Translating urban history, research and sources, into interactive digital libraries

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General track

Translating urban history, research and sources, into interactive digital libraries

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Abstract

Many results of historical studies regarding Cultural Heritage assets are still recorded and stored into traditional books and reports. They quote essential documents, iconography and archival sources. The efforts done in the last years by digitizing libraries and archives contents represent just a first step towards a digital communication of historical research results. The challenge is in looking for a new digital access to outcomes linking also to the related sources.
The use of GIS technology and 3D modelling allow a new way to share historical information among the specialists who need to access those information to document, preserve and manage Cultural Heritage assets.
In particular basic historical information about urban centres can be archived and transmitted by using shape files, 3D models by using the most advanced *3Dpdf* format and complex historical research results connected and presented by using hyper texts which can be easily published as websites.
All these platforms produce critical readings linked to digital libraries where the users are able to access the data but also to integrate those data in digital platform.

Keywords

Digital History, GIS, 3D modeling, cities, urban spaces, digital libraries

1 Introduction

The definition of digital library is evolving from the old meaning of electronic or virtual library as a set of digitized documents and collections.
Today this simple concept can be extended by considering that digital libraries are not single entities, therefore they require high technological solutions to link the resources of many but preserving the transparency of these links to final users.
More advanced definitions are directed to guarantee a universal access to digital libraries as information services and to overpass the concept that digital libraries have to be realized as surrogates of paper documents: they have to be extended to digital artefacts that cannot be represented or distributed in printed formats (Stern, 2014).
By following the modern trends of digitization of all the information in order to open towards a better interoperability of the data among different specialists also the data concerning the documentation of Cultural Heritage assets have to fit this topic.
While the results of metric survey are today completely developed, stored and documented (by means of metadata information) in a digital way, up to now

the results of historical research related to the comprehension of the importance, from a cultural point of view, of an asset (both tangible and intangible one), its documentation and the interpretation of the related sources, have been stored and transmitted by using the same media that has been used for the last centuries since the invention of the printing such as printed books, reports, etc.
In the last decades a lot of efforts have been devoted to a wide digitization of archives and libraries but this action cannot be interpreted as a ~~real~~ full digitization of written text and documents.
The realized digitization just prevent the losses and damages of the original documents but do not allow a real digital “translation” of the contents.
By considering the built environment as a space where a large part of the cultural assets are, the historical research on architecture and on cities is very important in order to share new developments in the documentation and advance in the understanding. This kind of historical approach is quite peculiar because the time is strictly linkable to the space. In the making history of architecture almost all the information used to understand and describe a specific asset can be easily referred to a geographic reference system and therefore the use of digital and interactive thematic maps can be one of the most intriguing way to share this kind of information: this is the case, for example, of huge cataloguing works performed in the past about architect’s ideas and designs. Another important aspect of history researches is the study of the development of urban centres by considering the relationships between historical events and effective architectural and urban transformations.
A more complex kind of historical studies refer to historical reconstruction of a life cycle of a specific building or asset by using original documents and original analysis performed by a specialist. In this case hypertext (e.g. website) can represent an alternative way to allow the access both to the conceptual processing of the data and the original data themselves.

2 Effective digital conversion of historical data

Every book concerning a particular argument of the history of architecture contains many information that can be extracted and used for different aims or just to explore a specific aspect of the treated argument.
All those data can be grouped in the following main categories:

- Geodata: data which can be located in a specific cartographic reference system (both historical and modern ones);
- Historical sources: digitized documents and iconographies usually stored in public libraries and/or Archives and museums;
- 3D models: virtual 3D reconstruction of existing or not existing architectures.

For each of these categories specific solutions can be adopted by preserving the principle of interoperability and reuse of data strongly underlined and promoted by all the scientific communities and finally stated at European level by INSPIRE directive (also adopted by a lot of extra European Countries).

2.1 Historical geodata

By considering urban history, a huge amount of data used by historians (especially architectural historians) to support their studies can be located in a specific point of the Earth’s surface or in a specific point of a local system (e.g.

when referring to a single building).
Some of them find a correct location on historical maps with different accuracy properties than modern digital map but in any case they can be located by using the traditional vector elements used in a traditional GIS layer (point, line or polygon).
Often historical maps can linked to modern reference and coordinate systems (e.g. UTM/WGS84) or by using rigorous transformations (when all the geodetic data concerning the historical map are known like in case of maps dating from XIX century) or by means of local transformations when some of the points of the historical maps can be easily identified in a modern map or on the ground. In this last case GNSS techniques allow to define modern coordinates of the homologous points and then estimate the transformation parameters.
Each of these possible solutions has to be discolsed in such a way that all ~~the~~ users can judge in an indipendent objective way the quality of the adopted geo-referencing strategy.
In the aim of a rigorous translation the authors have to declare the basic information: use of official data released by official cartographic bodies, use of specific software or the values of the parameters used and the transformation (e.g. Molodensky model, etc.).
In case of local transformation a report about the points used and the coordinates of those points in both the coordinate systems and the residuals on the used points is required.

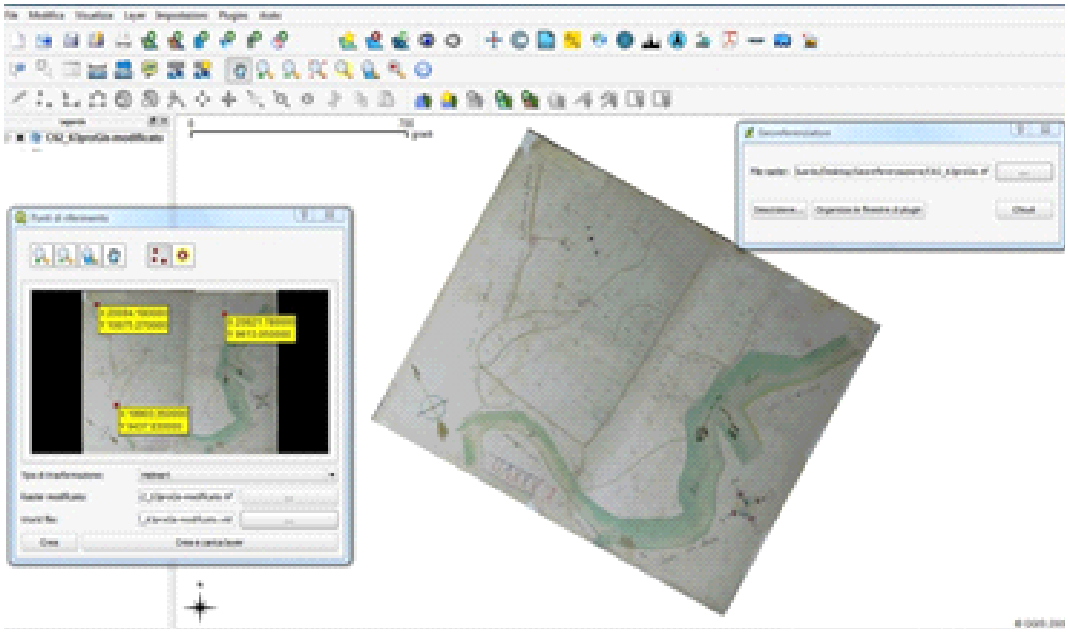

Figure 1 – Georeferencing of an historical map

Once the reference and coordinate systems have been defined for a specific map it is possible to insert the non-cartographic information by using one of the possible vector elements.
Obviously the vector element to be used depends on the scale of the map and on the detail of the data to be inserted. In case of traditional and historical maps those elements (points, lines or polygons) must be generated by means of a digitizing process which requires a correct interpretation of the historical

map.
The selected data are than stored as attributes and all the information saved in *shapefile* format in order to be accessible independently from the used software.
To be really accessible all the contents of the recorded data a complete and exhaustive information about the distributed data has to be annexed.
The organized historical information is the division among a traditional digitisation of documents and a digital library. The survey provides data to be processed, the historical approach provides the interpretation ranking data in layers.
The main information to be provided are:

- Metric contents:
  - datum and coordinate system (if known);
  - residuals on referencing points (in case of use of local transformations);
  - nominal scale.

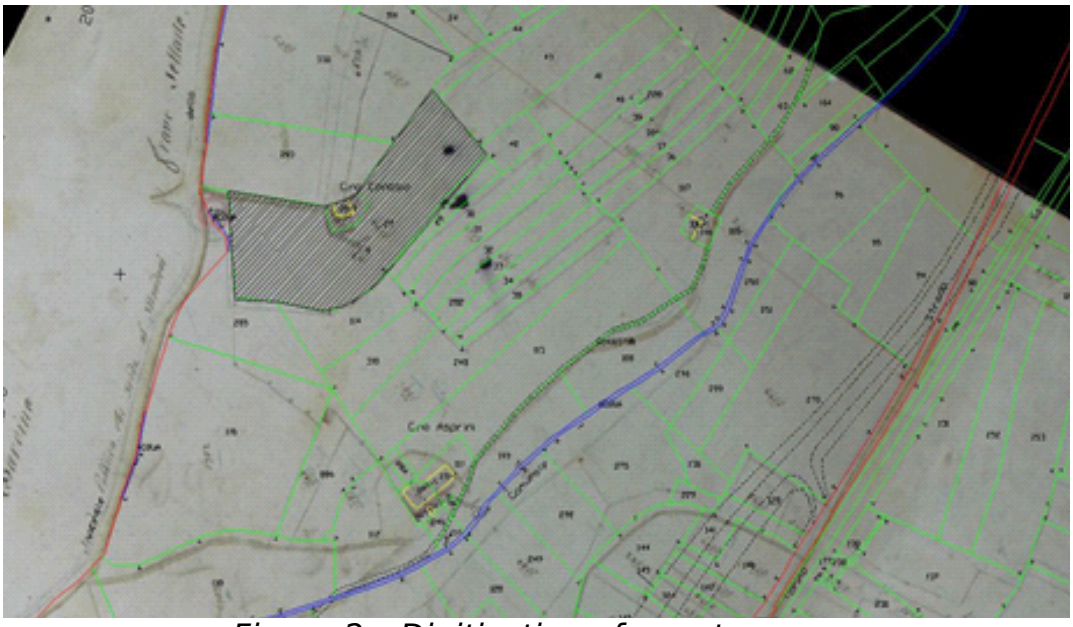

Figure 2 – Digitization of a raster map

- Attributes:
  - clear definition of the content
  - type (number, string, etc.)
  - glossary (in case of strings a clear definition of each term has to be given)

2.2 Historical sources

All historical researches are based on original documents usually stored inside Libraries and/or Archives or Museums.
In a traditional book they are usually cited in terms of footnotes and is up to the reader to check, in case of interest, the original documents which justify the historical reconstruction of an event.
In case of a digital “translation” of a book, the challenge is to produce a new access to the outcomes and to the sources. Translating research in a digital environment is quite different than produce a digitisation of a book or a report.

The full use of the digital implication boosts to change our mentality in communicating the research as an open data. By considering the outcomes as a step of the knowledge to share, the digital tool asked to be conceived as useful to check the evidence of the results by accessing sources also able to accept integration and new implementations. it is possible to conceive a direct link to the original documents by considering the two possible cases.
If the cited document is present in a digital archives directly accessible from the network a simple link allow the user to access the original information; if the document is not yet digitized or not accessible through the network a digital copy of it can be published by using mainly the *pdf* format easily visible from every kind of digital platform.
In this case the metadata have to be defined by the hosting digital library or Archive. Only in the case of new digitization some basic information have to be connected to the digitized document (e.g. author, resolution, copyright, etc.).

2.3 3D models

A lot of books on history of architecture use 3D representations (e.g. axonometric or perspective views) to show particular details of interest to demonstrate in a graphic way ideas, interpretations and designs.
A simple scan of these drawings cannot be considered a real digitization of them.
The ideal solution can be the realization of complete 3D models by using one of the useful packages (e.g. AUTOCAD, Revit, Rhinoceros, etc.) and to record them in *3Dpdf* format in order to ease the users to see the different logical layers of the 3D models, to rotate them and to extract the 3D metric information usually lost in every sort of 2D reproduction of specific views of the realized 3D model.
This is the most expensive digitization process of historical data and must be performed in such a way that the 3D model can really transmit the contents useful to understand what the author need to show to support his ideas.
The use of layer structure have to be studied carefully in order to allow the user to see the object in all the aspects required by the aims of the book to be digitized.
For those digital documents some information have to be delivered to easy the user to understand and properly manage the data.
Each layer have to be defined in terms of contents and in terms of origin (drawings, surveys, interpretation) and accuracy of the data by considering that each layer have to contain only single origin and single accuracy data.
These tools allow a visual translation of all data collected, by creating digital archives and especially by representing synthetic information.

3 A practical example: Alessandro Antonelli’s designs

In the following an example about a possible translation of a book of history of architecture is explained.
The considered book (Rosso, 1989) is a catalogue about the designs of Alessandro Antonelli, one of the well-known Italian architects of the XIX century: he designed the Mole Antonelliana the symbol of the city of Turin.

Figure 3 – The "Alessandro Antonelli 1798 – 1888" book cover and a sample of the catalog of the Antonelli's design

From this book the complete list of the Antonelli's designs was extracted and located on a digital maps by considering different scales and therefore different set of attributes for national list, regional list and municipality list of the analysed designs.
As an example the following figure shows the list of the Antonelli's designs at different scales. For each Italian region only the number of designs were recorded (due to the considered scale 1:1000000) while for the municipality of Turin (due to the considered scale 1:1000) more detailed information was extracted: e.g. year of the design, name of the object, property (religious, private, public), realization (yes or not), presence.
The *shp* files can be downloaded and opened by using a GIS platform (e.g. QGis). At municipality level hyperlinks allow to access, for each design, the original drawings, the 3D models realized by using Revit software and published as *3D pdf* format and in some cases also some video showing the Antonelli's designs in the existing urban context (both at the time of the design and at present times).
The books could contain several reproduction of drawings but the most of the data about drawings and documents were just noted in records and footnotes. Sources were preserved in different archives, such as the municipal archives, archives private or public related to the patronage, archive in the library of the school Academia Albertina collection of the Galleroa d'arte Moderna where the personal archive of the architect is kipped.

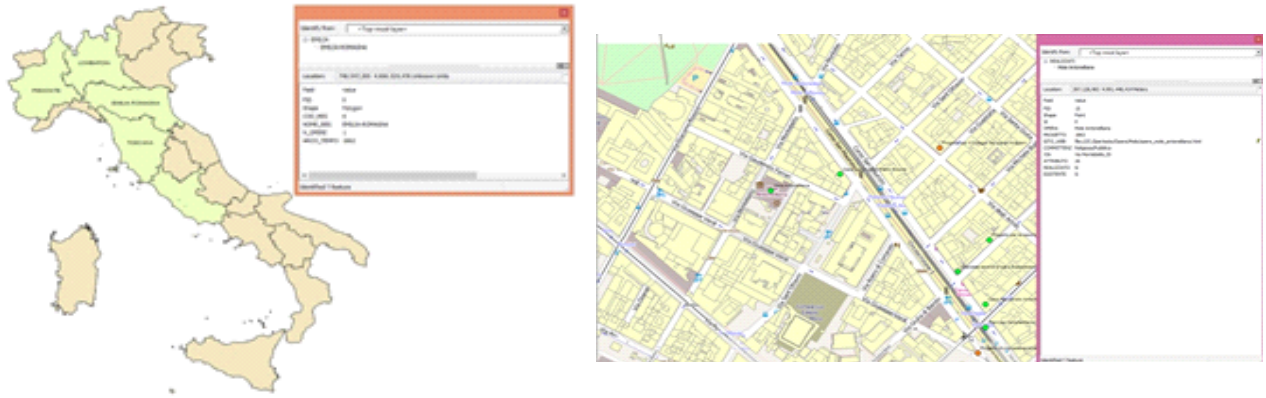

Figure 4 – Italian regions were Alessandro Antonelli conceive his designs (left), location of the Antonelli's designs at city scale (right). Beside the thematic maps generated by using a GIS platform the list of the attributes of the selected object

All the files could be stored as single elements inside a digital library by using indexes and all the metadata needed to help the search but a possible alternative solution is the use of an intermediate media such as an hypertext or a website able to drive the user through a correct use and comprehension of the produced documents.

Figure 5 – Original design drawings and resulting 3D model on 3Dpdf file.

This hypertext can contains texts and comments, active buttons to allow the direct downloading of the *shapefiles*, *3Dpdf*, scans of the used original documents, video and related ancillary information.

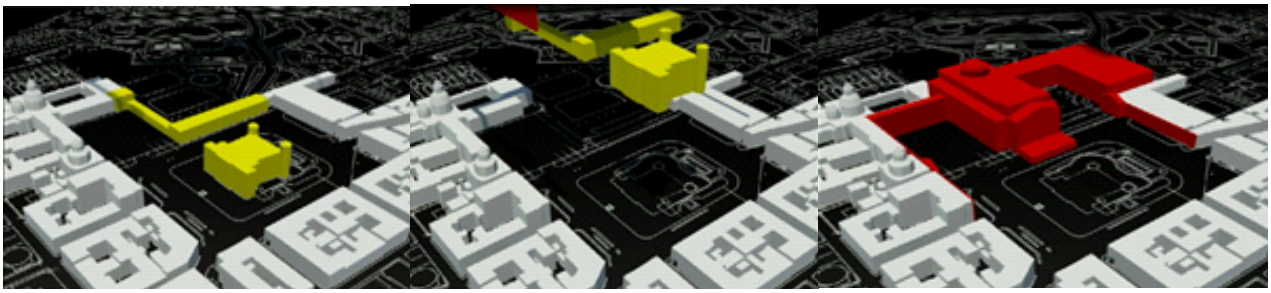

Figure 6 – Frames of a video showing the modification of the Piazza Castello in Turin due to a not realized design of Alessandro Antonelli

4 Conclusions

The data used for historical researches on the history of cities can be used in different situations and for different aims.
The development of the concept of digital libraries allows to share those data organised by the historical research and visualised in digital form by preserving the quality of the data themselves and by ensuring a real complete access to them.
The efforts to be done to reach this goal are not negligible, therefore historians have to start to collect and manage the basic data and their subsequent elaborations in digital form.

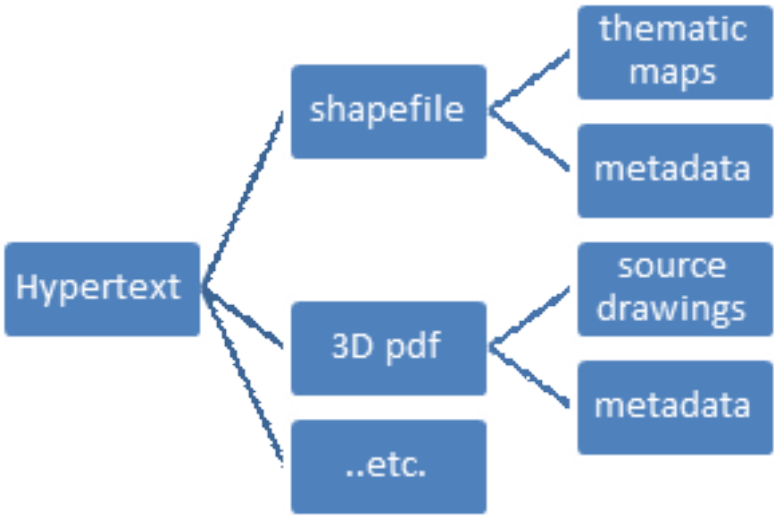

Figure 7 – Hierarchical structure of the documents which translate the content of a traditional book

The use of digital technologies is not only a way to communicate the results of an historical research but, especially during the research, the construction of databases organizing information affords a more complex management of a lot of data that can be enquired crossing many different sources. This digital approach to the research by historians allow a better understanding of the primary data and open new possibilities of interpretation.
This last goal is strongly supported by the development of the Digital History, a branch of the Digital Humanities defined from 1970 as the use of digital media and computational analytic for furthering historical practice, presentation,

analysis, or research.

References

Borgman, C. L. (2015). Big Data, Little Data, Open Data, and Libraries.

Fay, E., & Nyhan, J. (2015). Webbs on the web: libraries, digital humanities and collaboration. *Library Review*, *64*(1/2).

Meyer, H., Bruder, I., Finger, A., & Heuer, A. (2015, January). Building digital archives: Design decisions: A best practice example. In *Emerging Trends and Technologies in Libraries and Information Services (ETTLIS), 2015 4th International Symposium on* (pp. 59-64). IEEE.

Rosso F. (1989). *Alessandro Antonelli 1798-1888.* Electa

Singh, T., & Sharma, A. (2015, January). Research work and changing dimensions of digital library: A review. In *Emerging Trends and Technologies in Libraries and Information Services (ETTLIS), 2015 4th International Symposium on* (pp. 39-42). IEEE.

Stern, D. (2014). *Digital libraries: philosophies, technical design considerations, and example scenarios*. Routledge.

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