



POLITECNICO
DI TORINO

Honors thesis

MASTER OF SCIENCE IN SUSTAINABLE
ARCHITECTURE

Abstract

**From point cloud to BIM.
The case study of Pollenzo's Roman amphitheater**

Tutors

Arch. Filiberto CHIABRANDO

by

Maurizio SOMANO

Teacher Antonia Teresa Spanò

December 2015



In the thesis treated here, innovative techniques and methods of representation were tested in order to contribute in the disclosure of historical and artistic heritage. This study was carried out by relating different topographic techniques with the aim of obtaining a unique 3D model of BIM type. Eventually, possible fruitions both in the professional-technical field and in the cultural dissemination were conjectured.

The example taken into consideration is a portion of the amphitheater built in the second half of the 1st Century AD by the Romans in Pollenzo, a municipality of the town of Bra. On the

ruins, from the end of the 18th Century, it was built a village of houses which still allow you to easily recognize the elliptical shape of what was there previously as well as the structure of several cellars. In order to obtain a complete reconstruction, ground pad and aircraft take-overs were used and then compared; the results were integrated with a topographic survey and GpS.

Topographic survey: thanks to the RTK surveying system and a specific software, the targets previously set along the facades of the buildings and, besides these, materialized points in the center of Pollenzo (clearly visible from the drone camera) were detected.

Lidar survey: the LIDAR technology used for the survey from the ground is derived from the distance measurement method by means of electromagnetic waves through laser scanning instruments. 17 scans were performed, each of which had to have a minimum of three targets in common.

UAV survey: in order to survey the covers, the use of a UAV drone with fixed wings was necessary (flight time about 20 minutes). About 140 frames were acquired.



Once all the “on field” operations were done, the work continued in the laboratory in order to process the data using special software. The survey of the buildings in the form of point clouds, characterized by precise coordinates, was given by the laser scanning.

The digital images obtained from UAV, were aligned by identifying the points in common, and thanks to further elaboration, a dense point cloud based on the positions of the rooms at the time of the acquisition, was reproduced. Then, after having obtained a single type of data referring to the same reference system, unnecessary data have been deleted.

FROM POINT CLOUD TO BIM

The second goal we set was to give an identity to the gained data by reconstructing the heritage through parametric objects, named BIM – Building Information Modelling. The program used did not allow a direct use of the point cloud, so it was necessary to enter each kind of item, sometimes taking them from those already present in the program, other time drawing them specifically. The cloud was then used as a support for the correct positioning of these. As elements were inserted, the appropriate texture made from photographs taken during the survey was assigned. Finally, we tested the ability to add descriptions in the form of tables and text strings to ensure that future users could use as many information as possible.

Many are the vistas obtained: from a mere swipe of the houses built over the amphitheater to a overlap of the model above aerial photo.

Photo- realistic scripts made it possible to verify the quality of the survey and a model for displaying and touching navigation for smartphones and tablets has been tested for data sharing. Achieved a satisfactory result, we decide to stop the researches.

FRUITION

We examined different conclusion operations for this type of modeling. The first thought was to create a database using common language in order to share the model with operations, assuming a use for the analysis, conservation and restoration. Equally interesting would be sharing these models in cultural fields for educational and tourist purposed. Next-generation applications allow for the display and query templates created by offering full accessibility and sharing that goes to affect multiple disciplines.



FOTO

RAPPRESENTAZIONE BIM



For further information please contact:
Maurizio Somano, mail: maurizio.somano@gmail.com