Introduction

Awareness of the heritage constitutes self-consciousness of the contemporary society. In this way, preservation of historical monuments concerns not only the past, but also our future. Awareness of how important heritage is strongly depends on common knowledge about its aspects. Rendering such information visible to all is one of the basic tasks for contemporary preservation-related bodies and organizations, and, generally speaking, for contemporary societies. This can be realized by effectively introducing a digital cultural heritage concept, with its emphasis on information aspects\(^1\).

Project Origins

The work presented in the following article fits this context. It was originally aimed to fulfill requirements of the INSPIRE EU Directive, which (among other requirements) obliges the EU member states to render visible all basic information concerning protected sites, including historical monuments and sites. This should be done using of a coherent spatial information system. National Heritage Board of Poland decided to broaden this task and publish a more extensive information set using spatial information system tools. As result, map-based reference of knowledge about Polish built heritage has been created\(^2\). It includes 69974 immovable (mainly architectural) monuments and 7705 archaeological monuments, giving a total of 77679 (as of March 12, 2015) listed in National Inventory.

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\(^1\) See: Bianchi, Cristiano. „Making online monuments more accessible through interface design”, in: MacDonald, Lindsay (ed.), *Digital heritage: applying digital imaging to cultural heritage*. Amsterdam: Elsevier. 2006, pp. 445-466.

**Project characteristics**

Because the project was aimed at both common users and experts, it required a very careful visual communication design. The author's task, which is presented here, concerned the fragment of a larger work referred to the whole map service\(^3\). This included symbolization of monuments groups and types (preceded by categorization) represented by icons and visualization of their basic features, represented by icons' variations. Another task was to develop clear and legible color schemes for maps.

Since the project’s main task was to develop a map which would serve as an interface for information about historical monuments, studies on previous approaches to heritage maps (especially in Poland) were required. Among these examples the most significant and comprehensive was „Atlas zabytków architektury w Polsce“ (Atlas of Architectural Monuments in Poland) by A. Miłobędzki and J. Łoziński, released in 1967\(^4\). Its graphical representation of monuments – 50 icons referring to monuments’ types – is characterized by a detailed distinction between various sacral building types, a consistent differentiation between single objects and building complexes, and by representation of main material of buildings through an icon variation. There was only one symbol for an archaeological monument (settlement). These icons, however, were based on two different semiotic regimes: on one hand referring to the meaning or idea of the building – its immaterial connotation (like cross for a church), on the other hand to the actual or archetypal, material shape of the monument itself (like a palace or a manor house). This is a result of a cartographic tradition; however, the original attempt while creating the new set of icons for heritage maps in this project was to avoid such duality.

While studying printed, analog atlases as comparative material for digital maps one should be aware of the basic difference between them: the dynamic nature of the latter. In case of maps this concerns one of their basic features: scale. Designing a representation of monuments on a dynamic-scale map reveals new set of problems. One of them refers to displaying dense information sets in relatively small map scales. Such situation takes place in cities, where a lot of monuments are placed on a relatively small area. Displaying their representations (icons) in a small scale would result in a massive overlapping, thus making information illegible. In printed atlases this problem was solved by referring monuments (or rather their symbolizations) in such areas to the whole city rather than to their actual position. This idea was transferred to digital maps as so called „cartographical matrix“ which is an original development of the project team\(^5\).

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\(^3\) The whole project included a much broader set of actions associated with developing working solution for presenting monuments in spatial information systems and was realized for the National Heritage Board of Poland by a team from Warsaw University of Technology: Anna Fiedukowicz, Andrzej Głązewski, Krzysztof Koszewski, Paweł J. Kowalski, Kamil Latuszek, Robert Olszewski, Leszek Włochyński in 2013 and 2014 with Robert Olszewski (Faculty of Geodesy and Cartography) and Krzysztof Koszewski (Faculty of Architecture) as project leaders.


\(^5\) However, this item is not covered by the article since its scope goes beyond graphical representation referring to icons, which was the main task of the author.
Visual information environment

Visual information environment for a system for spatial information about heritage consists of several elements:

- System of signs-icons representing monuments or their classes,
- Map compositions – in terms of coherent and legible visual communiqué together with icons,
- Elements of map interface facilitating efficient discovery of information
- Organization of icon sets in relation to a dynamic map scale.

The scope of this article refers mainly to the first of the above as was the author’s task within the whole project; other problems will be mentioned briefly. Several presumptions were made prior to designing icons for monuments:

- Icons had to follow the rule of formal simplicity as a characteristic feature for all graphic elements which serve as signs
- Icons had to be diverse enough to facilitate clear distinction between them
- They had to be graphically coherent to create a sense of visual system
- Strong semantic link between the signifier (icon) and signified (monument) was to be provided
- Uniform representation criteria had to be adopted – icons had to follow one semiotics regime (pertaining monuments as objects rather than carriers of ideas)
- Icons set had to conform technical requirements for effective displaying on a map in a spatial information environment

Bearing in mind the technical requirements and conditions for visual coherency, all icons were designed using graphic modules. All of them are placed on 16x16 square grid with no elements thinner than a single module.

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6 Icons have to be displayed on the computer screen against a map background correctly, which means that no lines should be thinner than one pixel and there are no fractions of modules.


**Signage semiotics**

All of the designed icons have to fulfill semiotic requirements for signs. Mieczysław Wallis accurately defines a sign as ‘a physical object shaped by its creator with a purpose to induce in the recipient (thanks to some object’s properties) specific thoughts about the subject other than himself’. In this case the created object refers to an icon, the other subject refers to signified building/site and specific thoughts concerns special features of the original object that constitute its historical value as a monument. This interpretation unveils rooting of Wallis’s definition in Peircean semiotics system based on the triad of sign-object-interpretant. The latter one is of great importance in our case, since the aim of developing a sign system is for it to be clearly interpreted by a wide audience.

According to Peirce, we can name a specific element of a sign, which we call ‘a sign-vehicle’ – the carrier of specific features of a signified object – i.e. these which we consider distinguishing in terms of the categorization applied. In the sign system described here, the constituting features were those that refer to the archetypic shape of the objects – architectural monuments (or rather their formal-functional types). The sign-vehicle for them (also called the signifying element) was the shape of the icon. As it was mentioned before on the example of the Atlas of Architectural Monuments in Poland, a traditional icon system with cartographic traditions had to be thought through. This aspiration of semiotic coherence resulted in some design dilemmas, described hereafter.

**Icons design**

The number of icons to be designed corresponds to the mapping of formal/functional attributes assigned internally by the National Heritage Board of Poland to monuments in the database of the National Inventory. There are three levels of categorization in a database: categories, classes and functions, with more than 200 specific types on the latter, lowest and the most detailed level. This large number had to be significantly reduced, and finally, the visual system consists of 64 designed and 3 adopted (previously existing and known) icons, referring to all three levels of categorization.

The first problem was to signify archetypical shapes for object (monument) classes, starting from very general, like division between immovable (architectural) and archaeological objects. Because of the high level of generalization, the basic references had to be taken into account.

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8 Categories refer to a general division into immovable (architectural) and archaeological monuments, historical spatial layouts, UNESCO World Heritage List Monuments, National Monuments of History; classes refer to formal/functional general typology, like buildings, spatial layouts, cemeteries, greenery; functions refer to detailed typology like: churches, bridges, single- and multi-family houses etc. (and sometimes are divided even further, but this is of second importance here).
Symbols for smallest map scales, where large groups of monuments have to be aggregated, consist of five elements: a general icon for all monuments as a Blue Shield sign adopted by the 1954 Hague Convention (original design by Jan Zachwatowicz, Fig. 4, no. 1)\(^9\) – shown in the scale of the whole country, the UNESCO World Heritage list sign (Fig. 4, no 2)\(^10\) and the National Historic Monument sign (Fig. 04, no. 3)\(^11\). Remaining two were designed as part of the system and refer to general classification of immovable (Fig. 4, no. 4) and archaeological (Fig. 04, no. 5) monuments (while for the purpose of generalization, historic spatial layouts are considered as immovable monuments). All icons, when referring to aggregated monuments, are pictured with a suffix showing the number of aggregated monuments represented by a single sign (see Fig 2-4). Further nine icons represent object classes (as defined in National Inventory database): building (Fig. 5, No. 1, following numbers refer to the same illustration), structure (construction) (2), communication layout (3), greenery (4), cemetery (5), cultural landscape (6), urban layout (7), small architecture forms (8), building complex (9). These, as still general types, are represented by icons referring to commonly recognized shapes as sign-vehicles. In case of spatial layouts these shapes do not resemble the physical look of them, since this was not possible, but a widely recognized convention of plans.

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\(^11\) National Historic Monument is one of the degrees of protection defined by law in Poland, granted by President of Republic of Poland, its signage was developed by National Heritage Board: http://www.nid.pl/pl/Dla_wlascicieli_i_zarzadcow/opieka-nad-zabytkami/pomniki-historii/identyfikacja-wizualna/manual_pomnik_historii.pdf (accessed 13.30.2015).
Next set of icons refers to immovable monuments (most of them being architectural monuments) symbolizing more detailed formal/functional types (like a castle, a manor house, a catholic church, a bridge etc., see Fig. 6). They represent the most characteristic types, but only about 1/5 of all the detailed third level categorization. The rule for the rest is to be represented by a relevant icon of a more general class level. Since the rule of shape relevancy (shape of the icon as sign-vehicle referring to a shape of building/archetype) was adopted on semiotics level, sometimes special icons have to be designed for very characteristic building types which hardly fit into the higher level categorization in terms of graphic representation. The example of this approach is a windmill icon (Fig. 6, No. 29) designed to avoid picturing this kind of building with its general signifier – industrial building icon, even if there is a relatively small number of historic windmills under protection12.

However, sometimes abstract symbolization has to be used, and it is the case of various building complexes listed as National Heritage represented by a single building icon with a stylized bracket over it. In fact this abstract symbolization does not refer to the building itself, but to the idea of a building complex as a functional and formal ensemble (Fig. 7).

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12 There are 1363 industrial buildings listed and shown on the map (about 2% of all immovable monuments shown), among them we find 224 windmills (0,3% respectively). All data as for 15.03.2015.
There are also some cases when no shape analogy could be found as a sign-vehicle (like a battlefield or a memorial (see Fig. 6, No. 31, 30).

There is the group of icons which use abstract symbolization extensively and they refer to archaeological monuments. There are mainly two reasons for such approach here: archaeological monuments hardly fit the category of objects with a ‘shape’ recognized visually, and there is a strong tradition of signage for archaeology. This group consists of 8 icons referring to archaeological sites and relics (plus 5 versions of immovable monuments where they meet the case of both classifications, Fig. 8).

Fig. 6. Icons for monuments - object formal/functional types:

Source: authors’ own work.
Color codes for dating

Dating of monuments is represented by a color icon. This information is shown only in larger scales, since in smaller scales icons are aggregated. The choice of palette is based on the color-code used in professional works related to architectural surveys¹³, where red usually refers to medieval origin, and newer parts are marked by cooler colors, respectively. The color palette (Fig. 9) also has to be adjusted according to how frequently monuments representing specified period occur. Warmer part of the spectrum is in minority on the map since there are much less medieval monuments than those from the 19th and 20th centuries.

¹³ The color coding rules were widely used and adopted as best practices, see example, in: Brykowska, Maria, Metody pomiarów i badań zabytków architektury, Warszawa 2003, p. 88.
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Fig. 9. Color codes for monument dating:

Source: authors’ own work.

Fig. 10. Monuments shown on the map in the geoportal service, case of Przemyśl (some buildings aggregated)


Fig. 11. Monument properties: material:
1 – masonry, 2 – wooden, 3 – other; 4 – uncertain localization (semi-transparent icon), 5 – non-existing, 6 – threatened monument

Source: authors’ own work.
Another icon variant is the result of an evident difficulty in unequivocal dating of historic buildings or sites, which are structures stratified in time. To solve this problem, a multi-period icon with dominant dating was prepared with a presumption that it should be used in most ambiguous situations14.

Color codes for icons work best provided that they are presented against a monochrome background. The whole signage system was designed with this presumption, ensuring legibility of the visual communiqué. Map compositions were prepared as grayscale to fulfill this guideline (Fig. 10).

Visualization of other monument properties

The formal-functional type, represented by the shape of the icon, and dating, represented by the color of the icon were not the only characteristic features to be represented by the signage system. The others are: monument’s material, in some cases a general monument classification (immovable/archaeological referring to the same object class or function), standing independently vs. part of a complex, condition of the monument, certainty in the location or even – in some cases – existence15. Monument’s material is shown using color code with the assumption, that this classification is disjunctive from dating in terms of presenting on a map. The color codes used are also different (Fig. 11).

Future plans for the system

The spatial information system for the Polish National Monuments Inventory is working in its beta version16. Not all features described in this article are implemented, but the core functionality is available. Monuments are presented with a visualization of their location, types and dating. If there is an area occupied by a particular monument, it is displayed using the relevant color code.

What is yet to be done is the implementation of profiles for different user groups, the visualization of building material and other features of the monuments, providing extensive information on shown monuments. Additionally, the system needs to be connected with other functionalities available in portals run by National Heritage Board of Poland.

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14 This solution, however, requires that a significant amounts of data is modified in the database, so it is not implemented in the current version of the system.

15 The last two features seem not to be relevant to information system reflecting reality; however, the primary task was to report legal status and use it as one of verification tools for it, hence, rare instances of non-existing monuments being inscribed on the National Heritage list may occur and have to be shown.

16 As for 15.03.2015.
Conclusions

The Signage scheme for spatial information system described here offers a wide range of detailed information, thus constituting a unique resource for various kinds of purposes. Complex information sets become readable thanks to the use of visual means which are easily decoded by users. However, the system needs constant development and verification. Representation of such a large amount of data, referring to a fragile matter of heritage protection demands careful approach and – sometimes – individual treatment in particular cases. On the other hand, due to the scale effect, some generalizations are necessary. Proper relation between these attitudes is crucial to achieve balance between efficiency and accuracy.