PRESERVING MEMORIES WITH DIGITAL MEDIA

A methodology for the reconstruction of Castelnuovo Village

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Abstract. The historical centre of the village of Castelnuovo (located in Abruzzo, a region in central of Italy) was seriously damaged by the earthquake of the 6th of April 2009. Following the survey by the Civil Protection, all dwellings have been classified as unsuitable for habitation. The village should be either abandoned or totally rebuilt. But which is its value? Is there something worth of being preserved? If observed from a biodiversity point of view, or more precisely from a “cultural biodiversity” point of view, the historical centre possess interesting materials and immaterial characteristics. These qualities constitute real guidelines for a possible recovery project. Since there is not any possibility to make a survey of the inner village because of its destruction by the earthquake, in this research we have decided to use information technology, in order to rebuilt it and study it in a three-dimensional environment. In this paper we describe the theoretical basis, the method of elaboration and the instruments we have used to locate and evaluate the memories that should be preserved in a new project. Starting with a traditional documentation, such as photographs and drawings, we have used a variety of software (graphics editing program, CAD, 3D modeler, videogame 3D-engine), because of the several hypothesis considered.

Keywords. Digital heritage; digital design; design methods; digital reconstruction; memories conservation.

1. Introduction

The use of Information and Communication Technology (in particular CAAD, BIM and three-dimensional modelers) in the architectural field can be divided,
with some exceptions, in two large sets of applications: on one hand architectural design, and on the other hand the study/analysis of hand-made artifacts belonging to the old cultural traditions (constructions methods still in use or in protected archaeological locations). In the first case, the case studies and the documents developed in a virtual environment constitute the essential documentation to construct a building in the real world. Within the second set, the reconstruction of hand-made artifacts and objects of the real world in a virtual environment permit to deepen their knowledge (examples on Al-Qawasmi et al., 2008).

In our research, the interrelation between the real and virtual world is a mixture of the interrelations described above. The main object of study is real: it is the village of Castelnuovo, and particularly its fortified centre, destroyed by the earthquake. The passage to a virtual space has been useful to study more deeply and to increase the knowledge of a real world which was not only heavily compromised, but also dangerous to study on site. During the analysis and the creation of the various documents, these software applications has been useful to identify and evaluate those memories of the village that should be preserved, by including them in a recovery project. Therefore, the virtual environment is the link between a wounded present, which has strong roots in the past, and a future full of hope that wants to turn the page, by preserving the best qualities of the old village: the memories.

2. The case study: the fortified village of Castelnuovo

The disastrous earthquake that hit the Abruzzo region (located in central Italy, an area rich in medieval artistic heritage) on the 6th of April 2009, heavily damaged the regional capital itself, L’Aquila. Damages of various entity were registered in more than 50 small villages including Castelnuovo, a borough of the village of San Pio delle Camere, that counts less than two hundred inhabitants.

Castelnuovo is located within the “Piana di Navelli”, a plateau surrounded by mountains, at about 700 meters above sea level. The village rises on the top of a hill where it dominates the entire landscape, today marked also by an important road. This privileged position inserted Castelnuovo, and in particular its fortified centre, inside the sighting and defence system of the valley of L’Aquila, during the Medieval period.

From the twelfth century to the present, the village has known for various phases of growth. In our research, we have dealt with the fortified centre, the most ancient and important part of the village, which is an a urban settlement inspired to the Roman “castrum”. This peculiarity, that distinguishes Castelnuovo from the other nearby towns, derives probably from the closeness of the
ancient Roman settlement of Peltuinum.

2.1. CASTELNUOVO, THE EARTHQUAKE AND THE UNIVERSITY

The geological features, and the presence of spaces excavated in the rock, called “grottoni”, have amplified the effect of the earthquake, causing serious damage to the whole village. In fact most of the dwellings have been classified by the Civil Protection as uninhabitable (Class E damage).

The Faculty of Architecture of Pescara (University G. D’Annunzio, Chieti-Pescara) started immediately organising seminars, in order to discuss and reflect on the problems linked to the earthquake. After a first preparatory workshop, a group of PhD students (Building Technology and Environment programme, coordinated by Professor Forlani) continued working during the following months, in order to elaborate projects and research hypotheses useful to go through that difficult moment and to prepare a sustainable future (Forlani, 2009)

The research described in this paper is part of this study and it has a main object the fortified centre of Castelnuovo (figure 2). Since there are no buildings to be preserved, in a hypothesis of intervention the village should be totally rebuilt. But why should we rebuild it? And how?

Figure 2. Two views of the fortified centre of Castelnuovo after the earthquake.
3. A way to analyse the memories to be preserved

As anticipated in the introduction, other studies have as a main objective the preservation of memories only for educational and cultural purposes, such as virtual museums or virtual reconstructions of ancient archaeological sites. We wanted instead of analysing these memories in order to propose them in a real project but to create a continuity of the village with its own historic roots. The choice of rebuilding the heart of the town, its fortified historical centre has been symbolic and deeply meaningful.

But for what reasons should we be preserving these memories? And how should we work?

3.1. HOW AND WHY PRESERVING MEMORIES?

We have concluded that the phase of the reconstruction should be of a “perceptive-cultural” kind, in order to avoid the falsification of history, as a result of imaginative elaborations.

The fortified centre being the oldest part of the village, is the outcome of many transformations and stratifications occurred during the centuries. For this reason there are interesting material and immaterial features that should be preserved. Both these characteristics are the expression of “cultural biodiversities”, a term which means: man’s ability to influence natural processes and the way the environment appears in space; the issues related to culture and traditions of specific local realities, which are the expression of man’s life in a specific local context and environment. The character of this biodiversity is thus resulting from the relationship between human and natural factors (Borreli et al., 2007). A concept that has to be considered and protected in every intervention made on the territory, to face the alienation of the landscape, and hence the loss of the local identities.

A deeper knowledge of the fortified town is essential in order to propose its character, its “atmosphere”, in a new project. In fact, a “location” is more than an abstract localisation; this word means “a set made by concrete things with its material substance, shape, and colour” (Norberg-Schulz, 1986). As a matter of fact, one should not consider only the functional aspects, because even the human functions are different, and are conditioned by different cultural traditions and by different environmental conditions.

4. The elaboration of a method

A working method was developed taking into account some important constraints: the impossibility of entering into the village and the desire to minimise the survey of the external areas because of the danger of moving through
the rubble and the crumbling buildings and the little information available documenting the village before the earthquake.

This situation has directed us towards the use of tools and methodologies of information technology allowing to reach a level of details greater than with methods using traditional tools.

The work was divided into several phases: collection of documentation, creative three-dimensional reconstruction to study the morphology of the original settlement and its criticality; realisation of three-dimensional models to develop a hypothesis of reconfiguration of the village, and the analysis of aspects relating to the perception of the place and its atmosphere. For the three-dimensional models different levels of synthesis were chosen in order to communicate various information.

4.1. TRADITIONAL AND DIGITAL DOCUMENTS

During the first phase we collected all the documentation available. The documentation on the village in its original condition before the earthquake is the result of previous studies and consists of floor plans, sketches and photos. Some pictures taken from above proved very useful because they allow to see almost all the building roofs, most of which have now collapsed.

These pictures have been scanned in high resolution and touched up in Photoshop, to analyse them better.

We have also included, together with the traditional documentation, a new photographic survey, made with a compact camera of 8Mp and some small avi videos, made with the same instrument. The longest video lasts 4’24”, and was made during a walk all around the fortified village. The videos have included important spatial information, and have completed the photographic documentation.

4.2. THE THREE-DIMENSIONAL MODELS

The three-dimensional models are useful to study more in depth the aspects linked to the localisation and evaluation: material memories of the village related to morphological-functional changes; the spontaneous transformations that have spoiled the original plan and that should not be preserved, a first design hypothesis that retains some traces of the original village. The physical models, in wood and in other materials, have always accompanied the work of the architects; the three-dimensional digital model can be considered as the natural evolution because it offers greater opportunities of elaboration.

A first synthetic model has been created in 3D Studio Max, starting from a plan prepared in AutoCAD, where only the perimeters of the single living
cells are shown. The photos from above were essential to understand the different heights and roofs of the buildings. In this case we can speak of an imaginative reconstruction because it was necessary to interpret and recreate the morphology of the village with the little information available.

Thus it was possible to make a more appropriate reading to comprehend the morphological-functional transformations of the town centre, which have also involved the buildings heights.

In fact, throughout the centuries, new necessities have modified the original uses and caused an increase of the number of floors, up to a maximum of five. The result of this first reading showed us an extremely complex urban centre, with constructions that had not only pitched roofs, but also terraces and loggias (figure 3).

In another three-dimensional model, based on the previous one and defined “Criticality model”, we have identified the spontaneous transformations, such as the abandonment or the demolition of parts of the buildings, or the closure of important pathways. These modifications have compromised the original plan of the village.

The previous analysis has given us the possibility to understand that, in the plan of a new village, we should preserve some important peculiarities/characteristics that have been lost throughout the centuries. For instance all the pathways had exits towards the external part of the village and now there are only three paths left.

Figure 3. The three-dimensional models used to study the morphological transformations.
The third three-dimensional model was used to formulate a first design hypothesis. The new model was created using a base plan with a historical light structural grid shown by a slight extrusion.

On this model we positioned new bearing walls, in correspondence to the foundation plan of the old village, which is another trace of the past that we should preserve.

Through the study of this model, we tested some hypothesis trying to combine planning solutions in line with environmental sustainability principles, with signs belonging to the historical memory. In the new village, for instance, it would be possible to foresee some small heights variations among the buildings, both as reference-mark to the complex original morphology and as a way to avoid excessively monotonous solutions (figure 4).

5. A method to analyse the atmosphere: lights, shadows and spaces

Besides the characteristics of the materials such as building heights, the size of the living cells and other historical signs, we have also considered the immaterial memories linked to the image: the colours, spaces, lights and shadows all pertaining to create the atmosphere of the place.

Like all ancient settlements, Castelnuovo was built mainly with local materials, such as stone. There is a relationship between the settlement and the landscape, like between a figure and its background: if this relationship is missing, both of them loose their identity (Norberg-Schulz, 1986).

Figure 4. Models to study the first planning hypothesis (6) starting from the original plan (1).
Therefore, the old fortified village was chromatically inserted in its own natural contest. With Photoshop and Gimp, we analysed several pictures, using techniques that have permitted us to underline the predominant colours through a synthesis of pixel reducing image resolution, and therefore the number of pixels. By applying Photoshop’s filter patchwork we splits the image into small squares filled with the predominant color in that area (figure 5). Most of these colours have been inserted in a diagram, together with the indications of RGB values of each one.

Starting from the synthetic three-dimensional model used previously, we have also studied the characteristics linked to the space and the perception of the lights and the shadows in the internal paths of the village.

With 3D Studio Max we rendered several images, both isometric views and eye-level perspective, placing the sun at three different times of the day: 9 am, 13 pm and 17 pm on the 1st and 15th day of each month. This analysis was used to understand whether and how the different paths were lit by the sun, and therefore where the darkest areas covered by the shadow cast by taller buildings would be (figure 6).

Together with the renderings, we also used another approach: the explorations in “real time”, with the use of technologies for videogames. For these analyses we chose Unreal Engine 2 Runtime, a version of Unreal Engine 2 (used for videogames such as UT2003), which is free for educational purposes. This version is not the latest (Unreal Engine 3) but was chosen because it was sufficient for our analysis and it was faster to run on the computer used for the study, an Athlon 3800+, with 1MB of RAM and an NVIDIA GeForce 6600 256MB of RAM.

*Figure 5. The analysis of the pictures used to underline the predominant colours through a synthesis of pixel.*
The synthetic 3D model was reconstructed in the UnrealEd (The Game editor); in this way, thanks to the game engine, it was possible to do a few “virtual walks” inside the various paths of the village, using a eye-level perspective. Because it is impossible to walk on the real streets of the village, this experience is the only possible way to obtain a movement close to reality, using an inexpensive solution.

By using this technology it was possible to appreciate the usefulness of the “profferli”, which are semicircular steps that permit the entrance to the houses from every direction. Unlike the standard steps, the “profferli” help to make the perception of the spaces more dynamic, reducing the sense of uniformity of the volumetry of the buildings.

6. Conclusions and future developments

The research presented in this paper had the following objectives: the development of a method, the choice and the application of the appropriate technologies to study an ancient medieval village (damaged by a tragic and exceptional event), in order to identify the most interesting memories that should be preserved in a new project.

In this paper, we propose an experimental working method that could be used in other places around the world. Moreover, this is an approach that uses affordable instruments, supported by a theoretical multidisciplinary basis. The opportunities offered by the concepts and the instruments of videogames, for
instance, offer new perspectives to the research field. A new planned research is centered on the use of these technologies, to deepen narrative and spatial aspects of architecture, which are impossible to be elaborated just with static representations that freeze an instant in time.

These analyses have permitted to gain a deeper understanding of the fortified village of Castelnuovo and to study the perceptive aspects linked to the atmosphere. The information gathered could be elaborated and enriched under the most appropriate aspects, in order to provide the basis for new research.

This study could also represent a starting point for the creation of a storytelling through a virtual and interactive exploration of the village, for educational-cultural aims.

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