

**CONTINUOUS MONITORING THE CATHEDRAL OF MILAN:
DESIGN, INSTALLATION AND PRELIMINARY RESULTS**

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The institution named *Veneranda Fabbrica del Duomo* (VFD) [1] was established in 1387 with the objective of having in charge all operational aspects related to the Cathedral of Milan (i.e., design, construction, financing and maintenance). Since the completion of the building (19th century), the VFD is mainly involved in the continuous restoration and maintenance of the Cathedral.

Within the traditional collaboration between VFD and Politecnico di Milano, significant efforts were recently devoted by the authors to the critical re-analysis of the past issues experienced by the Cathedral of Milan and more recent experimental evidences (see e.g. [2-5]), with the objective of designing and implementing a continuous monitoring system, aimed at assisting the condition-based maintenance of the building (through the continuous interrogation of sensors installed in the structure and the extraction from measured data of features which are representative of the current state of structural health).

The conceptual design of the monitoring system is presented and discussed in the paper, as well as the investigations carried out to address the main choices and the first results obtained from the continuous monitoring.

To the authors' knowledge, the new monitoring system of the Milan Cathedral is the largest ever implemented in a Cultural Heritage monument and includes different measurements and sensors: traditional measurements of piers' verticality, acquisition of quasi-static strain in selected tie-rods and biaxial tilt of selected piers and the main spire, inner and outer monitoring of environmental parameters (temperature, humidity, wind direction and speed) and dynamic measurement of the velocity response at the top of 14 piers and 3 levels along the height of the main spire. In addition, the monitoring system is characterized by a distributed architecture, allowing easy modifications and/or adding of sensors; furthermore, all quasi-static sensors are not wired and powered through high capacity batteries (power charge every 3-5 years).

References

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