Past, present, future. The history becomes 3D

Documenting Palazzo De Gaetani in Genova

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From survey to models

The research here proposed concerns the documentation of cultural heritage through interconnected methodologies focused on architectural survey, historical understanding and restoration to create 2D and 3D models. The aim of the study is to understand at what extent the ‘digital twin’ of the object can be used as a common base for heterogeneous analysis. Furthermore, the paper aims to discuss several approaches in data integration and information extraction.

The neorenaissance Palace: Palazzo De Gaetani

The construction of Palazzo De Gaetani dates back to the early 1900s, built on the initiative of the regents of the Genoese seat since the old bank of the Kingdom of Italy was no longer suitable for hosting the functions of the newly formed Bank of Italy.

The building object of study is thought on the style of Palazzo Koch in Rome, completed a few years earlier, with which it shares two characteristics: firstly it is one of the few buildings that share the name of the architect who designed it, Luigi De Gaetani for Genova and Gaetano Koch for Rome; in the second place both buildings are characterized by stylistic features that can be traced back to the ancient language.

The building is organized by a first register marked by arches with bugnato, finished with corner pilasters. The upper register is marked by aedicule windows with tympanums alternating between the main floor and the second floor, triangular and flat respectively.

In the same way as Renaissance architects Luigi De Gaetani takes benefit from on the classical repertoire, taking the Teatro di Marcello in Rome as a reference model, and overlaps the same architectural orders on the facade of the Bank of Italy building: Doric, Ionic and Corinthian.

Interconnecting the heritage

Data capture phase was conducted on the external elevations of the building. The first key aspect was to design the surveying phase according to time requirements – three full days for data capture – final accuracy of 2D/3D models – namely 1:50 drawings and orthoimages - survey methodologies and procedures to involve. Starting from this, a full 3D laser scanner data capture was combined with image acquisition and topographic survey. The project of survey was designed to allow each methodology improving the global accuracy of the

final model and keep track of both metrical and chromatic features. The laser scanner point cloud was used as a massive reference basis for metric and geometric features; photographic images were used to generate high resolution orthographic projections of elevations by photogrammetric processes, topographic point cloud allowed a bundle adjustment of photogrammetric models by introducing fixed points with relative coordinates as markers.

The integrated survey for the study of history and the restoration of architecture

The data elaboration phase focused on two complementary goals. The first one was to product specialised 2D and 3D models to support heterogeneous analysis related to conservation planning, historical and stylistic analysis, detailed documentation of the current state etc. The second focus of the study concerned the fusion of different models into a unique *information system.* In these terms, a BIM approach was tested on a part of the building to connect 2D and 3D models coming from survey into a unique 3D virtual environment, in this digital space, survey data were used to build up a parametric model. The model takes advantage of metric and proportional information to give the architectural interpretation and the *reading* of the building itself. More than this, the parametric model allows to register each transformation occurred on the façade over the years and to plan several interventions, going from general maintenance to more complex operations. From a theoretic point of view, the 3D parametric model is interpreted as the place where the existing building shows its current state, through survey data and it is connected with its past, through the identification of historical phases and changes, and its future by allowing designing and planning operations.

Since the Renaissance, artists, studious and architects have tried to understand the architecture of the past, through literary sources (Vitruvio) or through the monuments's drawing.
While authors like Fra' Giocondo, Cesariano e Martin-Goujon they took care of drawing up illustrated editions of the "Trattato di Vitruvio" starting from Serlio (with his "Sette libri dell'architettura") a personal interpretation of architecture (or the architectural orders) begins to be the rule.

This paper intends to investigate, through the high-resolution ortho-images metrically accurate, the design genesis employed by Luigi De Gaetani in the design of the Genoese headquarters of the Bank of Italy and the reference models used.
At the same time, we intend to verify, through parametric BIM modeling, how the perception of the architectural space varies with the variation of the reference model for the design of architectural orders (from Serlio to Letarouilly).

This whole process merges together a scientific and objective phase of data capture and data elaboration with a more subjective phase; during this crucial second phase raw data are interpreted to extract information.
The study sheds light on new ways of thinking integrated research and new strategies to support knowledge through digital models.

Fig. 1. Ortho-projection of the main entrance facade.

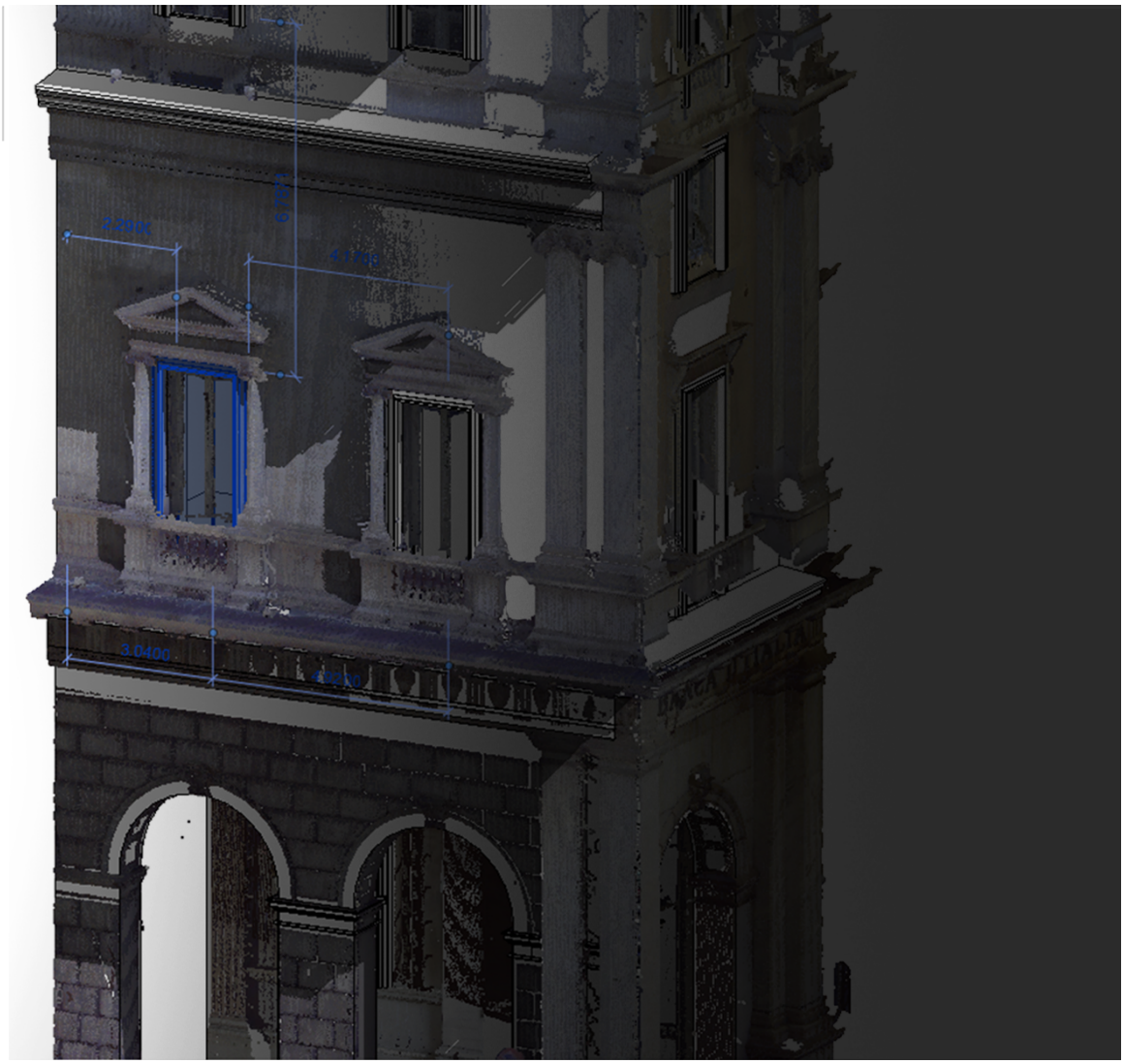

Fig. 2. Parametric and numeric models

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