Active tendon control of a Geiger dome

Mohamed Hechmi El Ouni, Nabil Ben Kahla

First Published October 22, 2012 | Research Article

Abstract

This paper investigates the nonlinear modeling of a smart tensegrity structure of Geiger's type with active damping using pairs of displacement actuator and force sensor, collocated at the lower end of strings and/or struts. A control strategy based on decentralized collocated integral force feedback is employed. A linear model is first used to optimize the number and the location of the active tendons. A geometric nonlinear dynamic procedure is then used for the analysis of the response of the structure with and without active control. An incremental-iterative solution based on a Newmark direct integration method and a modified Newton–Raphson scheme is adopted for solving the nonlinear equation of motion. For high excitations, the nonlinear dynamic behavior of the smart cable dome is observed and damping is successfully added to the system. The responses with and without control of particular modes are studied in frequency and time domains. The results obtained indicate that the active control strategy presented in this paper is adequate for vibration attenuation of Geiger domes.

References


