Urban conservation and colour project: virtual reality supporting tradition for the protection of historic center of Lomello

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ABSTRACT
Aim of this paper is to describe a research project concerning the colour planning in Lomello, a small town in the Pavia province. The importance that the chromatic component covers in the architectural and environmental design revealed herself, also in Italy, in a strong attention towards all urban planning and design actions through the colour project tool. In the former attempts of urban requalification, colour in historical centre hadn’t been discussed for its intrinsic evidence of material culture, but as mere cutting edge characteristic. Today this issue is evaluated under a new point of view and colour matter is bearer of signs of the times and of local recollection. For this purpose the goal of the proposal for a façades preservation project inside a sample area in the historical centre of Lomello is the collection of the chromatic data and their analysis to establish the best strategies of intervention to be evaluated through the use of virtual reality tools.

Keywords: Colour Management, Urban Conservation, Virtual Reality.

1. INTRODUCTION
In the former attempts of urban conservation, colour in historical centre hadn’t been discussed for its intrinsic evidence of material culture, but along with the plaster had been considered as mere surface that could be renewed according to cutting edge dictates.

The importance that the chromatic component covers in the architectural and environmental design revealed herself, also in Italy, in a strong attention towards all urban planning and design actions through the colour project tool. The Colour Piano of Torino on the late ‘70s represents the first attempt in Italy to give a rational answer to the façade conservation problem on urban scale on the basis of an objective historical documentation. The colour projects drawn up later in other towns were set up, till today, as useful urban planning tools to recover colour tones, original materials and manufacturing techniques of historical buildings, to ensure the maintenance and the conservation in time,
contributing to define a coherent image of the town. From the eighties the subject had been evaluated from a different point of view: colour matter is bearer of signs of the times and of local recollection. The main assumption for a conservation project of façades in ancient towns is the study and conservation of the “materia signata”, of its stratification as well as “colour-material” as time had handed down to us. The design process thus should consist in defining a set of intervention hints concerning materials and colours choices, to be identified in a conscious and consistent way following a deeper materials and pathological analysis, Bortolotto and Giambruno [1]. This methodology had been applied in historical towns under a normative point of view following the “Rules Plan” referring to the regional Law 12/2005. For this reason the urban design project of Lomello complies with research latest evolution in this field according to the requirements of all the regulations in force in Italy. The aim of this paper is also to demonstrate, through an interdisciplinary approach, how virtual reality could be used as an enhanced tool by designers and urban and landscape planners, Ceconello and Paquet [2]. Digital models, apart from their photorealism, are able to act as true virtual prototypes endowed with behavioural and performance similarities. They allow us to observe, simulate and analyse the design project, as well as its behaviour, in a much better way than physical models, both from the visualization and a database point of view. The further shift from the hyper-realistic model to the virtual reality system enables the planner to appraise the planning decisions in relation to the urban re-organization, including new modes of intervention in the pre-existing urban landscape. The focus was the use of VR techniques to evaluate different solutions for the colour design of Piazza della Repubblica in Lomello (Fig.1). This paper copes with these issues from three distinct points of view: colour planning, urban planning and valorisation.
2. TOWARDS A “COLOUR DESIGN”

2.1 Methodology and analysis

The municipal rules for actions on the buildings of Piazza della Repubblica in Lomello gives directions about different chromatic choices for painting the façades, without any details concerning “the colour matter” as a summary of different layers (plaster, finishing, glazing, etc.). The purpose of the new Colour Project is to provide defined action guidelines for urban areas, buildings and material surfaces characterizing them, and to define a chromatic scale for façades and their elements.

The conservation and requalification activity is necessarily based on a well-organized data survey and on different elaboration phases and analytic interpretation concerning:

- reading of connections between buildings and their environment;
- identification of architectonic components, of materials and artefacts deterioration;
- the role of permitted zoning use compared with buildings vocation;
- direct sunlight time slot in different seasons considering also adjacent buildings.

2.2 Survey phases

This action, besides providing the exact structure of the square and façades through metric measures, plays a fundamental role for the understanding of free lots and architectonic artefacts.

In collaboration with prof. Susanna Bortolotto (De-
partment of Architectural Design), the survey was performed with a Laser Total station performing polygonization method. For every front a lot of reference marker points had been located to control the photographic correction (Fig. 2).

Before starting the colour survey, a sort of front recognition pattern had been identified to detect every single architectonic unit, as well as all the overhang objects (boss, loggias, balcony, backgrounds,) the “void” elements typically windows and doors, considering also the scheme of façades and of structural elements and typological variations. In many intervention of façade there isn’t a real coordinated design activity planned at a urban scale, but is followed the logic of a single owner decision, sometimes turning out with a not consistent result with the style of the building, causing visual disorder and contradictions. The preservation status evaluation of the materials of the façades in Piazza della Repubblica had been carried out following the UNI NORMAL 11182/2006 Directions; after a careful investigation of building structure without any laboratory investigation, all the materials had been identified with all possible kinds of decay (material and pathologic survey).

2.3 Chromatic survey

The main purpose of the “Colour Project” is to reach the right balance between the will to preserve the actual finishing as “material culture” and the need to renovate the urban aspect. The aim is to provide an effective tool that could define the most suitable “chromatic condition” for every architectonic unit and suggest guidelines for future intervention in a unitary and coherent way.

All the actual condition data collected in situ had been reported on two different kind of technical form with all the directions needed to create the analytic layout showing material/pathological data as well as the stratigraphic and colorimetric references for the correct definition of the “chromatic model” for every single finishing. The survey was carried out through a direct method, using the human eye as a tool to compare the source with a control group.

The Munsell Scale (Revis-
ited Washable Edition, 2000) had been used as the chromatic reference for its suitability for a subsequent elaboration of the “colour code” in the tone of earth colour range used in historical town centre. The collected data had been converted afterword in digital alphanumeric codes. The graphic restitution had been possible using the RGB chromatic scale, even if it was not possible to convert directly from Munsell to RGB; for this reason an intermediate step had been needed using first the conversion tables of the Munsell Glossy Finish Collection - NCS (1976), and afterwards the tables in the NCS Digital Atlas 1950 - RGB (2007) (Fig. 3).

3. ACTIONS AND RESULTS”

3.1 Proposed actions for colour design
To propose the tones in the design phase it has been adopted the criteria to choose between the earth colour range hues respecting the information that came out from the colour survey and the General Town Planning Scheme of the Lomello Municipality; the only proposed variation is the decrease or increase of values that determine brightness and saturation values. In particular the guidelines for the north front propose darker colours, considering that the façades facing south experience problems connected to the reflection of light; the result could be achieved through the reduction of the brightness unit value of 10-20 units. Actions could be undertaken to harmonize the north side fronts hues with the ones of south front of the square, decreasing the hue variance indicative unit value of 10-20 units. The south front is characterized by the presence of various tones for the single residential unit. The suggested action is to assign different shades related to the architectonic units. If two units have the same shade, to differentiate one from the other the direction is to change brightness and saturation in a 10-20 units range (Fig. 4).

3.2 Digital models to support decisions
It has been possible to evaluate the proposed actions through the visualization of a highly realistic 3D Model which enables more than one level of fruition.

Fig. 4
Façades on south front (drawing: M. Bertoldi, M. Marletti, S. Puglisi).
The creation of a model whose objective is solely for visualisation does not actually imply the highest level of metric precision yet it does allow for a greater degree of flexibility in choosing the instruments used for digitalisation. The architectural surveys, subjected to appropriate verification, might actually provide an excellent source of useful information for the modelling process without having to resort to more expensive surveys in terms of time and resources, like photogrammetry and laser scanning.

As far as the architectural components are concerned the process has been based upon a methodology that has been elaborated and tested in previous projects, Ceconello and Spallazzo [3].

The three-dimensional modelling took place after the vector data was provided, by means of software used for the modelling of surfaces which guarantees dimensional and formal control and the immediate conversion of the data already available. Furthermore, we should also point out that not all the architectural components were modelled with the same degree of precision, defining a maximum level of detail beyond which the modelling would only have weighed down the final product without consistently improving the degree of realism. Where allowed, there has been a formal simplification of the complex components (stuccos, decorations), outlining the curved surfaces in an appropriate way, in order to facilitate the subsequent phase of polygonisation.

The polygonal model was subse-
quently exported to a model in which photographic textures were applied. These textures were obtained by means of a detailed photographic survey that was created in loco. The mapping of photographic textures is useful in guaranteeing a degree of realism for the final model and the use of bump textures enables us to overcome certain limits due to simplifications that were produced during the phase of surface/polygon conversion.

The model lends itself to the navigation in real-time which might even take place in real-time in a virtual theatre by means of dedicated software. To assure the right colour correspondence the visualization interface (monitors, screens, virtual theatre) must be calibrated with appropriate procedures or instruments. Visualizing different proposals for the fronts colour design it could be possible to define the best solution applicable as well as to evaluate the planned actions for the reorganization of Piazza della Repubblica through still images or walking through videos (Fig. 5).

4. CONCLUSIONS
The research on Lomello historic center gave the possibility to experiment 3D modelling techniques in addition to topographical, materials and pathological survey of the surfaces of the diffused housing typical of urban conservation as well as a designing tool for urban furniture. The digital model obtained reconstructs with a high degree of realism the actual state of the center and it has satisfied the prerogatives of the project, i.e. the achievement of a model which may support a multi-platform visualization to act as an urban planning support system. The use of the model for conservation or for new re-qualification projects may offer planners further means by which the impact is evaluated and how the projects might be supported in the decision-making process. Mixing up science and new technologies with the traditional conservation survey actions could be desirable for creating interpretative mathematical models for the underway decay, to represent the actual state of the façades and to simulate the design actions. This could cause a more effective control of the analytical and designing activities as well as the refining of a future Master Plan to manage cultural heritage.

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