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A dynamic approach for the analysis of thin-walled members within the generalized beam theory (D-GBT)

The Generalized Beam Theory (GBT) is a powerful tool for the elastic and buckling analysis of thin-walled members (TWM). The basic idea of the method consists in describing the displacement field of the TWM as a linear combination of assumed deformation modes of the cross-section (including in-plane and warping components) and amplitude modes, which are unknown functions depending on the axial coordinate. This approach falls within the Kantorovich's semi-variational method because of transforming a three-dimensional continuous problem into a vector-valued one-dimensional problem. The use of the GBT requires the execution of two main steps: (1) The identification of a suitable set of deformation modes capable of describing the cross-sectional behavior, referred to as cross-sectional analysis and (2) The member analysis that determines the amplitude values defining the intensity of the deformation modes along the member axis. In this context, the novelty of the proposed approach relies on the use of the dynamic modes of the cross-section as the basis of the GBT deformation modes. In particular, the dynamic analysis is performed on a planar frame that represents the cross-section and this procedure enables the evaluation of the conventional, extension and shear modes. The proposed approach is applicable to open, closed and partially-closed cross-section. After providing a brief description of the D-GBT method, its ease of use is demonstrated considering a number of case studies.

Biography

Gianluca Ranzi is currently an ARC Future Fellow, Professor and Director of the Centre for Advanced Structural Engineering at the University of Sydney Australia. His research interests range from the field of Structural Engineering with focus on computational mechanics, behavior and design of steel, concrete and composite steel-concrete structures to architectural science, heritage conservation and high-performance buildings.

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