

Preliminary Young Researcher Workshop

19 - 21 May 2017



Geomatics and Restoration
Conservation of Cultural Heritage in the Digital Era

GEORES2017

AUTEC (the Academic Association of Topography and Cartography), SIRA (the Academic Association of Architectural Restoration) and IGMI (the Italian Geographic Military Institute) have organized on the occasion of the 1st International Conference on "Geomatics and Restoration: Conservation of Cultural Heritage in the Digital Era", a workshop especially addressed to PhD students, postdoctoral fellows and young researchers.

The challenge of the workshop is to create a contact point, and perhaps also a cross-pollination, between the practice of architectural surveying and that of restoration. These two disciplines have never been completely independent as they are consecutive steps in the process of safeguarding and the enhancement of Cultural Heritage. Currently this relative dependence finds new reasons in the notable development

of technologies applied to historical buildings. Laser scanning, digital photogrammetry, UAV, as well as GIS and BIM, join with the work on historical heritage from surveying to data management and the projection of future interventions.

The workshop will address four cases very frequently present in the practice of restoration, thus seeking to provide the elaborations (raster and vector) and the analyses necessary for the design phase.

- i. The first case regards the geometric survey necessary to study the structural aspects of the building. Through sections, thickness of walls, analysis of verticality, measurements of wall inclination, extracted from pointclouds, it will be possible to acquire detailed understanding of these attributes.
- ii. A second case concerns the material restoration. The most useful instrument is the orthophoto which can be obtained by means of photogrammetry. The
- iii. The third case deals with functional restoration and reuse of the building, for which a fully detailed plan is very useful. This plan, extracted from pointclouds, can be used for the reuse design and, further, for the analysis of accessibility and the architectural barrier-free design.
- iv. The last case is common to each practice; it concerns the communication and dissemination of the restoration intervention and, in more general terms, the evaluation of Cultural Heritage. The publication on the internet of high quality documents and, especially 3d models will serve to attract the public by describing the historical importance of the building's architecture.

orthophoto allows for correct metrical information, together with the descriptive quality of the photos, which is very useful for the understanding of material pathologies.

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19/05 Friday

- 9.00 - 9.30 Introduction to the workshop [IGM via Cesare Battisti, 10]
 9.30 -10.30 Invited professor presentations: Margaret D'Ambrosio, Alessandro Gambuti, Giuseppe Cruciani, Mario SantanaQuintero, IGM
 10.30 -12.15 Theoretical lessons: introduction to topography, laserscanner, photogrammetry and CH communication
 12.15 - 13.45 Lunch break
 13.45 -18.30 Practice of data acquisition at Palazzina della Livia [Via degli Arazzieri, 2]

20/05 Saturday

- 9.00 -11.00 Practical lessons: photogrammetric data processing [IGM via Cesare Battisti, 10]
 11.00 -11.15 Coffee break
 11.15 -13.00 Practical lesson: laser scanner pipeline and data processing
 13.00 -14.00 Lunch break
 14.00 -16.00 Individual work on case study
 16:00 -16.15 Coffee break
 16.15 - 18.30 Individual work on case study

21/05 Sunday

- 9.00 -11.00 Individual work on case study IGM via Cesare Battisti, 10]
 11.00 - 11.15 Coffee break
 11.15 - 13.00 Individual work on case study
 13.00 -14.00 Lunch break
 14.00 -15.45 Digital application for Cultural Heritage valorization
 16.00 - 16.15 Coffee break
 16.15 - 18.30 Redaction of presentation for the special session of the day of conference

INTRODUCTION TO ARCHITECTURAL SURVEY

- Survey project
- Scale of representation
- Measure and accuracy
- Theory of errors

TOPOGRAPHY

- Angles and distances
- Total Station
- Topographic Network

LASERSCANNER

- Active and passive sensors
- Optical sensors
- Operating principles: TOF and phase shift
- Instrumental characteristics
- Project of laser scanner survey
- Scan resolution
- Point cloud principles: geometry, reflectivity and color
- Point cloud registration: topography and ICP
- Errors in pointclouds
- Data processing: from pointcloud to drawings.

PHOTOGRAMMETRY

- Digital images and digital cameras
- Main concepts of photogrammetry
- Photogrammetric pipeline
- Capture geometry
- Inner orientation
- Exterior orientation
- Dense image matching process
- Orthorectification and orthophoto

CH COMMUNICATION

- Introduction to the digitization of CH
- Enabling Technologies
- Augmented Reality
 - Systems and Devices
 - AR Typology
 - A taxonomy for C H
- Virtual Reality
 - System and devices
 - AR vs VR
- Future Trends and Limitations
- Virtual Tour
 - How to capture images
 - Stitching: Creation of MultiView Spherical Panoramas
 - Creation of a Virtual Tour



TUTORS



ANDREA ADAMI is an architect and he was awarded with honour with the title of PhD in Geodesy and Geomatics at the Politecnico di Milano. From 2003 to 2012 he worked at the Photogrammetry Laboratory of the University Iuav of Venice. In 2012 he moved to the VHLab (Virtual Heritage Laboratory) of CNR ITABC to deepen the theme of 3D modelling in the field of virtual reality and museum applications. In 2015 the project "BIM for Cultural Heritage: a geomatic question too" was selected and funded by SIR national projects. Since then he works as a temporary researcher at the Politecnico di Milano. He has taught as adjunct professor at Iuav University and at Politecnico di Milano and in several summer schools. He is author of about 50 papers on issues of architectural

survey, enhancement of historical and cultural heritage and historical maps.

Conservation &Communication of Cultural Heritage Laboratory (GeCo).

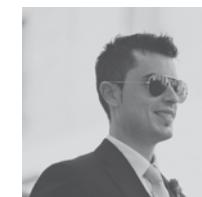


ALESSANDRO CONTI Graduated in Architecture in 1993, he works as architect. He dealt with the conservation of Modern Movement architecture and was Adjunct professor of Materials deterioration and diagnostics and Pathology and deterioration of historical buildings (1999-2003). In 2014, scholarship recipient on Data collection and elaboration for the definition of innovative methodologies of urban and territorial analysis, by means of data capture and 3D modelling for the visualisation of the present condition, simulation of urban planning and communication. Currently on architectural and archaeological surveys in Italy and abroad participating to other activities held by Geomatics for



FRANCESCO FASSI graduated in Engineering for Environment and Territory at Politecnico di Milano in 2001 and hold a Ph.D in Geodesy and Geomatics. Since 2003 his research has focuses on survey techniques and methodologies in the field of cultural heritage. During the surveys of Villa Reale di Monza, Basilica of San Lorenzo in Milan and Basilica of San Marco in Venice he experimented the acquisition and processing of data. He also worked at the tests to outline the guidelines for archaeological surveys, performed on Claudio's Aqueduct, and at the survey of the archaeological excavation in the Hall Station Metro Line 1 of Naples. He supervised several research activities about surveying complex architectures,

including the Main Spire of the Milan Cathedral. He is currently coordinator of the Milan Cathedral Survey Project. Member of ICOMOS Italia, he is author of over 80 publications in the fields of survey, photogrammetry, BIM and measures in general.



ROBERTO PIERDICCA was born in Ancona, Italy, on 1st March, 1985. In 2011, he receive the Master Degree in Building Engineering and Architecture from Polytechnic University of Marche with a thesis entitled "Notre Dame du Haut a Ronchamp: Storia Rilievo Struttura" (supervisor Prof. Gabriele Fangi). He get the Ph.D degree in 2017 and his research activity is mainly focused on "Senseable Spaces", a new paradigm of technology applications, which concerns with the development

of novel digital tools designed for a global exploitation of the spaces experienced by different kinds of users. This topic includes several research areas with a multidisciplinary approach, with a particular focus on Digital Cultural Heritage (DCH), mobile development with specialization on Mobile Augmented Reality (MAR), Space Sensing in both indoor (e.g. Retail) and outdoor environments (Public Open Spaces) and Geomatics applications . He is author of more than 30 scientific publications in International journals and conferences.

INVITED PROFESSORS



GIUSEPPE CRUCIANI FABOZZI, graduated in Architecture in 1971, he graduated in the same year in the professional profession and is registered in 1975 at the Archives of the Province of Florence. Since 1984 Associate

Professor of "Architectural Restoration" at the Faculty of Architecture in Florence, in 1994 he was named, as a winner of a competition, as a Professor of First Architectural Restoration at the Politecnico di Milano where he taught at the School of Specialization and in the PhD in "Architectural and Environmental Heritage Conservation". Since 1998 he has been Professor of "Architectural Restoration" at the University of Florence, he was a member of the Academic College of the PhD in "Architecture Materials and Structures" and of the Center for Cultural Heritage, becoming Coordinator of Master II degree in "Restoration, protection and security of historic and monumental buildings". Responsible for MURST research projects in the field of building analysis and conservation, was invited as speaker at national and international congresses, in addition to organizing conferences, exhibitions and workshops on restoration. Author of more than 120 publications, editor in chief of Psicon magazine, since 1997 he is part of the Writing Committee of the Bollettino Ingegneri in Florence and since 2010 of the magazine Capitale Culturale.

Already in the Steering Committee of ICOMOS-Italy, he is Academician of Drawing Arts and Associate of various Cultural Institutes in Italy and abroad.

in 1997 to reassume her duties as Cataloging Specialist for the IRIS Consortium of Florentine Area Art History and Humanities Libraries.



MARGARET D'AMBROSIO holds an undergraduate degree from New York University and advanced degrees from both NYU and Columbia University. After having held professional positions at the George Washington University Library (Washington, DC) and the American Numismatic Society Library (New York, NY) she returned to Washington for a position in cataloging at the Smithsonian Institution Libraries. In 1995 she was granted a year of sabbatical leave from her position as Senior Monographs Cataloger at the Smithsonian to train the Berenson Library staff (Harvard University Center for Italian Renaissance Studies) in Florence, Italy in online cataloging. She returned to Florence

ALESSANDRO GAMBUTI, Historian of the Humanistic Education Architecture, he graduated in 1968 at the University of Florence. Professor in charge since 1974, role until 2009, at the Faculty of Architecture of the Florentine University. Until 2000-2001 academic year he was part of the Institute, then Department of Architecture History and Restoration of Architectural Structures. Since 2001-02, by implementing studies already undertaken on the relationship between traditional materials, building practices and architectural models of architecture, he joined the Department of Restoration and Conservation of Architectural Heritage of the same Faculty, which conferred on him the

teaching of Building Characteristics of the "Historical building, as a holder of the subject in the short and magisteric degree courses. Other teaching assignments during his career are recorded in the Erasmus program (Escuela Superior de Arquitectura Sevilla) and in postgraduate and master courses on Architectural Heritage Conservation and Restoration. Concerning study and research activities, many of his interests include various aspects of architectural culture from the Renaissance to the Enlightenment, on which he has presented reports in international congresses, which can be consulted in the Acts, articles published in specialized journals and periodicals, essays Thematic and monograph published in single volumes.



MARIO SANTANA-QUINTERO is an

assistant professor on Architectural Conservation and Sustainability at department of Civil and Environmental Engineering Carleton University. He is also the Director of the NSERC Create program "Engineering Students Supporting Heritage and Sustainability" based at the Carleton immersive Media Studio Lab. He has an architectural degree, holding a master in conservation of historic buildings and towns and a PhD in Engineering from the R. Lemaire International Centre for Conservation (University of Leuven). He is also a guest professor at the Raymond Lemaire International Centre for Conservation (University of Leuven). These past years he has been teaching also at the Universidad Central de Venezuela, Universidad de Guadalajara (Mexico) and Universidad de Cuenca (Ecuador). Along with his academic activities, he serves as ICOMOS Board member and he is the past president of the ICOMOS Scientific Committee on Heritage Documentation. Furthermore, he has collaborated in several international projects in the field of heritage documentation for

UNESCO, The Getty Conservation Institute, ICCROM, World Monuments Fund, UNDP, Welfare Association, and the Abu Dhabi Authority for Culture and Heritage.

PILOT



FILIPPO FIASCHI in the period 2000-2006 had a professional experience in SMS techniques in application of the Textile industry as technical-economic supervisor of plant maintenance, Machines and steam generators. Since the beginning of 2015, he has dedicated to the development of technical services with remote pilot aircraft. He contributed, as a partner, to the birth of the SAPR School Division of AT Cirrus Aviation srl Bologna, where he worked for a year as a ground instructor.

Pilot I.APRA.000050 with Critical Operations (CRO) and Flight Instructor (FI) qualifications. He collaborates with the Geomatics Laboratory for the Environment and the Conservation of Cultural Heritage Of the University of Florence as a Flight Operator. He is an official instructor and developer for planning / command & control software RGS SPH Engineering's UgCS mission.

CASINO DELLA LIVIA

SOME NOTES

by Giuseppe Cruciani Fabozzi and Alessandro Gambuti

The "Casino della Livia" (casino meanted a small recreational building, also called 'Palazzina') assumed the current configuration thanks to Bernardo Fallani's intervention on a pre-existing building never used as a home before (around 1775-80).

Since 1545 it was destined as a factory for the manufacture of tapestries, using an annex on the garden for craftsmen. This purpose was maintained until 1760, when it was decided that the Medicean tapestry would give way to the straw warehouse for the nearby riding hall situated in the "Casino di San Marco" (by Bernardo Buontalenti), in which the Lorraine, after years of abandonment, had set up the Royal service of the Noble Guards.

There is a document dated 14 June 1764 regarding this change of use. It was sent by the Secretariat of the Royal Buildings to Mr. G. Ruggieri

(the official architect) with various instructions including the proposal to raise the roof; in response to the above-mentioned document, the architect presents a "Note of the Expenses" claiming that such elevation [which would allow to store more straw increasing the volume] can be done "at any time".

Ruggieri attaches to his letter a "Demonstration in Plane, and Front ..." in which are highlighted the changes to be made to the 'present state'; in particular the aforementioned rise of the roof [called tettoia as it was a



two-sloped roof], the closure of a door (at the number 6 in the Via dei Preti and of the windows on the garden, increasing the thickness of the wall from sopramattone (a thin wall) to a wall "one Braccio thick" (Braccio was the old florentine lenght unit that was around 58 cm).

Archive papers do not document other events until 1778, when some accounts are paid to various craftsmen (woodworkers and masons) for the construction of the "new Casino of San Marco", meaning that the building was under transformation, and thereafter from May 1779 to January 1780 there are other payments to Giuseppe Del Moro for the still existing wall paintings. In those years even a fireplace was made by the sculptor Harwood, that now is disappeared. About to the architectural renewal of the stanzone, it is possible to rely on the judgment given on May 8, 1780 by the secretary of the Secretariat of the Royal Buildings F. Piombanti who, in a report on Bernardo Fallani, writes: "he has made himself capable of very reasonable buildings, such as [...] in the addition to the Casino di San

Marco".

At this point it is also worth mentioning another document, which is anonymous and not dated, although relevant, containing a "description of the constituent parts of the Building called the Casino de [sic] S.Marco": [...] "... at present it serves for housing of the Royal Cavalry Guards ... "; [...] "... apartment serving for His Royal Highness consisting of six rooms from which you can go to a large enough garden, that has a room to keep plants in winter time.

From the same garden you can access



to a "Delightful building" which has the main entrance from the S.Marco square, consisting at ground floor of:

- a room
- two small rooms, and a closet that is in the garden.

On the first floor then there are:

- a room,
- four small rooms, and a closet ... "

On the basis of the expression 'delightful building' it is assumed that this 'addition' of the Casino Mediceo was requested by the Grand Duke himself for short stays, parties or exclusively private receptions; the above described outline corresponds to the new arrangement given by Bernardo Fallani to the pre-existing stanzone (factory), which had always been considered an integral part of the Casino di San Marco before.

This can be roughly seen in the maps of Florence but with more details in a map made the first half of the eighteenth century, drawn in color and entitled (in French) 'Plan du Rez-de-Chaussée du Palais près de S. Marc': it's interesting because it documents the distribution and use of

the Casino by Buontalenti, as well as its relationships with the outbuildings, such as the stables, carriage boxes, greenhouses and green spaces; there are also the Stanzone (the factory of the tapestries) beyond the garden, the corridor on the "street of the Arazzieri" which allows to pass to it from outside and another long building called "Office of the fortresses of His Royal Highness".

There is also a subsequent plan that shows the same situation about the Casino, but some changes in the Stanzone: the space is divided in two smaller rooms with a mezzanine and stairs. Moreover, the building behind, towards the church called "dei Pretoni" is subdivided, provided with stairs and enlarged inward, thus prefiguring the two apartments designed by Giuseppe Ruggieri for the Aiutanti della Cavallerizza (the Assistants of the riding hall). About this situation, there is a plan and front drawing which, however, differs from the previous one since there are not the four openings on the garden.

Returning to Bernardo Fallani, although his intervention on the

building is well known and confirmed, we must also remember the existence of other drawings by him concerning a further configuration of the area: there are three overlaid plans, marked as A, B and C, and a front view, in which the engineer plans to expand the building towards the the Church called dei Pretoni improving the overall distribution in an organic way.

Noteworthy is that in the C version the corridor between the road and the garden is incorporated by a room and an adjacent staircase, there are also six openings on the garden, the same that are represented in the "Facade of the Royal Casino ...": the drawing also shows the sections of the side walls and the floor height. The "new building" statement clarifies that the changes to be introduced are an addition to the old building or the original body of the Casino, reusing in part, but with more functional facilities for a prestigious residence the aforementioned neighborhoods for the Assistants provided by the Ruggieri.

It must be concluded that those projects did not develop as Fallani designed: in fact, from the documents

reached to us, almost exclusively plans of the nineteenth century (dated and not), we must suppose that the estate has been fractionated for renting to private citizens.

Thus, the architect's work remained in its primitive state, preserving so far the formal aspects that conveyed the Casino della Livia as a clever recycling of late 16th-century decorative patterns and the result of a cultural choice that had already received a sort of consecration in the Studio of Civil Architecture (in three volumes) by Ferdinando Ruggieri.

IGM ISTITUTO GEOGRAFICO MILITARE

The Military Geographic Institute has the task of providing geo-photo-cartographic support to the Units and Commands of the Italian Army. The Institute carries out the functions of the State's cartographic agency under Law no. 68 on February 2, 1960.

The Institute is therefore working to provide a wide range of users, both public and private, cartographic products offering the full range of content, coverage and territorial coverage.

It takes its origins from the Technical Office of the State Army of the Royal Army, which in 1861 had merged together the traditions and experiences of the homologous Office of the Sardinian Kingdom, the Royal Topographic Officer of Naples and the Tuscan Topographic Office. Transferred from Turin to Florence in 1865, to the current place, it was transformed into a military topographical institute in 1872 to assume, 10 years later, the present denomination.

The main activities of the Institute are:

- production, updating and sale of small and medium scale cartography;
- aerofotogrammetric coverage of the national territory;
- creation and management of the geographic database;
- maintenance of state boundaries;
- preservation of national historical cartography.

The Institute staff is committed to peace-support operations.

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PIANO TERRA - GROUND FLOOR-

- PT-01 Ingresso Entrance
- PT-02 Guardaroba Wardrobe
- PT-03 Servizi Igienici Toilet
- PT-04 Salotto Living room
- PT-05 Sala della livia Lounge area
- PT-06 Salone Lounge area
- PT-07 Disimpegno Disengagement
- PT-08 TV
- PT-09 Sala pranzo Dining room
- PT-10 Sala pranzo Dining room
- PT-11 Cucina Kitchen
- PT-12 Bar
- PT-13 Giardino Garden
- PT-14 Centrale Termica Thermal power station

PRIMO PIANO - FIRST FLOOR

- P1-01 Disimpegno Disengagement
- P1-02 Servizio igienico Toilet
- P1-03 Servizio igienico Toilet
- P1-04 Barbiere Barber
- P1-05 Sala del biliardo Billiard
- P1-06 Salotto Living room
- P1-07 Salotto Living room
- P1-08 Sala gioco Gaming room
- P1-09 Copertura Roof

AMMEZZATO - MEZZANINE

- PA-01 Disimpegno
Disengagement
- PA-02 Sala Conferenze
Conference room

PROSPETTI - FRONT

- Prospetto su p.zza San Marco
Front S Marco
- Prospetto via degli Arazzieri
Front Arazzieri
- Prospetto sul giardino
Front Garden



MAP

original scale
1:1000



TOP VIEW
Google Earth



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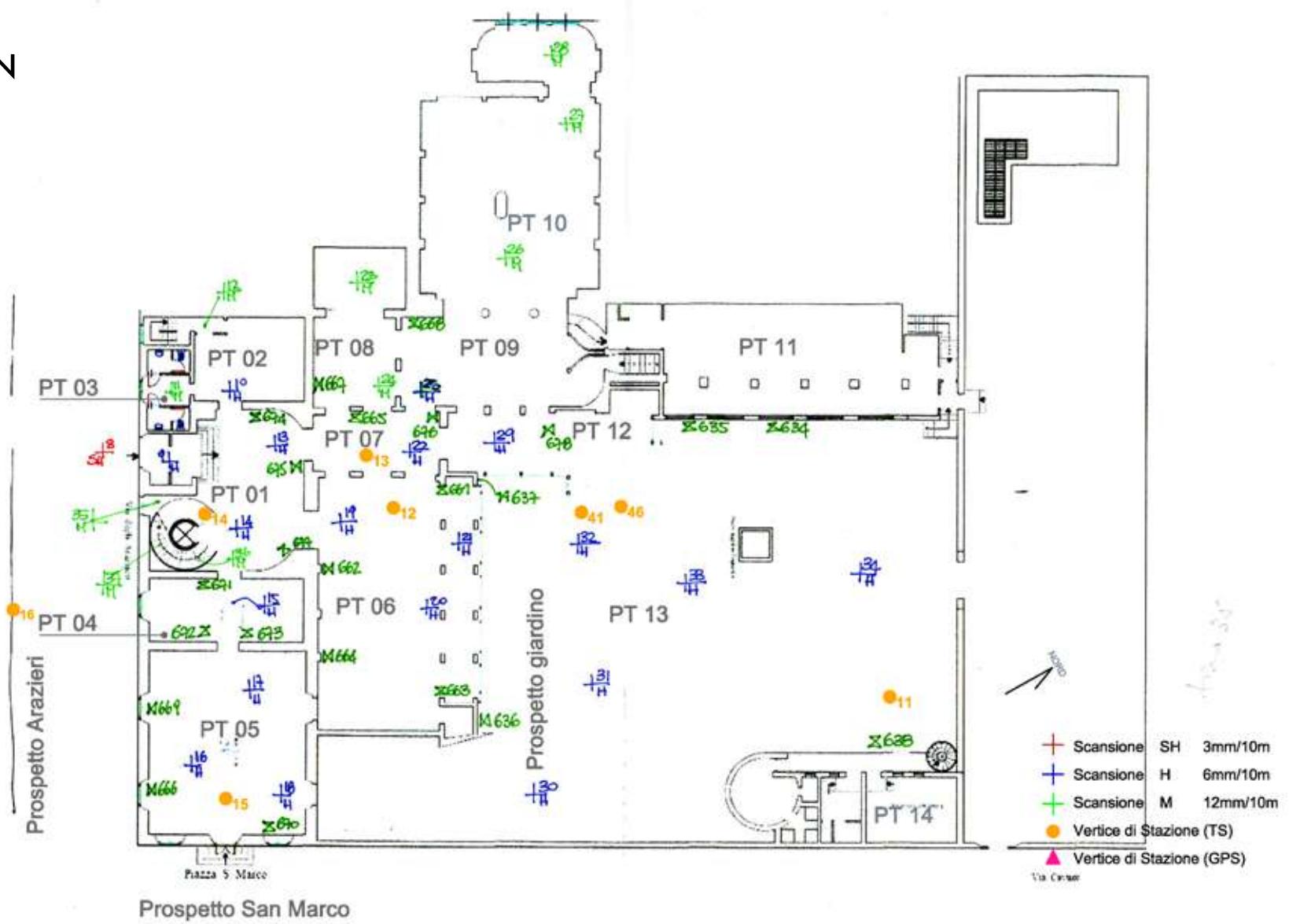
SCANNER Z+F 5010C**Nikon D700 +24 + 35 mm****DJI MAVIC**

DATA ACQUISITION



DATA ACQUISITION

Ground floor



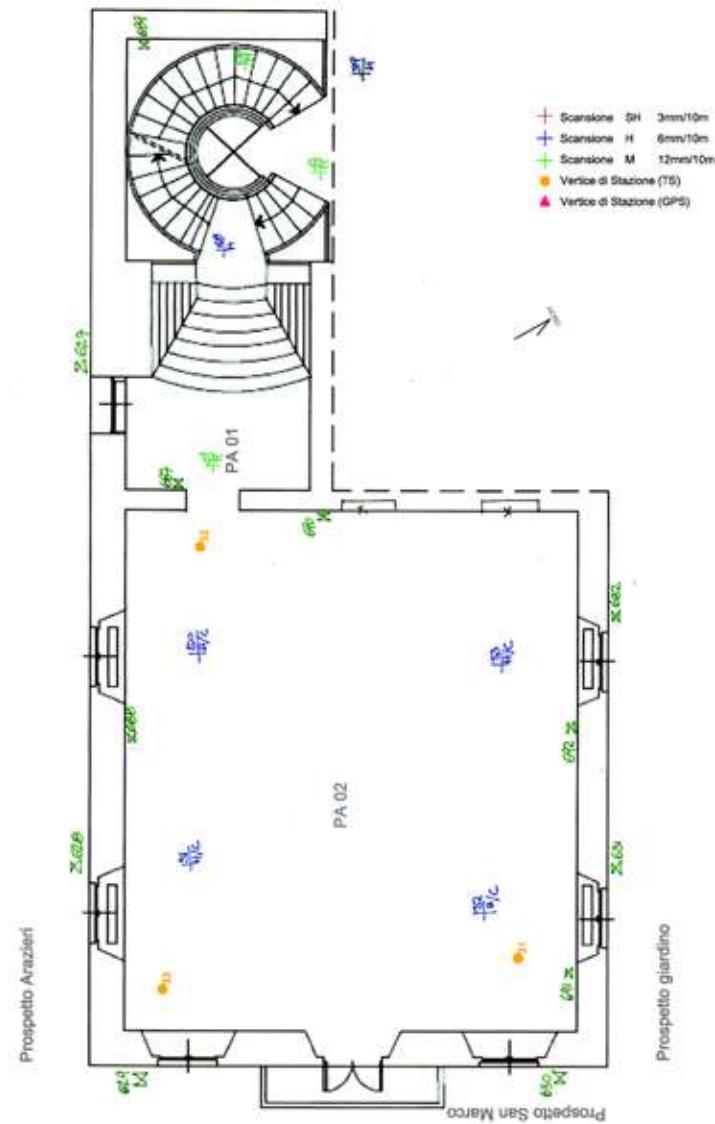
DATA ACQUISITION

First floor



DATA ACQUISITION

Mezzanine



WHAT TO BRING

For the workshop in general:

- Portable computer with mouse;
- USB memory;
- External hard disk;
- Pencils, pens and paper
- Mouse

Personal Laptop:

Free space: at least 50 Gigabyte.
Software to be installed, preferably before the workshop (even as trial version, from following websites):

- Autodesk 2016 + Recap
[<https://www.autodesk.com/education/free-software/all>]
- Agisoft Photoscan
[<http://www.agisoft.com/downloads/installer/>]
- Clouddcompare
[<http://www.danielgm.net/cc/>]
- Unity
[<https://store.unity.com/download?ref=personal>]
- PTgui
[<https://www.ptgui.com/download.html>]
- Pano2VR
[<http://ggnome.com/pano2vr#downloads>]

Other software that can be useful:

- Image processing (i.e. Photoshop)
- Presentation (i.e. Power point)

LOGISTICS

The registration fee for the workshop also includes coffee breaks and lunches for all three days of the workshop.

A shuttle service, at scheduled times, will be available to reach the location of the workshop

WHERE WE ARE

Location of workshop:

-  IGMI, Via Cesare Battisti, 10
Florence

Guest house:

-  IGMI, Via della Scala, 68
Florence

Conference:

-  Caserma Redi, IGMI,
Via Cherubini, 5, Florence



PARTECIPANTS

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