Chapter 15
Cities over Space and Time:
Historical GIS for Urban History

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ABSTRACT
This chapter will focus on the study of urban history, increasingly dependent on new communication and representation techniques, such as GIS, which makes it possible to represent change over space and time. This is a critical step forward in urban history, allowing for further developments in research. Scholars can compare historical maps and sequential phases of transformation and adaptation through relational databases of both spatial and non-spatial data, which can then be visualized in thematic maps. Every aspect of a city’s buildings, roads, and rivers can therefore be rendered in 3D and localized with extreme precision. By adding chronological data to engage with the issue of change over time, historical GIS allows scholars to trace and visualize a city’s development as a process stimulated by social and economic events, showing the dynamics of spatial objects that cannot be represented by other means.

INTRODUCTION
In the digital age historians of architecture and the city are discovering that new methods of study and new communication systems are making it possible to conduct research in new ways and to make the results of their research accessible to a much broader audience. Today’s technologies offer new tools for investigating, interpreting, synthesizing, and communicating research. Among those currently available, the ones best suited to the study of urban phenomena are GIS for spatial-temporal analyses, 3D graphics for modeling, and multimedia tools for disseminating results. The methodology proposed in this paper is the result of several studies conducted under the umbrella of a research project called Visualizing Venice (VV)1 and through a training program financed by annual fellowships during a few years of the research (Ferrighi, 2012).2 VV’s research has been structured around two criteria: site selection (the choice of case studies) and the application of a method of analysis to these portions of the city or region. Two databases were developed to handle alphanumeric and geographic data simultaneously. The alphanumeric data, derived from historic documents, was managed by structuring a database for collecting, digitizing, and storing.
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data; the geographic data was processed on a GIS to analyze changes over space and time working backwards from present-day geographic data. These databases interrelate creating an added value that is intrinsic to digital tools. They can be queried, and the queries make it possible to extract and reorganize data and, most importantly, to link it to geographic data. This process can also be reversed. Starting from geographic data, it is possible to discover how many documents have been digitized as well as what information they contain about a particular area.

The system that has been created is a Historical GIS, which is to say, a GIS that manages quantitative and qualitative data as well as spatial data, linking space and time together and taking into account geographic elements over time. It was designed in view of the subsequent phase of the research, which focused on the various languages and forms of communication that can be used in making research content broadly accessible. This final phase saw the creation of varied output: 3D digital models at an urban and at an architectural scale; prototype models (made with 3D printers) representing the physical changes that occurred in certain critical moments of the site’s history; videos recounting some of the site-related events (chosen ad hoc) in new narrative forms.

The goals of the research were manifold with respect to both technology and communication. The first goal was to create new investigative and knowledge tools to be used by researchers and historians of architecture and the city, who are increasingly obliged to rely on digital tools to facilitate their research. By visualizing qualitative and quantitative data on a map scholars can formulate new questions: the circular formula question / answer / new question / new answer is created.

The second goal was related to teaching and training, the demands of which are increasingly multidisciplinary and digital. The research sought to meet both these needs by organizing workshops on the use of new technologies, in the hope of training new generations of researchers in the use of new languages for transmitting knowledge in the humanities.

The third but not necessarily last goal was to make research results readily accessible through channels that are innovative for the discipline, such as temporary exhibitions, virtual museums, and websites on the Internet. The aim of reaching a non-specialist audience has always been one of the driving forces behind the research. Finding new languages, replacing words with images – be they still or moving – was perhaps the first motivation behind the scholars who launched this challenge, finding funds to support the research and promoting it through an international network of researchers.

This paper seeks to underscore the need for digital tools in furthering the investigation of urban phenomena and in making the results of this research accessible to a broad-based audience through multimedia supports that can visualize the changes in the city over time.

BACKGROUND

Spatializing the Historical Narrative

Space, and its meaning in history, finds its true place in the massive production of topographic iconography. The graphic rendition of cities or regions developed hand in hand with the advancement of the science and technique of surveying. Knowledge of an area has served numerous political, strategic, and administrative ends, which is why maps have always sought veracity, the exact measurement of places. Historians use maps and views continually, be they urban, chorographic, or geographic, seeking information that only these documents can provide. Maps make it possible to analyze the position and configuration of the objects represented – waterways, buildings (which are often represented by symbols characterizing