

Design of a biomimetic-based monitoring and diagnostic system for civil structures

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Abstract: Recent high intensity natural events such as hurricanes, tsunamis, and earthquakes have introduced new challenges for the design, maintenance, and sustainability of civil structures. Globally, civil infrastructures are deteriorating at an alarming rate caused by overuse, overloading, aging, damage or failure due to natural or man-made hazards. With such a vast network of deteriorating infrastructure, there is a growing interest in continuous monitoring technologies. In order to provide an information data transfer mechanism that integrates output of an embedded, distributed sensory network and the control system in civil structures, this paper describes design and development of a Structural Nervous System that mimics key attributes of the human nervous system. This biomimetic-based innovative idea for the design of a self-powered structural monitoring and diagnostic system utilises a novel, non-living plant protein (forisome) for sensing and information transfer. The overall nervous system design and preliminary experimental data on forisomes are presented in this paper.

Keywords: biomimetics; smart structures; nervous system; self-diagnostics; structural monitoring.

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Biographical notes: Rahmat Shoureshi was born in Esfahan, Iran in 1953. He obtained a BS Degree in Mechanical Engineering from Sharif University of Technology (Tehran, Iran) in 1975. He received his MS Degree from Massachusetts Institute of Technology in 1978 and a PhD Degree in Mechanical Engineering (with Professor Henry Paynter) from Massachusetts Institute of Technology in 1981.