

PhD in Architectural and Landscape Heritage

Research Title: Digital Twins in Heritage context

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Supervisor	Spanò, Lingua
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Contact	https://www.g4ch.polito.it/wordpress/
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Context of the research activity	<p>Architectural Heritage and the realms of the urban environment are by their nature complex themes, which attract cross-disciplinary fields of research and practices. Knowledge and critical analysis of the built heritage are the core for any conservation or enhancement intervention; furthermore, these are also configured as essential elements for an overall development engine of the communities and territories that host the Heritage.</p> <p>The harmonized interaction among Heritage and its enriched documentation and modelling is a key source where challenging demands and organized potential to elaborate valorisation and advanced management answers in terms of innovation of applied technologies spatially concentrate.</p> <p>Nowadays the Digital Twin concept, as model representations of real-world entities, is a key point to develop and valorise built heritage included in urban environments. The virtual representation in the field of urban space including architectural heritage in the form of smart digital systems (GIS science) can offer multiscale data gathering, such as integrated and predictive analytics capabilities for sustainable cities. The research mainly focuses on the urban scale, but further developments related to landscape and architectural scale assets may be addressed.</p>
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<p>Objectives</p>	<p>Within the Geomatics research team and Geomatics Lab research framework, PhD candidates will define their specific research interests following the general themes to which Geomatics lab devote most efforts.</p> <p>The objectives of the PhD study will be based on the field of survey, processing, representing, managing, and making available geospatial information to fit many demands of documentation and analysis concerning built heritage and urban spaces and legacies. Thus, the use of spatial information, both to be produced and to be retrieved from available datasets, is fundamental to process the data in the form of maps, 3D models, and other geo-located data.</p> <p>Furthermore, data integrations and fusion will be addressed to achieve harmonization between both geometric and semantic content and to newly produce interoperable spatial and non-spatial databases.</p> <p>Nowadays the development of Historical BIM is important within the framework of 3D models of cities and their buildings, which includes both geometric and semantic information, and also because HBIM models have been widely recognized as a powerful tool for many applied research fields and case studies. Hence the research will focus also on the interaction and combination of GIS and BIM tools to enable and improve digital twinning strategies.</p>
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<p>Skills and competencies for the development of the activity</p>	<p>The PhD candidates interested in this research should hold a Master Degree in Architecture or Construction Engineering. Candidates must hold competence in the Geomatic sciences field and above all Geospatial data modelling using interoperable data and tools based both on image and range-based data sources.</p> <p>A selection of themes on which good competence are requested is the following:</p> <p>Instruments and methods for spatial data collection:</p> <ul style="list-style-type: none"> • Terrestrial laser scanning • SfM based photogrammetry (also UAV photogrammetry) • Topography and GNSS • SLAM based techniques <p>Method and tools for spatial data and points clouds models storing and managing in GIS and HBIM</p> <ul style="list-style-type: none"> • Data acquisition and processing • HBIM and 3D GIS environments • Multi-scale data fusion • rapid digitalization, model accuracy, • Informative contents: Level of Details (LOD), Level of Development, • Models inventories, • semantics for HBIM/3D GIS,
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We welcome candidates with strongly independent and critical thinking, skills in the use of the various sources and software tools. Interested candidates are requested to work within a multidisciplinary team, with great ability to work in collaborative, interdisciplinary and international research environments.