A Knowledge Base for improving the Situation Awareness of Cultural Heritage buildings

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Europe has a significant cultural diversity together with exceptional ancient architectures and artwork collections that attract millions of tourists every year. The UNESCO sites in Europe are almost 400, located in different Climatic European Regions. This incalculable value and global assets have to be preserved for future generations. Environmental factors, worsened by the increasing climate change impact, represent significant threats to Cultural Heritage (CH) assets as monuments, historic structures, settlements and archaeological sites.

The management and preservation of Cultural Heritage (CH), particularly in the context of climate change, is a complex task in which authorities and decision makers need to oversee information from diverse sources and domains, including the analysis of data that is stored in different formats. Yet, only by considering all relevant and available information, stakeholders can make well-grounded decisions. This imposes a complex task upon the authorities, not only due to the diversity, but also to the quantity of available data. Therefore, authorities need to extensively aggregate and assort information in preliminary work, before they can make use of it.

To support the stakeholders in this task a Knowledge Base was created, which is able to integrate heterogeneous data from multiple sources, namely results from realtime sensors, predictive climate models, lab analysis of materials and related risks. All that information is semantically linked and available from one central entry point for each site and building. This supports decision makers in understanding the current situation of their site and then to plan long and short term maintenance and restoration actions with the aim to mitigate the effects of climate change.

The main challenge of such a Knowledge Base is to bridge the gap between two different worlds: the CH stakeholders and the scientific/technological experts since protecting cultural heritage assets and increasing their resilience against effects caused by the climate change is a multidisciplinary task. Experts from many domains need to work together to meet the conservation goals. As a solution the Knowledge Base facilitates an ontology, which models the risks and effects of climate change with regard to CH buildings and monuments and the caused damage and potential materials for restoration. Therefore, it covers the following topics: Cultural Heritage Assets, Stakeholders and Roles, Climate and Weather Effects, Risk Management, Conservation Actions, Materials, Sensors, Models and Observations.

Data (unrefined factual information), information (usable information created by organizing, processing, or analyzing data) and knowledge (information of higher order derived by humans from information) all play an important role in knowledge-intensive projects. A Knowledge Base needs to support all three types and support the creation of linking them. Therefore, the presented CH Knowledge Base maps the research results from the different domains to the ontological network. As a result the user can navigate and access all the relevant data and information starting from a CH building of interest and add additional knowledge.