



POLITECNICO  
DI TORINO

# Honors thesis

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DEGREE IN  
SUSTAINABILITY DESIGN

*Abstract*

**IMAGE BASED INDOOR POSITIONING.  
Methodological considerations and practical solutions  
for an application at the Valentino Castle.**

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This thesis is the result of a research project conducted by the Politecnico di Torino in collaboration with the South Korean Institute ETRI (Electronics and Telecommunications Research Institute). The aim was to develop a procedure for indoor positioning based on image recognition, for security in public places such as subway stations and airports.

The approach to the innovative method of positioning, experience above mentioned and several comparisons with digital photogrammetry techniques and 3D scans to the survey of Cultural Heritage, are the basis of development of the work presented.

It is proposed a method that involves the use of data from these surveys, made with innovative technologies, not only for the drafting classical graphic works 2D and 3D, but for the development of a platform able to allow, in addition to the navigation in a digital model, virtual experiences and data sharing in a network of enhancement and enjoyment of an Architectural Cultural Heritage.

At first it was discussed the theme of the Indoor Positioning by introducing it through an overview of the current positioning systems on the market, their weaknesses, strengths and possible applications. Following were presented a set of methodological considerations on their use, with particular attention to the field of Cultural Heritage. The proposed project aims to actively contribute to the enhancement and is part of a process developed on the use of geomatics methods and techniques to make them flexible and provide digital tools of knowledge, enjoyment and communication activities related to the development of Heritage.

Cultural Heritage is increasingly central to the development of activities aimed at its enhancement and conservation and, research, in this scenario is a particularly current topic that involves a specialized audience and not.

The term Cultural Heritage is not only objects we can see and touch, but includes intangibles assets.

With entry into the Age of smart technologies, new applications to meet new requirements of the continuous technological innovation in relation to cultural activity and enhancement of Heritage are developing. The presence of new higher performance devices on mass market favors the intensification of experience in exhibition and museum scenarios, enriching the Cultural Heritage of each path and bringing it to the concept of infotainment capable of bringing different themes and target audiences increasingly diversified.

In the second section it was presented the case study, the Valentino Castle. Good choice, lends itself particularly to the application of the proposed project since more and more active in the scenario of events in Turin and the Po Axis enhancement projects. The case study is also particularly representative according to the above considerations as UNESCO World Heritage Site since 1977.

In the third section are described practical solutions for the realization of the proposed method and possible future scenarios of implementation, to introduce the positioning as a starting point, not only for a virtual and interactive navigation in the halls of the castle, but to give the enable users to receive and share information and experiences in a larger museum system and complex, networked, including other assets of the Cultural Heritage at our disposal.

The purpose of the project is to actively contribute to the promotion of Heritage trying to take part of a process designed to provide digital tools of knowledge, enjoyment and communication related to the development of Heritage.

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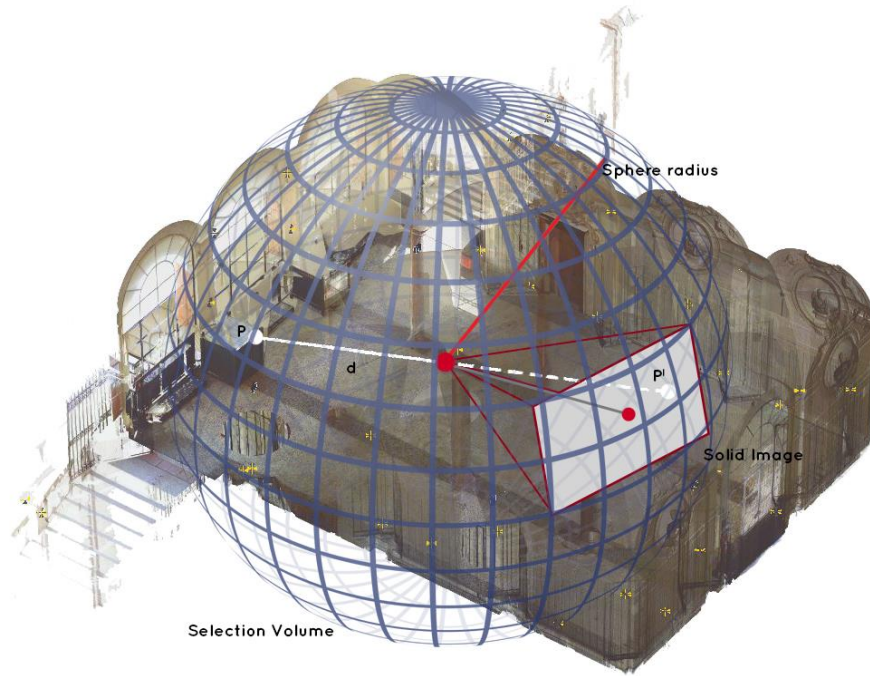


Fig. 1: Selection sphere for the creation of solid images, example on Columns Hall.

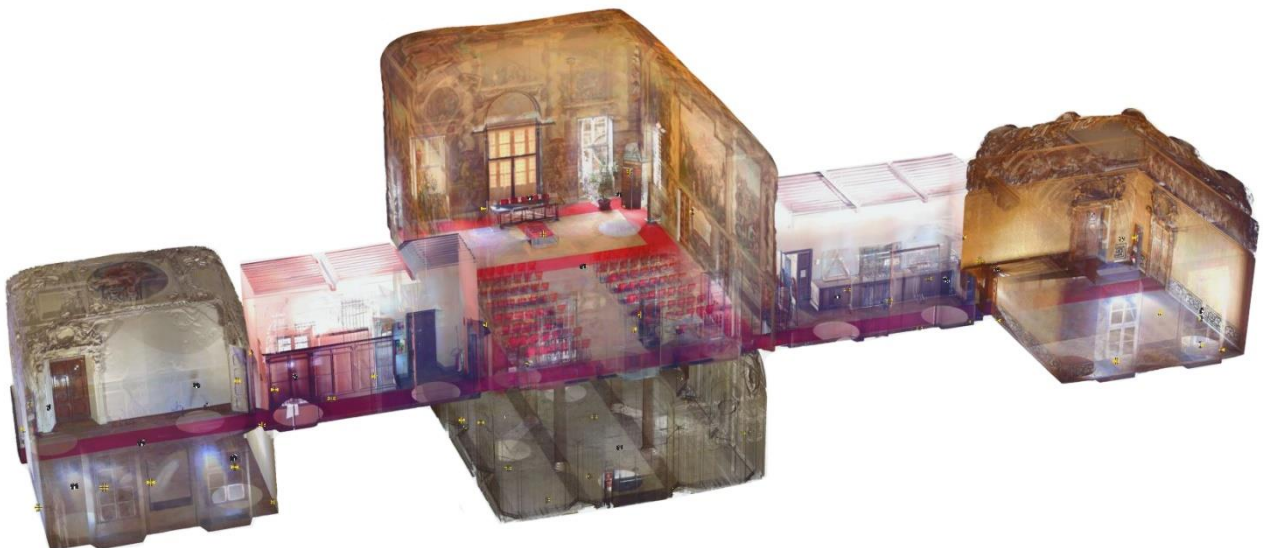


Fig. 2: 3D view on the complete point cloud of the Valentino Castle Halls, focus of study.



Fig. 3: Example of images generated by the software, raster with RGB matrix (sx); hdr with distance matrix (dx).