

3D MODELLING FROM AN 18TH CENTURY SCENOGRAPHIC MAP OF BOLOGNA (ITALY)

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The study subject is an XVIII century map of Bologna, by Filippo de' Gnudi; it is a copper etching of about 1 m², with a graphic scale around 1:2500. As the author states, it consists in a scenographic view of the city, with an added ichnographic value due to a more accurate representation of the building base perimeters with respect to all previous maps of Bologna. For these reasons, he named his map "*Ichnoscenografia*". For the purpose of the present study, a modern remake of the ancient map, made in 1985 by L. Confortini, was considered. The reasons for such a choice were both assemblage seams (not existent in the modern remake) and preservation state of the original sample today kept in the Archiginnasio Library of Bologna.

The modern remake was useful to carry out some digital elaborations. In particular, the specific kind of map representation was stimulant to a three-dimensional modelling of the city, in order to give the historical perspective map a new graphic view. To achieve the goal, a preliminary analysis of the map was performed. It consisted in georeferencing the map (converted in a digital form by means of high resolution scanning) on the basis of the current 1:2000 numerical map of the Municipality (UTM-ED50 system); the selection of the GCPs (Ground Control Points) which belong to unaltered buildings resulted from an analysis based on descriptive and graphic historical documentation. A total RMS equal to 10 m resulted from a 2nd order polynomial transformation performed by means of 80 GCPs. A subsequent analysis of the metric quality of the drawing was performed, both comparing the resampled map with the reference one (by means of mutual superimposition of the maps in a GIS environment and measurement tests concerning street widths and building heights) and calculating and displaying variations of some characteristic parameters (scale and rotation angle with respect to the cartographic North) inside the map.

The 3D modelling was performed in a part of the city, exploiting planimetric and altimetric information of the ancient map. The base perimeter of each concerned building was delimited and an extrusion was realized, according to the scenographic information of the map; each 3D solid element was texturized by means of image data deriving from the map, only on façades for which image information was available. A final reconstruction, resembling a 3D city model, was assembled and superimposed on today high resolution satellite images available in Google EarthTM, aiming to provide a modern visualization of historical data, which is unusual for an ancient map. The insertion of such historical data into image-based GIS systems, linking them to other kinds of historical and recent information, represents an interesting opportunity of melting data from different sources. In the study, an example is provided: finding inspiration in the particular scenographic view of the ancient map, some 3D solid elements were texturized by means of modern images captured by different bird's eye views (provided by some technologies, e.g. Pictometry®, implemented in the Bing Maps 3DTM environment). The insertion of these elements in the previous created 3D historical model provided a new product, historical and modern at the same time, that can be explored in Web-based systems supporting 3D datasets.

The study gave an example of which modalities are allowed by modern digital instruments to preserve and increase the value of Cartographic Heritage contents: it is made possible to achieve a higher expressivity level of map information, and to make the map a support for the study of city evolution. The study also highlighted the basic role played by 3D virtual environments in scientific communication or divulgation of cartographic issues, also to non-specialists.