Experimenting on 3D GIS: The Case of Sennacherib's South-West Palace at Nineveh

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INTRODUCTION

The creation of a 3D GIS allows to manage, create and analyse geographical and geometrical data in a three-dimensional context. It is particularly useful when dealing with multiple different types of data, whether they are of historical or archaeological origin. The purpose of the present project was to integrate and archive all the data relating to Sennacherib's South-West palace in Nineveh.

THE PROJECT

The creation of a GIS necessarily begins with a two-dimensional representation. In this case, the project was built on a geographically precise cartography, an orthophoto made through photographs taken with a drone and anchored to control points taken with differential GPS during the 2019 season of the Expedition by the University of Bologna and the SBAH (Fig. 1). Using this basis, the plans created over time of the excavations of the building have been georeferenced. In particular, the plans inked by Layard (Thompson and Hutchinson 1929: pl. 3) and assembled by Russell have been used here (Russell 1998: pl. 1). All the plans were first elaborated in CAD, which allowed to scale them obtaining metric accuracy, thanks to the measures taken by Russell during Berkeley last campaign in 1990 and reported in his publication (Russell 1998).

The creation of a 3D model was an urgent need due to the fact that most part of our documentation concerning the palace is represented by the images (drawings and photos) of the orthostats taken through time and documenting their progressive decay but at the same time revealing ever new details. The first and the largest amount of the documentation is formed by the original drawings, more than two hundred, made by Layard starting with his first investigations into the building in 1847. A similar number of photographs was taken by Russell between 1981 and 1990 and by Lippolis in 2002, but they concern only the throne-room suite (Lippolis 2011). We also have a hundred photographs available for the original slabs or fragments preserved in museums and other collections (Barnett 1998). To integrate this type of information into the 3D model, the three-dimensional SketchUp Pro modelling software was used (Fig. 2-3).

All the archival information was stored in a MS Access database, which includes the data concerning the position of the orthostats inside the palace, their measurements, the theme depicted on the surface, the possible presence of an inscription and the connected references. For embedding all these data, the ESRI ArcGIS Pro platform was used. On the georeferenced map, the shapefiles that characterize the building with the addition of an extrusion value given by the analysis of the historical and archaeological documentation have been inserted (Fig. 4).

To include both the geometrical information, the archival external data and the texture characterization it was necessary to create a geodatabase, a particular type of file which allows managing both spatial and nonspatial data, including texture, formed by feature classes. Each single 3D model created in Sketchup was imported into the ArcGIS platform and stored in a specific geodatabase, then after adding a unique value in the ID field within the attribute table it was possible to link them with the database (Fig. 5). Thanks to a subsequent collaboration with the CRANE project and the use of their software and infrastructural resources, I could create an online 3D GIS that has the potential to be publicly accessible in the near future.

CONCLUSIONS

The opportunity to create a 3D GIS is due to the fact that most of the documentation focuses on the vertical decoration of the building, which has since been dispersed or lost. The possibility of displaying for each room not only the still preserved reliefs, but also the photographs and drawings that have been made of them allows to visualize a large amount of data in their original position, a feature most important for anyone interested in visual and historical studies. Through this platform it is in fact possible to observe an image and at the same time have all the information associated with it. Further, such features allow to use the model also as a basis for conservation works both on the structures and on the reliefs, even for those that are still present in situ today in the open air museum of Sennacherib's Throne Room.

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Fig. 1 Orthophoto of the acropolis of Kuyunjiq and the GPS points surveyed in 2019.

Fig. 2 Sketchup Pro reconstruction of the palace viewed from north.

Fig. 3 Sketchup Pro reconstruction of court XIX viewed from south with the drawings made by Layard visualized in their original position.

Fig. 4 ArcGIS visualization of polygons extrusion following the excavation data obtained on the SW Palace.

Fig. 5 ArcGis Pro server (courtesy of the CRANE project), 3D reconstruction of room XXXVI connected with the external database.

Fig. 6 ArcGis Pro server (courtesy of the CRANE project), 3D reconstruction of room XXXVI. To the left of the red line the drawings made by Layard are visualized, to the right the photographs of the original orthostats kept in the British Museum.