Digital reprocessing of historical cartography through historiographic analysis of sites

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Abstract
There can be many places of excellence in an urban space, vital places in the city, such as squares. Telling their story also means defining a possible narrative of a site that, since ancient times, has represented the crossroads of functions, events, and human flows: a moment in the city’s history, the fulcrum and soul of the cultural identity of an urban layout. But it is also the site where significant architecture is concentrated, both sacred and civil, churches or palaces, which emblematically with their evolution constitute a tangible sign of historical stratification.
Starting from a historiographical and documentary study, the present work aims at accurately redrawing historical cartography based on contemporary maps to provide useful tools for the physical, political, and thematic analysis of the investigated areas. The methodology developed is based on the identification of those architectural and urban elements that have not undergone substantial changes over the centuries, presenting themselves as ideal references for redesign operations.

Key words
Computer aided design; chronological evolution of places; Burgos cathedral; Piazza del Mercato in Naples.
1. Introduction

Contemporary cities present themselves as a superimposition of layers of archaeological, architectural, and urban nature that have interacted over time, sometimes as antagonists, and that together constitute a often-contradictory urban palimpsest. The study of their origins has long been widespread in literature. The romantic vision that has valued the past since the 18th century, together with the evocative capacity of ancient layers, have made historic centres the seed of scientific research that transcends mere academic investigation (Rodríguez, 1979, Gombrich, 1987).

On the other hand, the complexity of today’s city can be understood from the different meanings that have shaped it in the past and will continue to do so in the future. Prominent among these is the idea of heritage. However, the extension of this concept to the city, and its understanding as a set of values, modes, and systems worth preserving and enhancing, is a phenomenon that has spread across Europe in fairly recent times.

The study of the urban dynamics of historic centres is widespread among the various European universities, which approach it from a variety of perspectives. It is a very consolidated line of investigation at present, especially in the disciplinary fields concerned with urban and architectural representation (Lefort and Solís, 2002). There are numerous eminent examples such as the book Valladolid Forma Urbis (Carazo, 2010), a reference for studies on the transformation of the urban fabric.

The value of drawing as a means of analysing the traces left behind over time is the original contribution of this study, which is aimed at the rigorous redrawing of maps and the organic representation of the evolutionary processes of the urban fabric. This becomes a primary goal because although there have been many, very brilliant studies on various European cities, the graphic contribution in this sense has been testimonial and merely synthetic. With this, we intend to interweave a narrative on the form of the city with a graphic atlas, which facilitates and allows a joint reading, to understand the path of urban formation and transformation.

2. Case study

Two cities were selected as a benchmark for the proposed methodology. The first is Burgos, in Spain, with its twelve centuries of history behind it, whose importance is considered capital in the formation of the country and which, despite the numerous studies on its origin and growth, has never been examined with a purely graphic approach.

In detail, we have focused on the area around the cathedral. This place has been the centre of the noble, ecclesiastical, and commercial power of a city that, abandoning the defensive slopes of the castle hill, organised itself on the banks of the river Arlanzón. This urban space suffered, as in many European cities, from the unique cult of the monument and the geometric perfection of 19th century cartographic traces, distorting a space that had been strongly formalised for centuries. From the 19th century onwards, a series of systematic demolitions took place around the church of Santa María with the sole aim of clearing the view and transforming the streets and squares that would be built around it.

The second case study concerned Piazza Mercato in Naples, southern Italy, located near the port, close to a part of the city that has always been characterised by its history and tradition of industriousness and social interaction. Founded in the Angevin period, the square was the stage for numerous stories, so much so that it has been widely represented in historical iconography and extraordinarily reflected in chronicles and literature since the first half of the 16th century. Over time, a construction pattern was defined around the square, determining a new part of the city: transformations and readjustments of the area were undertaken several times, with the construction of architecture or the replacement of building fragments to adapt services to the area.

3. Methods

The proposed methodology focuses on the redrawing of historical cartographies in 2D CAD format for the areas and phases investigated, identifying the urban, architectural and archaeological landmarks that have remained unchanged - or almost unchanged - over time with the aim of relating each temporal layer of this palimpsest and qualifying the evolution - or involution - undergone at each temporal leap.

Figure 2. F. Coello, map extract representing the surroundings of Burgos Cathedral in 1868.
The work is based on the processing of a large amount of heterogeneous information, catalogued and subjected to a rigorous control of the sources. In fact, all the iconographic documents that could provide data and information on the consistency of the places were collected, such as topographical maps, cadastral maps, drawings on an urban or architectural scale, period photographs and, more generally, views or other documentary images, not geo-referenced, but equally rich in information.

The aim of these operations was to reconstruct a dense network of connections between the main urban events that have contributed to shaping space. More specifically, we started from the current maps on which, by selecting some 'stable' elements from a chronological and documentary point of view, we carried out a retrospective study.

In order to create the basic cartography, only the layers useful for the definition of the urban space were selected, such as the level of streets and volume units. Going back in time, superimposing the current cartography on the historically previous one, and doing so for each historical phase, digital maps corresponding to precise moments were created. Every change between a map and the previous one, corresponding to a change in the urban space or in the built-up area, was recorded and redrawn with the necessary caution in the interpretation of the data coming from the sources (Ferrighi, 2015).

For obvious reasons in the case studies the whole process was limited both spatially and temporally. For the first aspect, factors such as historical relevance and the actual availability of cartographic documents were considered, circumscribing square regions - varying according to the case - containing sufficient stable references. For the second one, those periods affected by profound transformations were selected.

### 4. Results

The evolutionary analysis of the urban fabric around the Burgos cathedral made it possible to identify four significant moments for each of which it was possible to find exhaustive cartographic documentation:

- **1812**, represented by the *Plan du Chateau de Burgos, relatif a la defense faite par les francais* by A. Barriere.
- **1868**, represented by Francisco Coello’s Plan of Burgos from the Madoz Dictionary (Portela et al., 2016) (Fig. 2).
- **1894**, referring to the Plan of Burgos by Mariano Martin Campos and Eduardo Lostau.
- **1944**, with José Paz Maroto’s General Urban Development Plan.

The reconstruction of the historical maps in digital format was then completed with complementary cartographies such as urban and cadastral plans, work files as well as other graphic or written documentation preserved in the different archives consulted.

A similar approach was employed for *Piazza Mercato* in Naples, identifying the cornerstones of the evolutionary process supported by historical documents:

- **1750-1775**, when the square still retains substantially unchanged its original configuration, dating back to medieval times. It is a large shapeless space of spontaneous nature, strongly linked to its commercial function given the proximity to the port and the ancient *Marinella* waterfront (Carafa et al., 1775, Alisio, 1993) (Fig. 3).
- **1781**, year in which Francesco Sicuro, commissioned by Ferdinand IV of Bourbon, redefines the urban space from the eighteenth-century characters, with quadrangular shape and exedra on the northern side. This intervention follows a devastating fire that destroys the pre-existing wooden huts, built over five centuries in derogation of the rules in force (Rossi, 2017) (Fig. 4).
- **1887-1889**, period characterized by the partial demolition of the buildings in the surroundings for the widening of the road axes during the Reclamation, without substantial modifications of the urban space. The reference cartography includes the plans in scale 1:200 realized by the municipal technicians (Alisio, 1980).
5. Conclusions

Drawing has always been the main tool for the analysis and documentation of urban fabrics.

This paper proposes a methodology for redrawing, in digital format, historical urban maps starting from contemporary cartography and in-depth historiographic research. The main challenges of these operations are the rigorous verification of sources and the identification of partially and temporally stable references for the correct geolocation of historical documents. Future applications will involve the conversion of the produced two-dimensional drawings into 3D objects for implementation in BIM and GIS systems.

References


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