HISTORICAL COLONNADE COURTYARD SURVEYS: COMPARISON BETWEEN THE SEMINARIO MAGGIORE AND THE UNIVERSITY BUILDING.

E. Agosto[*], C. Porporato[*]

[*] DITAG, Politecnico di Torino, 10129 Torino, Italy - eros.agosto@polito.it – chiara.porporato@polito.it

KEYWORDS : Architectural, Comparison, Survey

ABSTRACT

The present work describes a survey on historical courtyards located in the heart of the city of Turin: the *Università di Torino* building and the *Seminario maggiore*. These are apparently similar objects, but there are quite significant differences; they were adopted as test sites for the practical lessons of a survey and History Art course at the Politecnico di Torino. This course was arose out of a cooperation between different Politecnico di Torino departments (DISET and DITAG); the aim was to make the new generation of construction engineering students able to directly face the problems and difficulties that arise when surveying a building of historical relevance.
The differences in the adopted techniques and the results of the surveys are shown in the paper.

1. INTRODUCTION

A new course was recently created at the Politecnico di Torino, whose aim is to give students a unique vision of surveying and representation processes. It was in fact thought, that students, who are taught how to survey and draw in separate courses, might find it difficult to perceive the union and integration they should have in the perception, study and communication of objects. These are the reasons that lead the Geomatics research group of the DITAG – the Department of Geo-Resources and Land, and the Drawing and Representation research group of DISET – the Department of Building Engineering and Territorial Systems, to create a common survey and history - of - art course. This course is thought up for construction engineering students.

An important role in the course is played by practical lessons, where the students can apply what they are taught during theoretical lessons, and to face the real difficulties of survey operations.

As Turin was first the former capital city of the Savoy kingdom, and then of Italy, its city centre is very rich in valuable buildings, especially baroque ones. It was attempted to make the student face the peculiarity of surveying historical objects.

It was also decided to give the students a chance to work in a quite and safe place, and to force them to actively participate. It was thus decided to have two different sites for the practical lessons; these sites are two historical colonnade courtyards: they are places where no traffic problems arise and where students can work without disturbance and danger.

The two selected places are the *Seminario maggiore* and the university building courtyards, both placed in the historical city centre, and apparently very similar objects.

1.1 The surveyed monuments

The two studied objects seem a first sight to have similar architectural schemas. They present two floor colonnades in each of the four sides and they are painted in the typical colour used for aristocratic building in Turin. The described characteristics make the appearance buildings appear similar.

The *Seminario Maggiore* is situated in Via XX Settembre near the Turin Cathedral and Piazza Castello. This square is the very centre of the city and the main central streets all start out from it: Via Accademia delle Scienze, Via Roma, Via Pietro Micca, Via Garibaldi, Via Palazzo di Città, Via Verdi and Via Po.

The university building, instead, mirrors the *Seminario Maggiore* regarding Piazza Castello but it overlooks via Po and via Verdi. Designed by Amedeo di Castellamonte, Via Po (the ancient Contrada di Po) links Piazza Castello and Piazza Vittorio Veneto near the left bank of the river Po. In the eighteenth century this was the main street of the city, with seven hundred metres of arcades on each side. On the left side of the street the buildings are linked by terraces, said to be part of a kind of elevated walkway which enabled royals and courtiers to go from the Palace to the river without mingling with the commoners. The buildings along the street were not inhabited by the high aristocracy, but the rich middle classes which were in great expansion in the 18th century. On the left side of the street, at number 17, is the 18th-century building which hosted the university and now houses the Rectorate. The University of Turin, founded at the beginning of the fifteenth century, numbers among its students and teachers great scientists and academics such as Erasmus of Rotterdam.

The construction of the university building was started at the beginning of XVIII century by King Vittorio Amedeo. The building was designed by Michelangelo Garove; he had to immediately face the difficulty of working on a partially already built zone, which had also an irregular trapezoidal shape. Furthermore, the town planning legislation of that time, written by Amedeo di Castellamonte, established the presence of a continuous portico on the via Po side of the buildings, which also had to have a height of three floors. Many other important architects such as Bertola, Juvarra, Vittone and Ricca also worked on the project. The splendid internal courtyard is adorned with busts of kings and scientists; it is placed parallel to Via Verdi, which at the time was known as Via della Zecca, and where the main entrance of the building originally was. It is characterized by a portico, which is sustained by columns and a round arcade, with a balustrade and composite capitals.

Less certain information is available about the history of the *Seminario maggiore*.

Fig. 2 – Total station (on the left), distancemetres (on the left-top) and rulers (on the left - below)

2.2 The survey method

Because of the dimension of the buildings and considering the limited number of hours of the course, it was necessary to make the students work in groups. Each group was assigned a portion of a building. After a preliminary inspection, the division of the building survey was decided. During this phase of the course, there was collaboration between the DISET and DITAG departments in order to combine their specific requirement and define a list of targets that had to be achieved to guide the students in their work.

The professors taught the method that each group had to adopt, the workflow they had to follow, in order to gain homogeneous works by the students, avoiding the loss of a comprehensive view of the monuments. In this way it was possible to have the survey of the whole building by merging the results of each group work.

In order to facilitate the putting together of the results of the different groups and to define a unique reference system for the whole object, a reference network was created in each site (fig. 3). This decision was also taken to make the integration of the subsequent works possible. Furthermore, considering the high precision necessary for the network vertices and the desire to concentre the students attention on the object, this preliminary operation was made by the teaching staff. Moreover, these matters are taught in a specific course that these students had not attended before. They therefore did not have the theoretical and practical knowledge necessary to carry out these operation, and it was not the aim of this course to teach them.

Fig. 1 – University building (top) and Seminario maggiore (below)

It is possible to say that these two monuments were designed around the courtyard which was their vital centre (fig. 1).

2. THE GEOMETRY SURVEY

2.1 The used survey instruments

The used techniques are both instrumental and manual.
Students were taught the principles and usage of the instruments. Some practical lessons were dedicated to introducing the students to the use of total stations, and to support them in using them. In the same lessons, photographic takings were made using a semimetric Rollei camera (Kraus, 1998); the DISET and DITAG departments also placed some instruments, such as distancemetres and rulers, at the disposal of the students whenever they needed them. The used instruments are shown in figure 2.
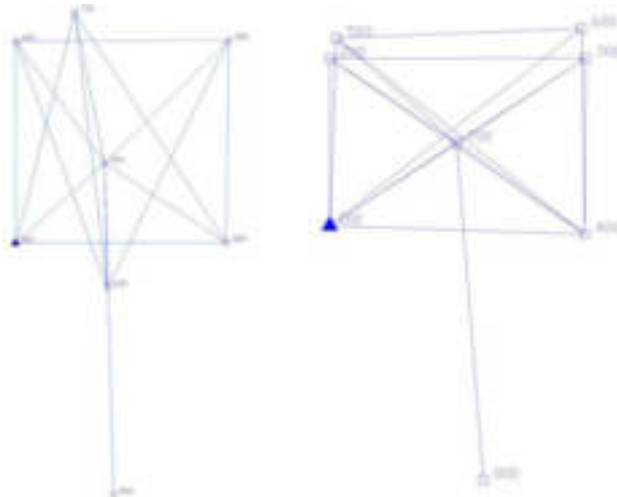
Fig. 3 – Survey schema of Seminario maggiore (left) and University building (right) reference network

The network was surveyed using a total station with topographical signals; some existent details (fig. 4) were chosen, instead of materializing new groundpoints as the network vertices, because of the value of the surveyed objects (Inghilleri, 1974). Monographs of the vertices were created to make their occupation again possible.

Fig. 4 – Vertex of Seminario maggiore (left) and University building (right) reference network

The same survey schema was adopted in the two networks cases: all the others were measured from each vertex.

The obtained data were compensated and an equivalent millimetric accuracy was achieved in both networks (Manzino, 1999).

In a preliminary introduction the two surveyed objects were presented to the students, both from a historical and architectonical point of view.

The students were asked to hand-draw the part of the object they had to study directly on the site.

This operation was thought up to make the students understand the geometries and to comprehend which point to survey in the subsequent phases.

It was necessary to consider which elements or particulars had to be measured during the survey campaign by directly studying the object using their drawings.

The students chose points that were visible and easily measurable; they were on sharp corners in the plinths, columns edge, details on the walls.

The measurement phase was started in order to give a correct metric information to the hand drawings

The groups, using the so-called, *trilaterazione* method, were able to determine the planimetric base of the portion of the building that they had to study (fig. 5).

It was observed that almost all the groups, in both sites, chose the distance between the column plinths as the *trilaterazione* base.


Fig. 5 – Seminario maggiore planimetric view used to plan the trilaterazione method

They were therefore also able to define the spatial collocation of the chosen elements thought to be necessary for the survey.

Where it was possible to reach the object, the students directly measured its metrical value just using a ruler; as it was not possible to manually measure each element of the façades, after giving a scale of importance to each part, different instruments were adopted to acquire them.

Laser distancemetres were also used, especially to survey the vaults: the ruler was put on the floor to materialize a section of the colonnade and the vault height was surveyed at regular steps (fig. 6).
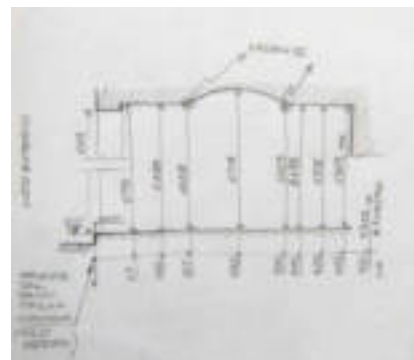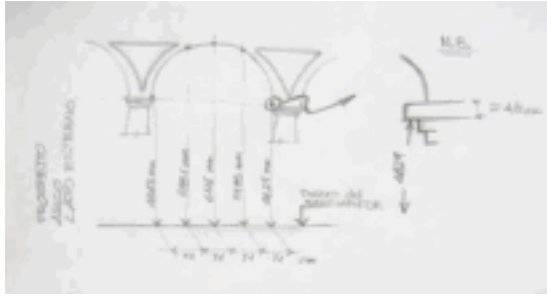
Fig. 6 – Some examples of the use of the distancemetres to measure the vault height.

The total station survey phase was aimed at measuring the manually unreachable points on the façades and also to carry out an integration with the manual data.

In both sites, the chosen points in this phase were decided on to give a correct proportion of the object: the edges of the pulvinos, the keystones (fig. 7), and the column plinth edges were measured (fig. 8), in order to gain information on the main architectural elements, such as the portico height, the distance between the columns, the arch spans of the façade.

Fig. 7 – Example of a point chosen in a keystone.

Fig. 8 – Example of a point chosen in a column plinth.

Fig. 9 – An example of a chosen point for the rectification

It was necessary to place the instruments in some auxiliary positions other than the network vertices; these were linked to the net in order to georeference all the measured data in the unique reference system of the object.

Some of these surveyed points were also useful in the subsequent photo rectification phase.

To carry out this operation, the students, analyzing the structural elements of the building, identified the planar elements they had defined at least four coplanar points on. They obtained the tridimensional coordinates of these points using the total station measurements. They were taught to transform these coordinates into a photogrammetric system in order to rectify the given photos.

The rectification operation was not easy because of the fact the façades don't present a unique main plane. The chosen points in this phase were decorative points on the main façades and their moulding edges (fig. 9 - 10).
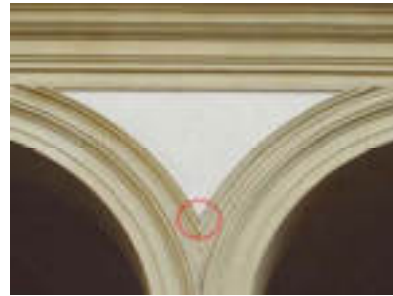

Fig. 10 – Chosen decorative point on the façade.

The rectifying software that was used, RDF, was developed by the Università di Venezia; its use for didactical purposes is free of charge.

The theoretical basis of the rectification technique had been taught to the students both in theoretical and in practical lessons showing them some significant architectonical examples.

The following images represent a portion of the University building (fig. 11) and a portion of the of the *Seminario maggiore* obtained form the rectification operation (fig. 12)

3. CONCLUSIONS

The main goal of the course was to offer the students the opportunity to perceive a whole survey operation on complex architectural objects.

This was obtained through a practical group experience. At the end of this experience the students had the information they had decided to gain when they planned their work, and they found themselves in the condition of beeing able to start the subsequent representation phase. The different measurement techniques they used and their different accuracies were taken into account in the representation phase; dedicated drawings make it possible to understand the reliability of the measurements and the used methodology (fig. 13).

The collaboration that arose between the DITAG and DISET Departments with the sharing of their specific skills and sensitiveness, offered the student a wider view of survey techniques.

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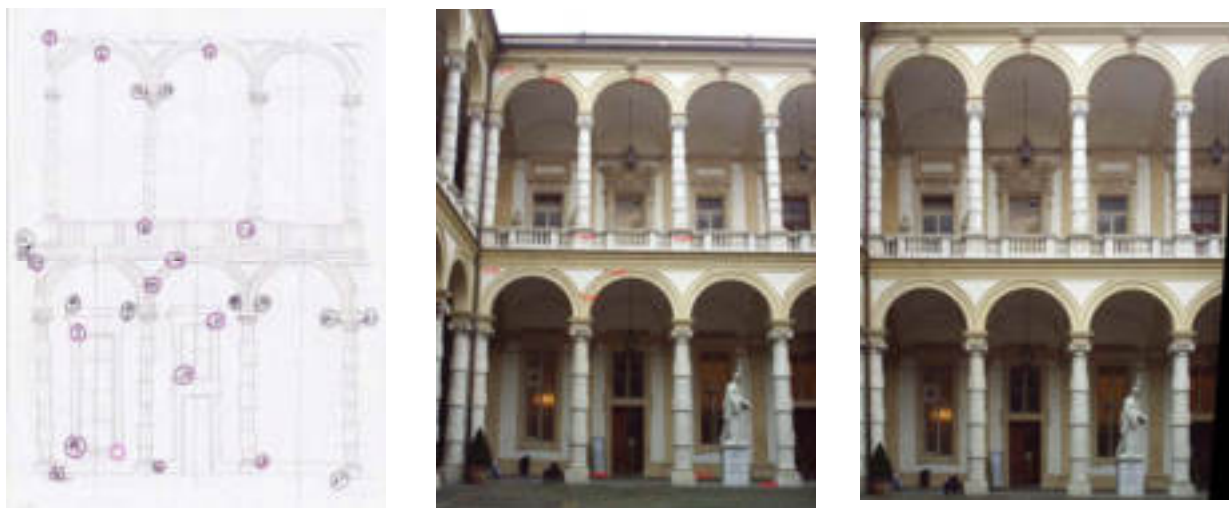http://www.iuav.it (accessed 30 Nov. 2004)

Fig. 11 – University building; an example of the result of the rectification operations.

Fig. 12 – Seminario maggiore; an example of the result of the
rectification operations

Fig. 13 – University building; an example of the result of the representation operations.