STRUCTURAL HEALTH MONITORING ISSUES IN THE VIBRATIONS OF FLEXIBLE PYLONS

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ABSTRACT

In this work, we report on structural identification for flexible, tapered pylons under the influence of external loads in the form of impulses for the purpose of developing a structural health monitoring system capable of operating continuously and in remote mode. The basic idea behind such a system is to use the minimum number of sensors, enhanced with structural analysis capabilities so that the continuously generated streams of data can be evaluated locally. These data streams could contain key kinematic and/or stress variables as functions of time and would be remotely transmitted to a central processing unit for further evaluation. This will happen only if a preliminary local processing of the data indicates that there is a strong possibility that the monitored structure is showing signs of overloading resulting in localized damage. The entire procedure could then be placed within an artificial intelligence environment in the form of an expert system that could outline a repair and rehabilitation protocol if necessary. Among the loads under consideration in the future could be wind, temperature and ambient vibrations due to traffic. It is believed that structural health monitoring nowadays plays a pivotal role in helping ensure the safe and continuous operation of lifelines such as electric power lines, telecommunication antennas, natural gas pipelines, etc., as well as of key transportation infrastructure components such as bridges.

Keywords: Pylons; structural health monitoring; finite elements; field measurements; ambient vibrations; structural dynamics

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