ECULTUREMAP:
HOW CULTURAL INSTITUTIONS CAN BENEFIT FROM GEOLOCALISED CONTENT

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GEOLOCALISED CONTENT

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Pilots for testing
the creative use
of cultural contents

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Foreword

This publication is the third in the same series dedicated to Geographic Information.

In 2011, within the Athena project, we published *Digital cultural content: guidelines for geographic information*. When seeing a museum object, a question of high interest is: where to find it? For that the knowledge of its geographic location is essential. These guidelines aim at providing basic information for the description of geographic locations. It needs to be implemented in such a way that the geographic location information is machine-readable and thus can be used also in Europeana and other relevant portals to identify the place of objects.

In 2013, within the Linked Heritage project, a second booklet was published: *Geocoded Digital Cultural Content*, focused on Geographic location, which is a very important attribute of a cultural heritage item. It can describe provenience, the current institution, as well as the location of the event or other related events. The added value of the geo-coded cultural content is in

the browsing of cultural portals efficiently through space and time, and searching for content in a more user friendly way.

Now AthenaPlus dedicates this third publication to *eCultureMap*. "The eCultureMap is the effort of the Europeana partners to put their cultural content on the one single geographical knowledge map when ingesting their metadata to Europeana. The eCultureMap currently displays more than 2 millions objects from several Europeana projects as are Athena, Carare, LinkedHeritage, AthenaPlus, PartagePlus and others". The eCultureMap is created as a simple, interactive geographical map and is ready for use by the general public and professionals on mobile devices as well as on desktops. This booklet presents the guidelines for use and reuse of the eCultureMap content.

We hope that it will be an helpful tool for the cultural heritage community.

Maria Teresa Natale
AthenaPlus Technical Coordinator

1. Introduction

The eCultureMap is a geographical knowledge map connecting and visualizing digital cultural content in a national context (with national portals) and in an international context (as Europeana).

The eCultureMap is created as a simple, interactive geographical map and is ready for use by the general public and professionals on mobile devices as well as on desktops.

The booklet presents the guidelines for use and reuse of the eCultureMap content and its tools.

The usage of the eCultureMap is demonstrated with several use cases as are drawings, historical photos, museum homepages, cultural routes, viewing augmented reality and using the map with iBeacon technology.

The current version of the map already displays more than three million digital cultural heritage objects from European museums, libraries, and archives, originated from several Europeana projects.
The most recent improvements to eCultureMap were contributed within the AthenaPlus EU project.

2. Why eCultureMap?

The eCultureMap has been developed for museums, libraries, archives and other cultural institutions to promote their collections in order to increase visits and visibility of the institution.

Let us suppose that we are small- or medium-sized cultural institution, whether a museum, library, archive, institute for the protection of architectural and archaeological heritage, or other cultural institution.

The institution has rich, well maintained collections, some on exhibition, and more of them in storage where they are inaccessible to the public. The collections might be of international, national, regional, or local importance.

Usually employees believe that creating a webpage with a description of the institution, location, and opening hours will bring a great amount of visitors to the exhibitions. Unfortunately, this is typically not the case. We can also not blame Google's search engine that our institution is not on the top of the search results.

The next step would be to enrich the webpage with the descriptions, images, 3D objects of our collections. We might even add a link to our webpage on international cultural portals, e-government sites, business registers and similar sites. Small- and medium-sized cultural institutions cannot be compared with internationally recognizable museums such as the Louvre or the Tate. The Louvre or Tate do not even need a web page "to attract visitors".

Fortunately a great European project named Europeana exists. Its result is not only a common cultural heritage portal of nearly 50 million images, videos, texts, etc. from

European cultural institutions. Even more important is the established network of people, institutions, engineers, curators, conservators, librarians, researchers on the topic of digitalisation, preservation and accessing the culture and cultural heritage.

Small- or medium-sized cultural institutions can get support and digitise, prepare metadata and ingest their collections to Europeana. Users from around the world can then browse and exploit their collections. Although our enthusiasm and efforts are not completely returned as Europeana has the following bottlenecks:

1. First, Europeana as a trademark is not well known among general public, and nor even among people dealing with cultural heritage.
2. Second, with current search technology our content is difficult to find and reuse.

For these reasons the need to invent the eCultureMap emerged. The eCultureMap aims to help raise the visibility of small- and medium-sized cultural institutions and to populate the Europeana to be more exploitable.

3. What is eCultureMap?

Video:
https://youtu.be/XAoRod4mQDk

Online:
http://athenaplus.eculturelab.eu

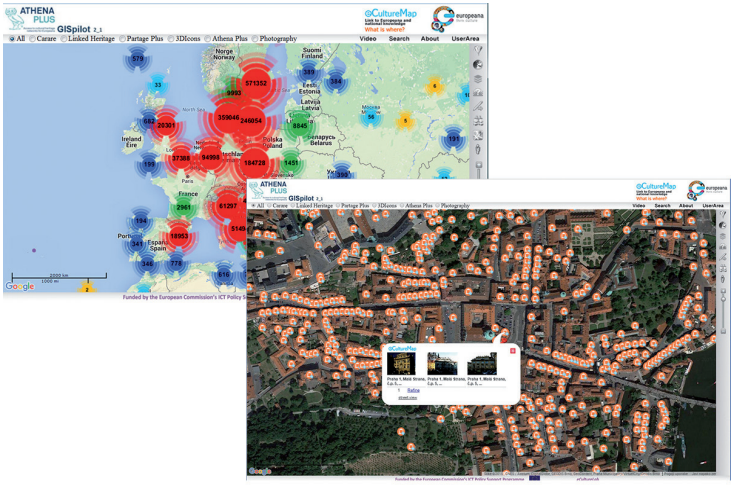
The eCultureMap is a geographic knowledge map connecting geographical space with digital objects of immovable, movable, and intangible cultural heritage across Europe. It relates the geographic context of cultural

objects in a national context (with national portals) and in an international context (as Europeana).

The eCultureMap reflects the effort of Europeana partners to put their cultural content on one single, global, geographical knowledge map before, during, and after ingesting their metadata to Europeana. The first work was done in the ATHENA project (2009-2011) when developing the models for the possible use of location-based cultural heritage data and geoparsed over 160 000 Europeana metadata. Project INDICATE — *international network for a digital cultural heritage e-infrastructure* (2010-2012) analysed the potential of grid and cloud computing for geocoded and geoparsing cultural heritage metadata. Project CARARE (2010-2013) was an important milestone in the development of the eCultureMap; the map was launched.

The eCultureMap can be utilised for numerous purposes, from discovering heritage at a location and exploring museum collections or archaeological sites to planning a cultural route. Beside the analysing, searching, browsing, and filtering of cultural heritage in geographical space on mobiles and desktops as well, eCultureMap is also an efficient tool for the enrichment of culture objects metadata with geographic coordinates and for reusing the content in several contexts as are the cultural institution home page, cultural portals and mobile applications.

4. How to use eCultureMap?



Video:
https://youtu.be/8nc2GRxaWwo

Online:
http://athenaplus.eculturelab.eu/

The eCultureMap is created as a simple, interactive, geographical knowledge map and is ready for use by the general public and professionals.

The centre of the user interface is a map surrounded with the menu for selecting a dataset, navigation to further functionalities and querying tools. At the small scale the map displays the clusters with the number of digital objects in the certain area. At the

* **More:** http://wiki.athenaplus.eu/index.php/ECultureMap

larger scales the map presents the exact geographic location of the cultural objects*.

When a user clicks on the any icon a pop-up window with thumbnails is retrieved. Each thumbnail has two hyperlinks. Upper part of the thumbnail links to a national/local website where user can read detailed description of the object. The lower part of the thumbnail is linked to a detailed description of that object on Europeana. The pop-up window also has navigation numbers to list among the retrieved thumbnails. Refine link redirects user to a search page where the results can further filtered. User can filter search results (thumbnails) by text in the title or any attribute data to find exact cultural object. Results can also be filtered by time period (before, after, after a certain year, older). Street view link displays the selected location in the Google street view 3D.

Most of the cultural objects on the eCultureMap have spatial accuracy of the geographic coordinates below 5-10 metres; the icons representing them are orange. The objects with accuracy above 10 metres are presented with purple icons.

IMMOVABLE			
	1010	architectural building	e.g. Trocadero, palace
	1020	arheological site	e.g. Pompei, Foro Romano
MOVABLE			
Current location			
	2010	museum	museum
	2020	gallery	gallery
	2030	library	library
	2040	archive	archive
	2110	civil object	fountain, cot
	2120	religious object	church, monestery
	2130	civil-religious object	painting in the church
Geographic provenience			
	2510	provenience area	provenience of a museum object
INTANGIBLE			
	3010	provenience area	provenience of an event
	3020	event	event
	undefined		
	photo GPS		location from where the photo has been taken

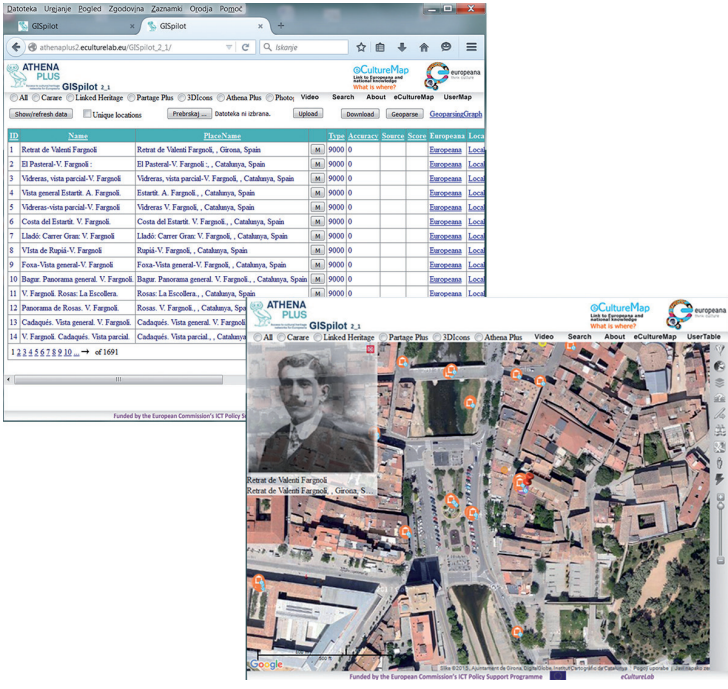
The eCultureMap has basic interactive map functions such as zoom-to-all, zoom-in, zoom-out, pan and switching the basemap layer (available: Google Physical, Open Street Map, Google Satellite, Google Streets, Google Hybrid).

	Filter tool. Reduces the number of digital objects displayed on the map. Automatic translation is performed when multilingual option is checked (e.g. filter by 'castle' displays heritage containing word 'château', 'Schloss', ' slot', 'castello').
	Cultural route planning tool. Gathers and saves the information (texts, images, 3D models, articles, etc.) on cultural content in a 20-meter radius around the selected route. The user clicks a line on the map and self generated content is displayed based upon the drawing. The use is especially recommended for mobile tablet and use in real time when travelling by bus, car or on foot.
	Find tool. Search a placename, e.g. Paris.
	Google Street view tool. Dragging a pegman on a map to explore cultural heritage around the world through 3D, panoramic, and street-level imagery with links to descriptions of the cultural content on national portals and Europeana.
Search	Search tool. Searches Europeana content by attributes and presents the geographical location of a selected object ("Where is what?").

The eCultureMap has been developed using the following APIs (Application Programming Interface):

europeana	Europeana API, http://www.europeana.eu/portal/api-introduction.html
Translator	Microsoft Translator API, http://www.microsoft.com/en-us/translator/translatorapi.aspx
OpenLayers	OpenLayers JavaScript library, http://openlayers.org/two/
LoCloud LoGeo API	LoGeo API, http://locloudgeo.eculturelab.eu/Console_LoGeo_1_2_m/
	Google maps API, https://developers.google.com/maps/?hl=en

5. Geocoding with eCultureMap



Video:
https://youtu.be/-ASiCqeUVfM

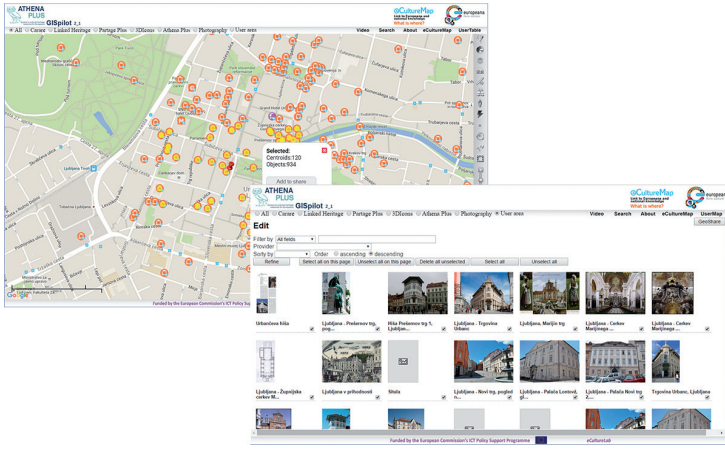
Geographic coordinates and geographic data have a long tradition of use in the architectural and archaeological heritage field, but they are relatively new in the area of museums, libraries and archives.

Geographic information for movable cultural heritage can be revealed from provenience, place of origin, place of creation, place of current location, birth place of the creator and similar information.

In case the cultural heritage collection metadata do not include geographic coordinates the eCultureMap can help to:

1. automatically obtain the geographic coordinates by geoparsing the collection using the place name field in the metadata, or extract the place name from other field,
2. manual improvement of the geographic location of the cultural object, if needed.

6. GeoSharing with eCultureMap



Video:
https://youtu.be/vvgVq6LmO3g

The eCultureMap introduces the innovative GeoShare tool. Non-programmer end users can generate custom map according to their needs and purposes and then put it on the web page.

This can be done with only a few clicks:

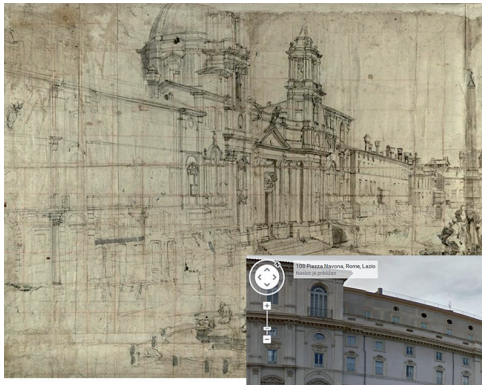
1. Select an area on the map such as a point, circle, path or frame.
2. Select/deselect individual digital cultural objects to be displayed on a map.

On the output side the eCultureMap services are available for web developers in the field of cultural heritage, tourism, municipal and related portals. The reuse of the eCultureMap data enables two pairs of APIs that can be embedded into any web page and/or mobile application. The first pair of APIs is appropriate for simple reuse with any Google Maps API* to display all centroids around the chosen location. By selecting one centroid, a popup is displayed with the thumbnails of all items at this location with links to local webpage with metadata description and Europeana description. The purpose of the second pair of the APIs is more general and is convenient to be used in different application environments, especially for navigation on mobile devices.

* **Google Maps JavaScript API**, https://developers.google.com/maps/documentation/javascript/examples/places-autocomplete

7. Use cases

7.1 CASE: DRAWINGS



Source:
Biblioteca nazionale centrale di Roma

Video:
https://youtu.be/vvgVq6LmO3g

Online:
http://athenaplus.eculturelab.eu/GISpilotGMap_1_1/index2.html

The case *Drawings* was developed for institutions with collections of high cultural value which would like to enrich the content and metadata with the information on geographical space. The collections can be drawings, paintings, books, manuscripts or other cultural objects.

The Van Wittel vedute use case was prepared with the cooperation of the Biblioteca nazionale centrale di Roma and its virtual exhibition. The objective of this use case is to demonstrate the power of the eCultureMap when reusing it in virtual exhibitions. The team geocoded *vedute* with the location where the painter, Van Wittel, had drawn them in the 17th century. The user can browse the vedute in central Rome through the map interface, retrieve an image of a veduta and open Google maps street view on the exact position in Rome where the painting was drawn. There are also red pins on the map, beside the *vedute* green pins, which are links to nearby Europeana content.*

* **Online:** http://athenaplus.eculturelab.eu/GISpilotGMap_1_1/index2.html

7.2 CASE: HISTORICAL PHOTOS

Source:
Ayuntamiento
de Girona

The *Historical photos* case was prepared for institutions which keep large amounts of historical photos, ancient maps, etc. and would like to browse this content instead in the sequential order on the classical search based applications in the parallel view that displays the chronological order of development, e.g. buildings.

Video:
https://youtu.be/-ASiCqeUVfM

Online:
http://athenaplus.eculturelab.eu/GISpilot_2_1/Map.html?LON=2.703321182613726&LAT=42.27635349782367&ZOOM=9&LAYER=7

The Girona historical photos use case was prepared with the cooperation of the Ayuntamiento de Girona. The objective of this case is to demonstrate the use of the eCultureMap when geoparsing place names and correcting results to the exact coordinates of historical photos. Geocoding functionality in the eCultureMap enables an exact determination of the geocodes with the image of the object in the geocoding process displayed on a map.

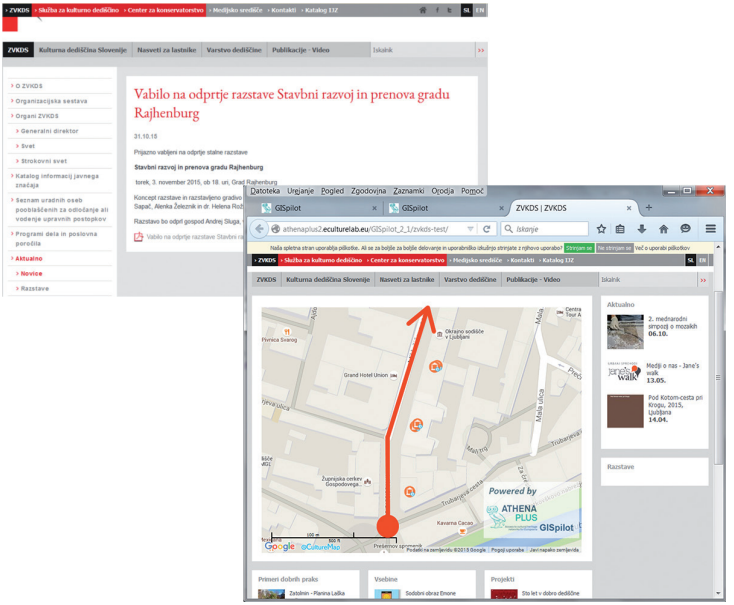
7.3 CASE: MUSEUM HOMEPAGE

Online:
http://athenaplus.eculturelab.eu/GISpilot_2_1/Mml-test/

Museums and other cultural institutions usually only provide a simple geographical map marking the location of the museum on their webpage. Museum maps can be

significantly enriched by the simple use of the GeoShare tool from the eCultureMap. The map can present the individual museum objects with links to local and Europeana metadata and further, also the content of nearby cultural institutions. Such maps can undoubtedly raise the attractiveness of the area and therefore also the number of visits to the museum.

7.4 CASE: CULTURAL ROUTES



Online:
http://athenaplus.eculturelab.eu/GISpilot_2_1/zvkds-test/

Another use case of GeoSharing with the eCultureMap is cultural routes. For example, a museum prepares a cultural heritage exhibition and announces it on the webpage. The announcement is usually simple and short text, sometimes accompanied by a virtual exhibition. Museums can enrich visitors' experiences by creating a cultural route from the eCultureMap. The museum could connect the exhibition with a cultural route on the field (e.g. provenience locations). The cultural route could be simply created by eCultureMap.

7.5 CASE: VIEWING AUGMENTED REALITY

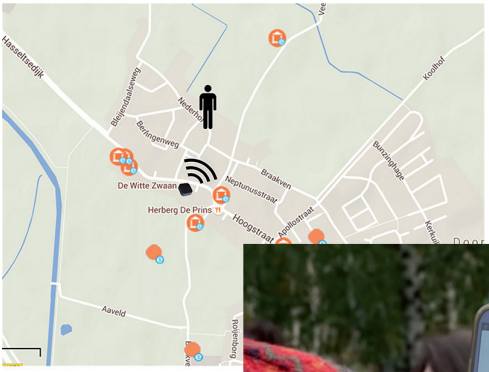
Video:
https://youtu.be/eAqkDAtY3_8

The eCultureMap team developed the augmented reality mobile application eCultureMapAR using GPS (satellite) location services in order to demonstrate the reuse of eCultureMap content.

Augmented reality is a live direct or indirect view of a real-world environment whose elements are augmented (or supplemented) by computer-generated input such as sound, video, graphics or location-based data. The eCultureMapAR enables browsing over three million cultural content objects on mobile devices (Android only). The application is free and can be downloaded.*

* **Download link:**
http://www.eculturemap.eu/AR/eCultureMapAR.apk

7.6 CASE: USING WITH iBeacon TECHNOLOGY



Video:
https://youtu.be/11t-k1bheAQ

iBeacon is newly introduced technology developed by Apple Inc.* In the area of the NFC (Near Area Frequency Communication) the protocol uses low energy consumption (BLE - Bluetooth Low Energy Consumption) which is especially important for mobile devices. The technology can be used indoors or outdoors and is spatially very accurate. Currently it is mainly used for shopping and marketing, e.g. announcing price reductions of articles. Why not use this amazing technology for cultural heritage? For example the city of Amsterdam has already implemented an iBeacon mile.**

* **iBeacon:**
https://developer.apple.com/ibeacon/

** **iBeacon Living Lab:**
http://amsterdamsmartcity.com/projects/detail/id/104/slug/ibeacon-living-lab

The case demonstrates the use of the eCultureMap with iBeacon technology. When users enter the zone of certain iBeacons (e.g. 100 metres) the thumbnails of digital cultural objects appear which are available for reviewing on national and Europeana portals.

8. Recommendations and conclusion

The geographic location is one of the most important aspects of information which pertains to every cultural heritage item and significantly enhances the power of searching, navigation and the visualisation of the content for research, education, creative reuse, cultural tourism and the overall promotion of culture.

1. eCultureMap, an interactive geographical map, is an excellent opportunity to present on your webpage the entire collections you have ingested to Europeana.

2. The eCultureMap is an amazing tool to browse your cultural objects and view your content together with Europe-wide cultural heritage.

3. eCultureMap is a powerful tool for geoparsing and geocoding your cultural heritage collection in order to enrich your metadata with geographic coordinates.

4. Almost without any effort non-programmers can generate rich, customised interactive, geographic maps presenting their own and other cultural content by using the eCultureMap GeoShare tool.

5. Act immediately. Begin thinking of an appropriate geographical reference for your digital cultural content otherwise it will be lost in the global information space.

6. When inventorying or documenting newly acquired cultural objects include geocoding and/or geographical ontology in data capture.

7. Download free GIS software. Do this to demonstrate the usefulness of GIS to your colleagues. (Example: https://en.wikipedia.org/wiki/QGIS)

8. Whenever taking a photo of cultural objects in the field (e.g. natural science specimens) use GPS with appropriate coordinate system and accuracy.

9. Consider encoding your geographical names thesaurus using the SKOS standard (a 'SKOSified' thesaurus) or use automatic geocoding.

10. If historical maps represent your valuable cultural assets then consider geocoding them as the first step to your digital georeferencing future.

11. Consider linking your cultural objects to already geocoded immovable cultural heritage.

12. When you are about to enrich your metadata either manually or automatically do everything possible to achieve as complete and as precise a description of geographical data as possible. Pay particular attention when you contribute your metadata to portals such as Europeana.

13. When selecting new or upgrading existing collections management software check what geographic information system functionalities is it capable of.

14. Monitor what is going on with the INSPIRE project in your country. Pay attention especially to the developments regarding territorial unit's layer.

15. Invest time in training on the concepts and uses of GIS in order to gain a basic and practical understanding of GIS concepts, analyses, techniques and real world applications. With this knowledge you can efficiently plan the introduction of GIS technology in your collections

9. Glossary

3D building
A 3D building (three-dimensional building) is a virtual computer model of the building which could be moved, rotated, enlarged, resized or could be moving around or within in three-dimensional virtual space.

3D city
A 3D city (three-dimensional city) is a virtual computer model of the city where users can move in three-dimensional virtual space.

4D GIS
A 4D GIS is a four-dimensional geographical information system, which besides the geographical coordinates x, y, z also includes the time dimension.

aerial photo
An aerial photo (also aerial photograph) is a photo of the ground taken from an elevated position (e.g. in an aircraft). Unlike an orthophoto the photo is not geometrically corrected.

digital topographic map
A digital topographic map is a topographic map in digital form. It can be viewed on the Internet using various web map services e.g. Google Maps.

gazetteer

A gazetteer is a geographical dictionary or index which contains information on places and place names and is meant to be used in conjunction with a map or atlas. It can be simple alphabetical listing of geographical names or it can include further information on latitude/longitude, geographical profiles of continents, countries or regions, social statistics, and physical feature.
Examples are GeoNames [8] and The Getty Thesaurus of Geographic Names (TGN). [9]

geo portal

A geo portal (also GIS portal) is a web portal which enables users to discover, visualize, share and retrieve geographic data. The typical functionalities are interactive maps, exporting maps and data. They are usually integrated data from distributed geographical resources and in some cases allow for the editing of data.
A subset of geo portals are interactive maps on the web which feature display and interaction with maps and various layers, and searching, browsing and displaying data, and measuring distances. Examples are INSPIRE Geoportal [10] and GoogleEarth. [11]

geocoding

Geocoding is the process of assigning geographic coordinates to the location of real world entities such as houses, streets, parcels. The geocoded location can then be used in GIS.

geographic coordinate

A geographic coordinate (also coordinate) is presented as x, y and possibly a z-value which defines a position in a coordinate

system. Examples of coordinated systems are system of latitude and longitude, used on the Earth's surface, and the Cartesian system.

geographic coordinate system

A geographic coordinate system is a coordinate system that enables every location on the Earth to be specified by a set of numbers. The coordinates are often chosen in such way that one of the numbers represents vertical position, and two or three of the numbers represent the horizontal position. A common choice of coordinates is latitude, longitude and elevation.

geographic information

Geographic information (also spatial information, data on place) is any data with direct or indirect reference to a specific location or geographical area on the Earth surface and could be in form of geographic coordinates and/or geographic names.

geographic information system (GIS)

A geographic information system (also geospatial information system) is an information system for the capture, editing, storage, analysis, management, integration, presentation, and visualisation of geographical data (i.e. data linked to a location on the Earth's surface). GIS can be used in different areas such as archaeology, urban and landscape planning, navigation, and cultural tourism.

geographic metadata

Geographic metadata (also spatial metadata) is a type of metadata used for the data describing geographical features. Geographic metadata include the geographic extent, content, quality, condition, and other

characteristics of the geographic data. An example of geographic metadata standards is ISO 19115:2003.[12]

geography markup language (GML)

Geography Markup Language is 'an XML grammar for expressing geographical features'. [13] GML aims to further the interoperable exchange of geographic data. GML is used for two purposes: as a modelling language for geographic systems, and as an open interchange format for geographic transactions on the Internet. Its grammar has two parts: the schema that describes the document; and the instance document that contains the actual data. GML was developed by OpenGIS Consortium; it is also ISO standard 19136. [14]

geo-ontology

Geo-ontology (also geographical ontology) refers to concepts that correspond to things from the physical and social world having a location on the surface of the Earth. Geo-ontology also defines semantic and spatial relations between things (i.e. topology and mereology). [15]

geoparsing

Geoparsing is the process of assigning geographic coordinates to textual words and phrases (e.g. 'ten kilometres east of Rome') or other media (e.g. audio recordings). Geoparsing is capable of handling ambiguous references in unstructured content. Geoparsed features can then be mapped and entered into a GIS. An example is the Europeana Geoparsing Service and Europeana gazetteer service.

global positioning system (GPS)

A global positioning system is a navigational system which uses radio signal from at least three satellites to determine its geographic position on Earth (latitude and longitude). With signal from a fourth satellite receiver it can also determine altitude.

layer

Geographic features are organized in layers (also map layer, GIS layer). One layer consists of geographic data on some thematic topics, e.g. road network, cultural heritage or orthophoto. The layers are registered to a common coordinate system, which facilitate analysis and integration across the various themes. A map is usually a composition of many layers.

INSPIRE (Infrastructure for Spatial Information in Europe)

The INSPIRE Directive aims to create a European Union spatial data infrastructure. This will enable the sharing of environmental spatial information among public sector organisations and better facilitate public access to spatial information across Europe. The INSPIRE directive came into force on 15 May 2007 and will be implemented in various stages, with full implementation required by 2019. [16]

ISO/TC 211 Geographic Information/Geomatics

Standardization in the field of digital geographic information is in the domain of the Technical Committee 211 of the International Organization for Standardization (ISO/TC 211 Geographic information/Geomatics). The Technical Committee 211 is working towards

establishing 'a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the Earth'. [17]

location

Location (also geographic location, spatial location) is a position or site on the surface of the Earth occupied or available for occupancy by a real entity.

location based services

Location based services (LBS) are computer services, which enable the user in the real world to orientate, travel and to find certain place.

named-entity recognition

Named entity recognition (NER) are computer methods that seek the elements in the text such as names of persons, organisations, locations, expressions of times, etc. [18]

open geospatial consortium standards

Open geospatial consortium standards are developed by the Open Geospatial Consortium (OGC). The OGC is a voluntary consensus organization that is leading the development of standards for geospatial content and location based services and also carries out GIS data processing and sharing. They are encouraging the development and implementation of open standards, free and openly available to the market.

orthophoto

An orthophoto is an aerial photo geometrically corrected ('orthorectified') in such way that the scale is uniform and therefore presents an accurate representation of the Earth's surface. [19]

raster data

Raster data is a type of geographic data in a GIS (see also vector data). Geographic space is presented as a matrix of cells. Cell data is arranged in a regular grid pattern. Attribute data is assigned to each unit or cell in the grid. Examples of raster data are digital orthophoto, imagery from satellites, digital elevation model, and digital scanned maps.

topographic map

Topographic maps depict terrain relief by showing ground elevation either by the use of contour lines or spot elevations. They represent the horizontal and vertical positions of the features. As a graphic representation they delineate natural and man-made features of an area in a way that shows their relative positions and elevations.[20]

vector data

Vector data is a type of geographic data in a GIS (see also raster data). A geographic feature is described by a vector – as a list of ordered x, y (and z) coordinates and other attribute data. There are three main types of vector data: points (e.g. centroid of building), lines (e.g. road), and polygons (e.g. town area).

Web coverage service (WCS)

A web coverage service interface standard defines a standard interface and operations that enable interoperable access to coverages [21] – digital geospatial information representing space/time-varying phenomena. [22] The specification was developed by the Open Geospatial Consortium.

Web feature service (WFS)

A web feature service is a standard Internet protocol for retrieving and updating spatial

features. The specification was developed by the Open Geospatial Consortium and adopted as ISO standard 19142. [23]

Web map service (WMS)

A web map service is a standard protocol for serving georeferenced map images over the Internet that are generated by a map server using data from a GIS database. The specification was developed by the Open Geospatial Consortium and adopted as ISO standard ISO 19128. [24]

WGS 84

WGS 84 (also World Geodetic System 1984) consists of a three-dimensional Cartesian coordinate system and an associated ellipsoid, which enables the description of positions as either XYZ Cartesian coordinates or latitude, longitude and ellipsoid height coordinates. WGS 84 (dating from 1984 and last revised in 2004) is the reference coordinate system used by the Global positioning system.

10. Useful links

[1] F.J. Zakrajšek, V. Vodeb, 'Digital cultural content: guidelines for geographic information', Athena project, Roma, 2011.

[2] F.J. Zakrajšek et al., 'Report on Europeana GIS services and archaeology/architecture site data', Deliverable D3.5 Project CARARE: Connecting ARchaeology and ARchitecture in Europeana, 2013.

[3] Google Maps JavaScript API, https://developers.google.com/maps/documentation/javascript/examples/places-autocomplete

[4] Example: http://athenaplus.eculturelab.eu/GISpilotGMap_1_1/index2.html

[5] Downolad link: http://www.eculturemap.eu/AR/eCultureMapAR.apk

[6] https://developer.apple.com/ibeacon/

[7] iBeacon Living Lab: http://amsterdamsmartcity.com/projects/detail/id/104/slug/ibeacon-living-l

[8] http://www.geonames.org/

[9] http://www.getty.edu/research/tools/vocabularies/tgn/index.html

[10] http://www.inspire-geoportal.eu/

[11] https://www.google.com/earth/

[12] http://www.iso.org/iso/catalogue_detail.htm?csnumber=26020

[13] http://www.opengeospatial.org/standards/gml

[14] http://www.iso.org/iso/catalogue_detail.htm?csnumber=32554

[15] http://www.geonames.org/ontology/documentation.html

[16] http://inspire.ec.europa.eu/index.cfm/pageid/48

[17] http://www.opengeospatial.org/ogc/partners/isotc211

[18] https://en.wikipedia.org/wiki/Named-entity_recognition

[19] http://en.wikipedia.org

[20] Steams J. Wood and E. June Wood. A practitioner's guide to GIS terminology. Federal Way: Data West, 2000.

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[22] OGC® WCS 2.0 Interface Standard – Core. See: http://portal.opengeospatial.org/files/?artifact_id=41437

[23] http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=42136

[24] http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=32546

[25] Europeana API, http://www.europeana.eu/portal/api-introduction.html

[26] Microsoft Translator API, http://www.microsoft.com/en-us/translator/translatorapi.aspx

[27] OpenLayers JavaScript library, http://openlayers.org/two/

[28] Google maps API, https://developers.google.com/maps/?hl=en

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