CERIS : Civil Engineering Research and Innovation for Sustainability

BIM for the smart management of heritage

Summary

The intention of this work is the development of a BIM-based solution to add "smartness" to cultural heritage buildings, based in wireless low-cost environmental and vibration sensors, that prove to be suitable for heritage building facility management. To that end, a sensor network will be installed with an optimization procedure as base, with programming scripts being defined to guarantee communication among sensors and the model. The data retrieved is intended to monitor environmental conditions and hazard parameters, to determine comfort and risk, in accordance with threshold values to be determined.

For the BIM construction it will be necessary the architectural survey of the building, with laser-scanning technology, to gather detailed geometrical information of the building. Also, tools that allow access to sensor data stored in model, such as plug-ins, will be explored. In this way, the last objective will be the implementation in a real case study of the integrated system of acquisition, storage, and query of data in real time, which allows for the informed decision making in facility management. To this end, the following tasks are planned: 1) The survey of the heritage building with laser-scanner technology; 2) Development of a Building Information Model; 3) Data acquisition through the identification and optimization of the Wireless Sensor Network; 4) Automation of data storage procedures in BIM, supported by BIM standards and frameworks; 5) Determine comfort and risk for alert and alarm values; 6) Identify solutions for remote query of real time data stored in model.

With this the intend result is to achieve a Self-Updating BIM that is constantly being feed sensor data allowing for the creation of a real time tool to support facility management. The case study will be the Monserrate Palace in Sintra, included in the UNESCO landscape heritage list, the construction of this palace dates from 1863 and combines architectural elements of medieval and oriental influence, being one of the most visited monuments in Sintra. With a record of neglet throughout its history, that led to several major interventions over the centuries, a careful management plan would benefit the site. The study of the impact of environment conditions, such as humidity, is crucial since it as had a major role in deterioration over the years due to its location on Sintra Hills, without belittling the study of seismic hazard since there are clear historic records of major deterioration of the location due to previous instances.

Keywords

BIM, laser-scanning, facility management, wireless sensor network.

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Preliminary point cloud in Autodesk Recap software of the Case Study - Monserrate Palace, Sintra.

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