

GIS as a tool for effective preventive conservation: its utility in studies of conventual outdoor spaces

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ABSTRACT: The aim of this research is to update conservation methods currently employed for the study of the conventual heritage in Seville. Within these buildings, there are several typologies of open spaces -compasses, courtyards, gardens, orchards and cloisters-, which add complexity to a historical and particularly dense urban layout. Some of these constructions, which undergo the contemporary lack of vocations, have the maximum Spanish heritage recognition as Cultural Assets. A situation that enhances the coexistence of cultural and religious functions in some cases. For these reasons, it is necessary to have a better knowledge about these spaces conservation conditions, specially since they are, sometimes, closed to the public.

Consequently, this research proposes the use of Geographic Information Systems as a new way of storage and georeference the pathologies and needs of this buildings on an urban scale. On this matter, priority is given to the visual exploration of the data, reinforcing their spatiality. Then, they can be quantitatively analysed on a territorial scale, not just as isolated buildings. As a result, the aim is to obtain a certain priority order for future interventions and heritage protection of this building typology.

KEYWORDS: conventual spaces, georeferenced system, heritage protection, information layers, preventive conservation.

1. INTRODUCTION. THE PROCESSING, ON AN URBAN SCALE, OF DATA RELATED TO CONVENT CONSERVATION.

Seville owes its urban configuration to the establishment of most of its convents and monasteries. This architectural typology configured almost two thirds of the city center area during the 18th century (Pérez de Lama, 1996). However, their conservation condition is, in many cases, unknown, due to the restricted access to them.

Many of them have had numerous transformations, interventions and works over the centuries. Sometimes these works are difficult to reference in chronological or systematic ways through traditional data storage methods, oftenly used by architects, conservators and restorers in past times.

That is the reason why this research suggests employing Geographic Information Systems as a means of storing and geolocating the pathologies and needs of this buildings, on an urban and systematic scale. This makes possible to prioritise the data visual exploration, which can be quantitatively analysed on a territorial scale (Mascort-Albea, 2017). As a result, an order of priority in the interventions is obtained, contributing to the building heritage protection.

1.1. *Precedents. What is GIS being used for on an urban level?*

The conservation of the Sevillian convent structure has been studied on a small scale for decades. Related to these buildings, the consultation of several intervention projects has been carried out. It has been verified how the diagnoses of them have been executed, normally, as isolated interventions, even within the different parts of the same convent (Consejería de Cultura. Delegación Provincial de Sevilla, 2004).

Traditionally, intervention reports are complex to read and interpret. In most cases, especially in interventions before to the second half of the 20th century, it is very difficult to reconstruct a history of the actions carried out. However, it should be mentioned that some efforts have been made trying to combine this information, facilitating the research and consultation for future interventions (Database of Interventions in buildings declared to be of Cultural Interest, 2003).

In last decades, the use of Geographic Information Systems has increased considerably in the municipality and the Andalusian Government. In this way, there have been developed catalogues of Cultural Interest Buildings (Gerencia de Urbanismo, 2017), World Heritage Sites (Consejería de Economía, Conocimiento, Empresas y Universidad, 2019) or Public Green Areas (Consejería de Agricultura, Ganadería, Pesca y Desarrollo Sostenible, 2005). In this situation, this research has seen the need to improve them introducing data about the conservation conditions of these buildings. The idea is to use the processing of these data through GIS to obtain not only visual or interpretative results, but also comparative and quantitative results.

2. RESEARCH OBJECTIVES AND METHODOLOGY

2.1. *Employing GIS for conventual buildings preventive conservation: Main and specific objectives*

Convent buildings are built by complex additions which suffer from numerous pathologies, both in their indoor and, above all, in their outdoor spaces. These can be due to the many different causes, such as the multiple uses they have accommodated over the years (Molina, López and Mosquera, 2018), the materials and complex structures used during their primitive construction, the plots on which they settle, or directly, to the action of the time. Their diagnosis requires a methodical and analytical control for their preservation and the determination of the causes. Then the main objective of this work is the chronological storage of specific data, through georeferenced layers.

Among the most common damages that convents of Seville present, are those related to the absence of conservative patterns or weak preventive and corrective measures: cracks and fissures, humidity, biological colonization, degradation of whitewash or plaster, among others. All these directly affect their current conditions and physical integrity

As specific objectives derived from this, are the recognition of positioning, extension, shape, temporality and distribution of the damages, as well as possible spatial interactions between specific pathologies.

The intention is to obtain results related to appearance patterns and to address a priority map of conservation actions on an urban scale.

2.2. *Methodology, the use of GIS as a support for spatial conservation*

As we have already outlined along with the approach and objectives of this research, it evident that the use of GIS allows multiple and diverse options for the work of conservation and heritage intervention (López and Marquez, 2013). Chasing the objectives set out above, the software employed for this study case is QGIS, an open-source Geographic Information System that allows handling raster and vector formats.

Thanks to its application, this research is organized along three stages: taking, georeferencing, and processing the data.

To complete this method, a specific case that qualifies the study is determined. The one chosen is Santa Inés Convent, a female cloister located in the center of the city, which has been accessible

for taking data and photographs. This convent also gathers specific typological characteristics that make its case comparably to the rest of convents in the city.

The first step is the technical visit, in which data have been taken about the state of conservation of the outdoor rooms (cloister and courtyards), taking photographs of them and identifying the location, shape, extent, and distribution of such pathologies.

Subsequently, this data is uploaded into the QGIS software. There, there have previously been arranged different layers, which determine modifications in the extension and architecture of the convent. By entering the data in the layer that corresponds to the current situation, it gets referenced.

Graphically, the current convent space is highlighted with a shadow. As we can see in Figure 1, red dots are introduced, thus marking the position of the damages detected. Each point contains attributes of its own. Among the information described in each point, fields on the table are shown. The main advantage of using attributes is that they allow us to select any damage according to its interest or characteristics. It is also possible to add photographs to their description. However, this software is not yet intended as a photography administrator so, for its classification, is used another application, in this case, the software of Adobe Lightroom, given its usefulness in creating image maps in combination with Google Maps.

As the last step, the processing of the data takes place. All information incorporated into the program is represented graphically by point planimetry or tables with photographs. At the same time, we can make use of different queries and thus, instantly, get the selection of points according to the chosen parameter, year, damage, extension, etcetera. At each point, the user can open all the related data. The program allows an accurate, simple, and effective way of seeing the state of conservation of as many points as were added.

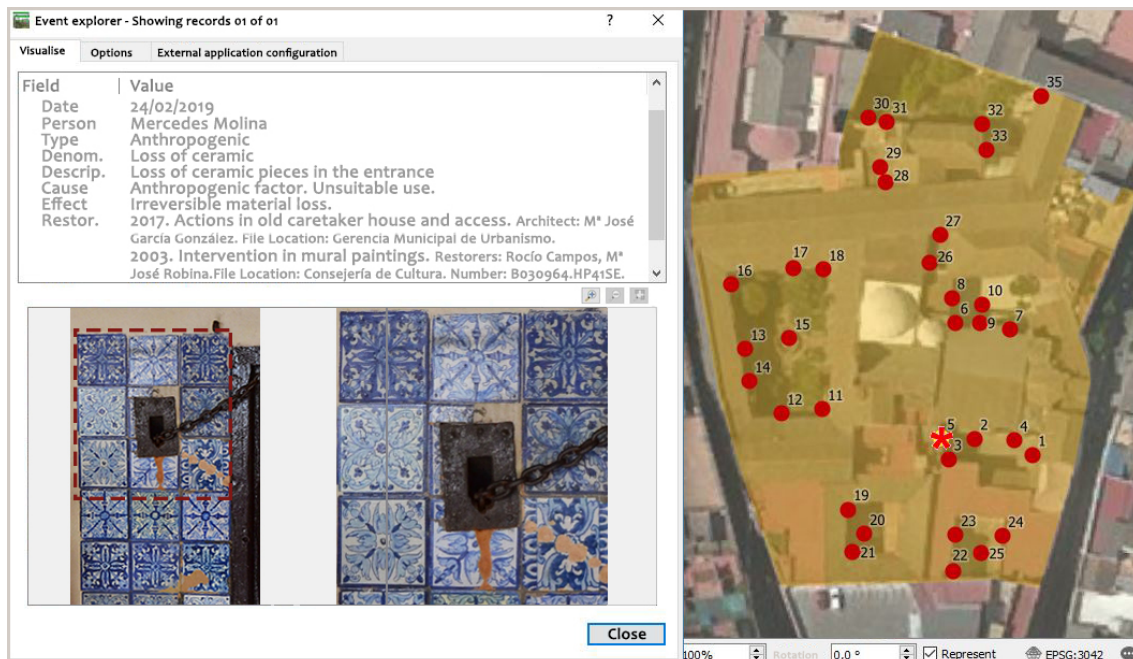


Figure 1. QGIS applied to the study case of the Santa Inés Convent, Seville. The authors.

3.RESULTS

There are many advantages related to the use of Geographic Information Systems in historical heritage researches. This is due to the fact that these types of tools allows the collaborative and interdisciplinary work in current interventions. In this research, we have seen the interest in using this type of software, in this case free code, in the conservation discipline and cultural heritage restoration. The main reason is because it extracts important data from technical visits: injuries recognition, deterioration factors identification, establishment of possible causes, etcetera. The

technical information obtained is materialized in this type of software in a fast and accessible way, facilitating the work of specialist technicians. In this way, it is possible to georeference any type of damage or injury to the building, being able to add complementary data and images that support the diagnosis issued.

The information obtained in the technical inspection must be complemented with an exhaustive knowledge of the previous interventions that have taken place. These data respond to pathologies that may affect the current state of the convent conservation. In this sense, the Geographic Information Systems can also be used as great data managers. They detail the right location of the previous intervention project and the architect or conservator-restorer who has executed it.

The main results of the use of GIS are focused on the diagnosis of the conservation in Sevillian convents. In this case, in the Convent of Santa Inés. These results have been able to georeference each one of the lesions in all the spaces, as well as to add the technical data obtained in the technical visits and archives.

On an urban scale, gathering this information in the software facilitates the knowledge of the conservation urgency that exists in Sevillian convents. This allows the management of the conservation of the buildings in the face of the measures type be adopted, the prioritization of the intervention and even the planning before possible investments.

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