Application of a simple two-point measurement strategy with emphasizing low-frequency signals to the force monitoring of cables

Pao-Yin ZHONG[1], Yu-Hsiang LIN[1], Chih-Peng YU[1]

[1]Civil Engineering, National Chung Hsing University, Chinese Taipei

When dealing with vibration tests of tensioned suspenders and cables, signals containing relatively high frequency components in comparing to the fundamental frequency are normally required in order to carry out reliable diagnoses for force estimations. Meanwhile, the necessity of obtaining a precise and broadband spectrum of the vibration signals would inevitably need to acquire relatively detailed time responses. One typical difficulty, which arises when incorporating vibration analyses into monitoring tasks, is the inefficiency caused by the post-processing for the huge amounts of time data. In this paper, a set of simple yet effective formulas associated with two-point measurements will be briefly addressed. The proposed formulas are derived based on the continuous formulations of the string model, and the corresponding applications to the tension estimations of slender members will be demonstrated using numerical and experimental data related to stayed cables of various restrained scenarios and linked-suspenders as well. The purposes of this work are twofold; firstly to introduce the potential usefulness of the proposed measurement strategy to form effective schemes for the tension assessments; secondly to evolve an efficient incorporation of wireless measuring techniques without the need of processing cumbersome time data which are the common consequences the analysts would encounter in the analysis tasks. Finally, this work aims to highlight practical ideas in guiding the use of the proposed techniques in the monitoring of cables/suspenders in field.