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Underground Spaces of the Basilica of Sant'Andrea in Piazza Mantegna New Research by the UNESCO Research Lab of the Politecnico di Milano

The digitization of narrow and difficult-to-access spaces such as tunnels, underground environments, and "hidden" staircases in historical architectures is always a challenge for those who document, inspect, or monitor these places. However, it is also an essential element for understanding their genesis, history, and design.

The three-dimensional reconstruction of these complex spaces, with precision and accuracy useful for defining them even in detail, allows scholars and researchers, or anyone interested in the history of beloved places belonging to their city, to immediately understand their geometries and "geography", that is, exactly where they are located and how they develop, in order to then deepen their genesis, their uses over time, their architectural and structural characteristics, and to think about their future through conscious projects.

The existence of underground and hidden spaces near the main façade of the Basilica of S. Andrea in Mantua has been known for some time. Various hypotheses have been written and made about their conformation and their possible uses, with suppositions regarding underground connections with other important architectures of the city.

The researchers of the UNESCO Research Lab of the Mantova Campus of the Politecnico di Milano, specialized in the field of Geomatics, for a scientific research activity shared with the University of Brescia and the Bruno Kessler Foundation of Trento, in recent days have started the survey of these interesting spaces experimenting with the use of technological systems for the survey and 3D restitution of complex places.

Thanks to the collaboration with the Diocese of Mantua and the Province of Mantua, it was possible to access these spaces. The data collected will be processed both to deepen specific scientific themes in the sector, and to obtain visualizations and 3D reconstructions useful for virtual tours or thematic insights (historical, material, etc.). The research, in fact, falls within the project "Cultural paths between art, faith and culture. Recovery, enhancement and inclusivity of the diocesan ecclesiastical heritage", financed with the call for "Beni Emblematici Maggiori" of 2022 by Fondazione Cariplo and Regione Lombardia, of which the Diocese of Mantua is the lead partner and the Politecnico di Milano - Mantova Campus is a scientific partner.

The ten researchers involved used four different instruments, based on LiDAR-SLAM and Visual-SLAM technology that allow them to locate and map, simultaneously and in motion, the surrounding environment. In this way, it becomes possible to digitize tight spaces more agilely than was possible just a few years ago. Through the different types of instruments, a three-dimensional point cloud (a real 3D database) has been generated, which allows the reconstruction of the shape of the spaces and galleries present under Piazza Mantegna, in the heart of the historic city. At the same time, the environments of the double-ramp staircase tower on the right counter-façade of the Basilica of S.

Andrea and the underground passages were surveyed, up to the well room with a hemispherical vault that is located below the current location of the ramps of the tower itself.

This research is an opportunity to experiment and compare cutting-edge technologies, which are increasingly taking hold in the field of surveying due to their lightness, speed and immediacy in providing results, with a good balance between acquisition times, costs and resulting accuracies. In the next phases of the research, the experimental data will be verified and geolocated to allow for various uses.

The knowledge of the underground spaces of Piazza Mantegna is in fact useful both from a structural point of view, for the modeling of the static behavior of the façade and adjacent historical buildings, and for geomorphological monitoring and possible interference with infrastructures or urban services.

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Who:

- Unesco Research Lab, Mantova Campus – PoliMi
- 3DSurveyGroup, PoliMi
- Gexcel e-DICATAM, Università degli studi di Brescia | UniBS
- 3D Optical Metrology, Fondazione Bruno Kessler | FBK

Research matter:

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