zjišťovalo se, zda vyhovuje některému ze sémantických vztahů k prostoru. Byly klasifikovány prvky EDM, které ukládají prostorové informace do tří hlavních sémantických vztahů u movitých památek v prostoru:
– Místo uložení – v EDM se informace o místě uložení objektů zaznamenávají při použití atributu *edm:currentLocation*. Současné umístění je definováno jako geografická poloha a název depozitáře, budovy, prostranství či jiného objektu, v rámci jejichž hranic je v současné době obsažen zdroj.
– Místo původu – atribut pro místo vytvoření objektu lze definovat v atributu nazvaném *edm:happenedAt*. Je označeno jako atribut, který spojuje určitou událost s místem, kde daná událost nastala.

– Místa se vztahem k tématu – při použití EDM lze tento typ vztahu ke geografickému prostoru uplatnit pomocí atributů *Dublin Core*, konkrétně u *dc:coverage*. Je to blíže neurčené prostorové pokrytí původního analogového nebo „přirozeně digitálního" objektu. Definuje předmět zdroje v prostoru a čase, prostorovou aplikovatelnost zdroje nebo administrativní působnost, pod niž daný zdroj spadá. V případě míst to může být název místa, poloha, prostorová souřadnice a jméno kraje nebo správního celku.

Na základě provedeného výzkumu byly určeny různé sémantické vztahy movitých kulturních objektů ke geografickému prostoru v datovém modelu Europeana. Obecně se soudí, že existuje sémantický poměr mezi nimi a GIS u movitého kulturního dědictví. V důsledku toho lze v EDM definovat různé typy prostorových vztahů za použití atributů EDM a souvisejících tříd (*edm:Place*). Při použití uvedených pravidel lze pomocí EDM určit každý objekt zaznamenaný v GIS pro movité kulturní dědictví.

Díky tomuto výzkumu lze dospět k závěru, že je možné uplatnit EDM u GIS pro movité kulturní dědictví. Architektura GIS umí převzít atributy EDM a rovněž třídy EDM. Navíc pokud se použije EDM, lze uplatnit funkčnost GIS ve svém celku na základě různých prostorových znázornění téhož souboru památek.

V bádání byly sice zkoumány objekty movitého kulturního dědictví, avšak řešení lze aplikovat i na jiné typy památek. Do týchž řešení a téhož systému lze zahrnout nemovité a architektonické památky.

Obr. 1 – Stejný soubor památek zobrazený s různými prostorovými aspekty (místa původu, místa se vztahem k tématu, místa uložení)
Obr. 2 – Atributy třídy *edm:Place*
Obr. 3 – Atributy EDM jako sémantické vztahy k prostoru
Obr. 4 – Užití datového modelu Europeana u geografických kulturních objektů na příkladu rukopisu z 19. století, jenž se nazývá „Kniha městské rady ve Szreńsku"

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Initial submission, 17 April 2014; final acceptance 7 May 2015.

Please cite this article as:
MOŚCICKA, A. (2015): Europeana Data Model in GIS for movable heritage. Geografie, 120, No. 4, pp. 527–541.