Visualising Ancient Maps as Cultural Heritage: A Relational Database of the Spanish Ancient Cartography

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Abstract

The analysis of the historical evolution of the territories and landscapes has been seldom based upon the study of old cartographic documents; they have been always set in a second place after texts and writings. Trying to bridge this gap, we have designed and implemented a relational database of the ancient maps and charts that are already preserved in the main spanish collections, archives and libraries, that includes the possibility to access to a a high resolution digital image of each one of them. The personalized queries to the database will allow the scholars and searchers to visualise the document together with its main features.

1. Introduction

Ancient cartography, as well as old pictures, drawings and photographs, has not been used traditionally as a reliable source of information about the history and the evolution of the land- and the townscape. Those graphic materials have been usually considered as 'second order' documents, mainly because of the difficulties that their interpretation can sometimes involve [1] due to the different conventions that are applied in each case by the cartographer.

But this is not the only reason why cartography is so seldom used in the historical searches, because there are other problems related to the difficulties of their localisation and visualisation that have to be considered.

Obviously, it is not easy to access to an original big size and small-scale map that is sometimes composed by several printed sheets; and it is also difficult to see properly the symbols employed in the map and read its texts when it is imposed to handle a reduced hardcopy or a low resolution digital image.

Although we find it is not essential to have an exhaustive knowledge of the context of each map to get a meaningful interpretation of it [2] [3], it is necessary to achieve some basic specific concepts on the theory of the cartographic expression and design (about map projections, symbols or representation of relief, for instance), because the lack of them can difficult the right interpretation of the document and distort the results of the investigations [4].

Although the spanish cultural offices are making a strong effort to digitalise the public collections of historical documents, the problems posed by the different locations, techniques, sizes and preservation conditions, are delaying the prompt achievement of their diffusion.

And we have to mention another problem that is associated to the difficulties of finding those maps, because they are frequently included into other documents or inside bundles of old papers, and remain yet undiscovered.

Assuming all those circumstances, the former stages of our search have focused on finding, studying and cataloguing all kind of cartographic documents that are preserved in the main spanish collections, archives and libraries, as the Archivo General de Simancas (AGS, Valladolid), Archivo Histórico Nacional (AHN, Madrid), Archivo de la Real Chancillería de Valladolid (AChV), Biblioteca Nacional de España (BNE, Madrid), Archivo del Palacio Real (PR, Madrid), Instituto Geográfico Nacional (IGN, Madrid), the Centro Geográfico del Ejército (CGE, Madrid), Biblioteca del Monasterio de El Escorial (BMEsc, San Lorenzo de El Escorial, Madrid), Biblioteca de Estudios de la Universidad de Salamanca (BEUS), Museo Marítimo del Cantábrico (MMC, Santander), or the Archivo General Militar (AGM, Madrid), among others.

Finally, the principal aim of this project is to diffuse the old cartographic treasures that compose a relevant part of the spanish cultural heritage, that

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actually remains unknown to the public and even to a great number of specialists.

2. A database of antique cartography

The study and diffusion of the cultural heritage in its various forms (that are extended to the architectural, urban and territorial scales) applying the most innovative technologies such as GIS and databases, is the main target of our team of searchers in the School of Architecture and Geodesy of the University of Alcalá (Spain) [5]. Of course, the ancient cartographical documents compose an important set of this cultural heritage whose knowledge becomes increasingly demanded and useful.

The definition of cartographic document that we have managed is the one formulated by Harley and Woodward [6], that includes every graphic representation that facilitates a spatial understanding of things, concepts, conditions, processes or events in the human world. This definition allows to incorporate to the study the topographical views as well as the topological schemes or sketches, with no restrictions due to techniques, functions or origins [7].

We decided firstly to limit our search in the temporal field and to catalogue all those maps, as well manuscript as printed, that have been drawn before 1900, because during the 20th century the cartographic production has very much increased in many senses and its study must be afforded separately.

Another spatial restriction has had to be imposed to the search, this time related to its spatial field: we decided that the maps must concern the actual spanish territories [8].

After the above mentioned first stages of the search, that consisted on an exhaustive investigation which aims of detecting every map, we have designed the different datafiles of the relational database.

The relational database has been designed as an open one to allow including new registers in the future and even adding new fields or tables, to update the contents to the new needs without damaging the existing ones.

Moreover the concept 'relational' implies the possibility of crossing the data of the different tables and reducing their weights, making easier the data management and the queries [9] [10].

Our methodology includes three main tables, that are the following:

- 'Cartography', that contents all the registers concerning the cartographic documents.

- 'Bibliography', that includes the complete bibliographical references that appear in the field *Bibliography* of the table 'Cartography'.
- 'Libraries, Archives and Museums', is the table that includes the complete references of the collections that have been visited, and that appear just as an acronym in the field *Collection and Signature* of the table 'Cartography'.

The three tables have been designed sharing at least one field that allows crossing the datafiles and economizes data length in the databases [Figure 1].
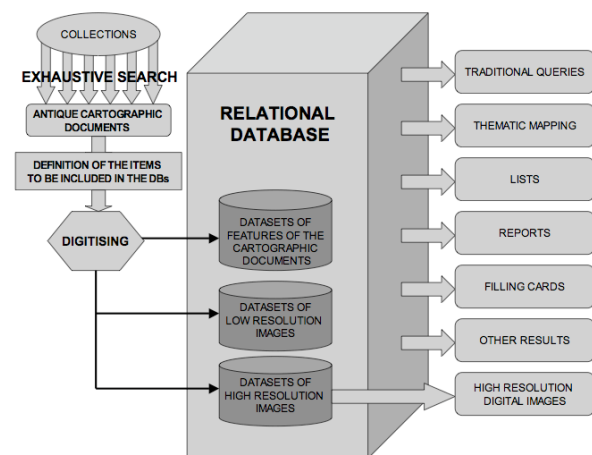

Figure 1. Scheme of the project's databases.

The whole work can be consulted by the searchers in the CEHOPU Library, Madrid.

2.1 The design of the table 'Cartography'

During the definition of the different fields that this table contains we have followed the ISBD norms of cataloguing, and are the following:

Place or Subject (text field): Refers to the geographical place that is represented in the document and the province it belonged to, since the reform of 1831. To define clearly the territorial limits, the old councils or boundaries are also included. And to determine the original uses of the map, it is also specified if it is a general, thematic (geological, military, statistic, cadastral, etc.) or a topographical map or plan.

Date (numerical field): as precisely as the document can be dated. If it is only an approximated date, it is quoted among square brackets.

Kind of Cartographic Document (text field): it defines if it is a map or plan, a chart, a portolan or a view, or even a terrestrial globe.

Size (text): width and high of the image in mm; it is also included the total size of the sheet(s) (or other supporting materials) and the number of pieces or sheets that compose the ensemble of the document.

Collection and Signature (text): the collection that preserves the document and the signature; the first one is quoted through an acronym and the second one is abbreviated according to the norms (its total extension can be consulted in the table 'Libraries, Archives and Museums').

Original Title (text): quoted among inverted commas if it is literal, as it is written in the document; otherwise it is defined among square brackets through its main features.

Author(s) (text): names of the author(s) if the map is signed; in case of ascription, the name(s) appear among square brackets; they can be also 'unknown'.

Scale (text): it is defined graphically or as a fraction, detailing the different units employed; when there is no definition scale, appears 'without scale'.

Projection (text): details the projection employed with its different elements: grid, references, orientation; it is also referenced the use of different projections, for instance profile or section added, axonometrics or perspective views, with their own distinctive elements, and even the case of large scale plans.

Technique (text): makes a distinction between manuscripts and printed maps, as well as the drawing surfaces and techniques, specifying the uses of colour.

Short History (of the map, text): place of edition, editor, or if it is a part of a big compilation or atlas. It is also mentioned where it comes from or the precedent owners, and the date of purchasing.

Bibliography (of the map, text): abbreviated and following the international system for scientific quotations ISO 690-1987.

Image (object/container field): it is included a low resolution image in highly compressed jpg format of the cartographic document. By clicking twice over the image, it is possible to display a high resolution one in a tiff format that allows to see the details and to read the texts. If the map is composed by several sheets, the image shown is the composed one, and it is possible to click over each one of them to get an enlargement [Figure 2].
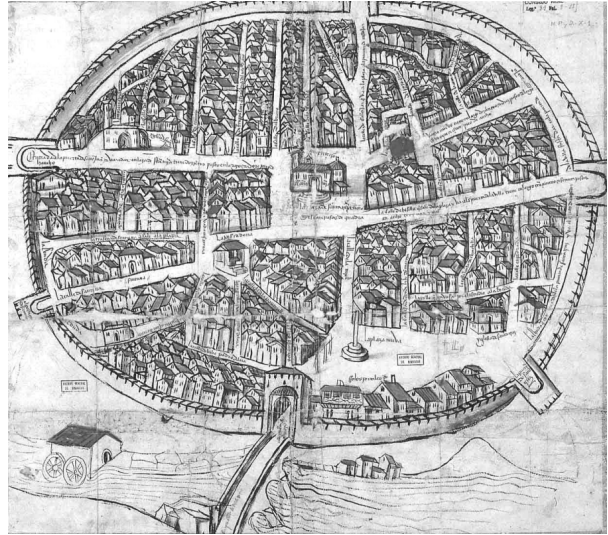

Figure 2. Anonymous, *Plan of Aranda de Duero*, 1504. Archivo General de Simancas, Mss. Valladolid (Spain).

Other Remarks (text): in the case of a printed map, includes other collections that have a copy, or variations of the plate, as well as manuscript notes, etc.

Date (of the catalogue, autom.).

2.2 The design of the table 'Bibliography'

This table defines completely the abbreviations and acronyms used in the other tables. The quotations follow the ISO 690-1987 Norm.

The fields are in this case:

Author(s) (text).
Date (of edition, numerical).
Title (of the book, text).
Article's Title (text).
Periodical or Book (in case of articles or book chapters, text).
Publisher (text).
Place (text).
Volume (numerical).
Pages (text).
Quotation (text): as it appears in the other tables.

2.3 The design of the table 'Libraries, Archives and Museums'

This table makes possible to identify the acronyms used in the *Collection and Signature* field. It contains the following fields that complete the location of the documents:

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Abbreviation (text).
Collection (text).

3. Conclusions

Ancient cartography can no longer be considered a secondary source of information [11].

The possibilities that ancient cartography bring to the study of the history of the territory and the landscape are very useful because maps are an important data-source because they give us an image of them at a specific moment [12].

When the aim is to analyse the evolution of those territories, it becomes essential to get a map series that allows to reconstruct the spatial sequences and patterns that have characterised the successive moments in the history [Figure 3].
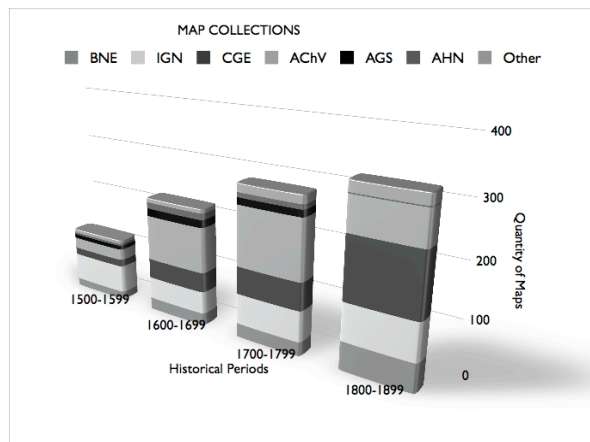
Figure 3. Main map collections and ancient cartography in the different historical periods.

Other possibilities are the usual informs, lists and queries to the databases, that can be made in several ways:
- Selecting fields, for instance *Date* and *Collection and Signature* in the table 'Cartography', and then entering '1750' and 'BNE' (Biblioteca Nacional de España).
- Ordering registers, in one or more fields: for instance *Date* and *Place or Subject*: '1850', 'León' and 'Tordesillas'.
- Making simple or combined searches in several fields at the same time: in this case it is also possible to select all the registers or limit the search to a group of them by entering a chain of search. For instance: *Date* and *Collection and Signature* and *Projection*: '1605' and 'BNE' and 'SGE' and 'Mercator' and 'Bonne'.

Searches can be as wide or restrictive as are the criteria applied in each case. The logical boolean expressions as 'and', 'or', 'xor', 'included', etc. are commonly used to formulate the queries.

Finally, we have designed a complete filling card that can be consulted through the database, that joins the essential features of each cartographical document [Figure 4].

Figure 4. The design of the filling card.

The results have been designed with the aim of getting the best perception and display of the data sets, according to the visualization techniques exposed by Ware [13], Spence [14]and Tufte [15], among others.

This search will improve the knowledge and the access to the different and scattered ancient cartographic documents of Spain. Other teams of searchers will be able to consult this database, that will be helpful and useful in future investigations on the history of the town, the territory and the landscape [Figure 5].

The exhaustive compilation that contains the cartographic database will allow a better knowledge of the changes that land has experienced in the different historical periods, and this will be also useful information to the historians and urban planners.
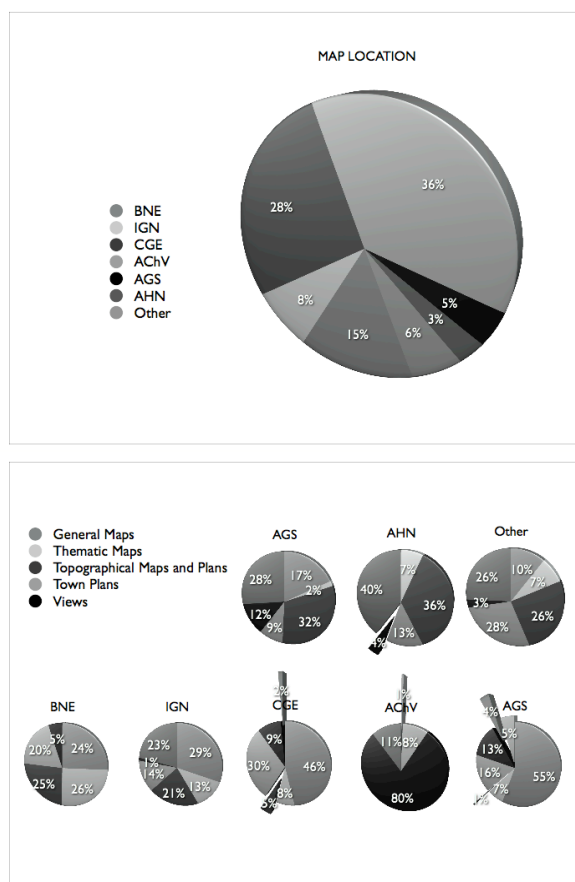
Figure 5. The main Spanish Libraries and Archives that locate the ancient maps of Castilla, from 1500 to 1899.

The inner potentials of the different kind of documents that have been studied are clearly exposed in the variety of the contents and the reliability of the databases, whose richness and relevance is unquestionable.

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5. Aknowledgements