Sparse optimal control of Timoshenko's beam usinga locking-free finite element approximation

Pedro Merino

Escuela Politécnica Nacional (Quito-Ecuador)

This work investigates an optimal control problem for a Timoshenko's beam with sparse controls, focusing on its numerical approximation via the finite element method and solution using nonsmooth optimization techniques. The incorporation of sparsity-promoting terms in the cost function is particularly beneficial for beam vibration models, as it localizes the control action, facilitating the strategic placement of actuators or control devices. We employ a locking-free finite element scheme with linear elements. Our analysis confirms that this discretization retains the locking-free property, ensuring a linear convergence rate for the L1-control case. For L0-controls, the approximation order depends on the distribution of switching points. These results provide insights into the computational feasibility and accuracy of sparse optimal control approaches for beam models, with implications for applications requiring precise actuation and efficient control strategies.

In Special Session 21 on Optimization and Control at the Mathematical Congress of the Americas 2025.

MCA 2025 internal code: SS21-T10