

Advanced sensor for remote and automatic monitoring of wooden structures and works of art

DESCRIPTION OF THE INVENTION

The invention is an advanced sensor for remote and automatic monitoring of wooden structures and works of art.

There is a constant need for preservation and maintenance of historical and cultural heritage. Nevertheless, the huge amount of heritage is overwhelming and has surpassed the capabilities of traditional and conservative management, which usually start once significant degradation has been detected. Thus, it is crucial to change that approach and to be able to anticipate and prevent possible degradations. This implies inevitably the use of sensors and new technologies (ICT, wireless technologies, cloud computing, big data, Internet of Things).

Xylophagous insects and fungi, especially termites, can cause structural and ornamental damage to wood structures, including high-value historical buildings and works of art (paintings, sculptures, altars, altarpieces, etc.). Art collection care, which is often called preventive conservation, can be significantly enhanced if automated continuous monitoring techniques can be applied in order to detect dangerous situations, such as extreme temperatures, high moisture or pest. In addition, automated techniques could simplify the efficient implementation of vulnerability analysis.

Due to the growing necessity of monitoring wooden works of art and the structural timber elements in buildings of cultural heritage in an automatic, cheap and reliable way, a new wireless sensor was developed.

The sensor was designed and developed by Miguel Ángel Abián Pérez, an AIDIMME's researcher responsible of the 'Wood Construction' R&D line. In practice, the sensor is used forming part of wireless networks that fulfills Smart City protocols and standards. Their data, if desirable, are integrated with Smart City platforms in order to show them in a public or private way.

Wireless networks of the sensor developed have been installed in the historic Central Market of Valencia, the Cathedral of Valencia, the Historic Center of Ávila, the Cathedral of Palencia, the Basque and History Museum of Bayonne (France), and the Monastery of San Pedro of Roriz (Portugal). The sensor can be also installed in new buildings in order to monitor the behavior of the structure.

The sensor can easily be modified to detect more situations related to wood degradation at an initial stage (vibrations, sound emissions, etc.) and it is now being programmed with algorithms to predict the future behavior of wooden elements and works of art. Hence, it opens an innovative research area for the monitoring and preventive conservation of timber structures and wooden works of art.

Due to the early and easy detection of the biodegradation risk, the sensor prevent future costs of repairing or replacing wooden elements, as well as the application of cost-intensive remedial chemical treatments with negative environmentally and health impacts.

APPLICATION BUSINESS SECTORS

-) Heritage preservation and management
-) Museums
-) Art collectors and private art collections
-) Construction and rehabilitation
-) Wood treatments and pest control

TECHNICAL ADVANTAGES AND BUSINESS BENEFITS

The sensor offers the following advantages and business benefits:

-) has no moving parts, what increases its reliability;
-) is bidirectional, and can be configured continuously by means of wireless data transfer;
-) is able to detect risks for fungal decay by relating the wood conditions (moisture content and temperature) to the development conditions of xylophage agents;
-) is suitable for indoor or outdoor use;

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-) is small and compact and easy to install and maintain;
-) can be installed in termite bait treatments in order to monitor them and to control the number of termites feeding without opening them from time to time;
-) prevent the application of cost-intensive rehabilitations and remedial chemical treatments with negative environmentally and health impacts;
-) is fully integrated with Smart City protocols, standards, and platforms;
-) is compatible with 3G/4G/5G.

STATUS DEVELOPED OF THE TECHNOLOGY

TRL7: the sensors has been installed in operational environments

INTELLECTUAL PROPERTY RIGHTS

The product and the manufacturing methods described are patented at European level.

Title: DEVICE AND PROCESS FOR THE DETECTION OF BIODEGRADATION OF WOOD

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COLLABORATION SOUGHT

Public and private entities or persons interested in cooperating are sought through:

-) Patent license agreement for the implementation and use of the patented technology.
-) Agreement for the implementation of the remote and automatic monitoring system to assist in the maintenance of wooden structures, works of art and the historical and cultural heritage set.
-) R&D collaboration agreement for the improvement of the system and / or integration in existing monitoring and maintenance systems, either in wooden structures, in works of art and the historical and cultural heritage set.

RELATED IMAGES





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