SM3L_10457

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Optimal Vibration Control of Guyed Masts

Bartlomiej D. Blachowski, Witold Gutkowski

IPPT PAN, Warsaw, Poland

Ice, together with wind pressure, are the most common reasons of mast failures. With this in view a robust, optimal control is proposed. The feedback control is designed to measure the structural motions of a guyed mast and to generate corrective control forces, to improve the structure response characteristics. The control forces cause tension changes in guy cables, using mechanical actuators at anchor points. The optimization is performed by minimizing a performance index, accounting for the closed-loop output error and the control effort required to regulate the system. The study starts with a discussion of dynamic properties of the mast and nonlinearities present in the problem. Then, based on the assumption of small amplitudes of vibrations, equations of motion are derived using motion linearization. Conditions of stability, controllability and observability are also investigated. Finally, the paper is illustrated with a numerical simulation of a vibration control process.

View the extended summary