Bending and unbending a backbone curve of nonlinear oscillators

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Abstract:
A backbone curve is a graphical presentation of the relationship between the natural frequency of an oscillator and its amplitude. A linear oscillator has a straight-line backbone curve as its natural frequency is amplitude-independent. Nonlinear oscillators, in general, have the frequency that changes with their amplitude, which implies that their backbone curve is not straight, but bent. When these oscillators are externally excited, the primary resonance response around the backbone curve is associated with certain nonlinear phenomena, such as multiple coexisting response outcomes and sudden discontinuous changes of the amplitude, which can be unwanted in practical applications. The overview of the possible shapes of backbone curves is presented, including the case when multiple banding of the backbone curve is created. The insight into the corresponding dynamics is provided. It is also shown how one can use nonlinearity to unbend a backbone curve of nonlinear oscillators to make it be straight as in the linear oscillator.

Biography:
Ivana Kovacic is a Full Professor of Mechanics at the Faculty of Technical Sciences, University of Novi Sad, Serbia. She got her undergraduate degree in Mechanical Engineering in Mechanics and Mechanical Design at the Faculty of Technical Sciences of the University of Novi Sad. She got her Master and PhD degrees at the same faculty in Mechanics. She has passed through all the academic titles at the same faculty, starting from a teaching assistant to a full professor, which is a position she gained in 2014.

During her MSc studies, she was a fellow of the Ministry of Science of the Republic of Serbia. He was also a recipient of a scholarship from the Ministry of Science of the Republic of Serbia for her postdoctoral education in the Institute of Sound and Vibrations ISVR of the University of Southampton, UK. She has been a Visiting Professor for Theoretical Mechanics at the Institute of Sound and Vibration of the University of Southampton, the University of Sheffield, and the University of Strathclyde, Glasgow, UK. Since 2014, she has been an honorary foreign member of the Academy of Sciences and Arts of the Marche, Italy.
Her main expertise is related to nonlinear oscillations, their modelling, analytical investigations of their behaviour and associated phenomena.

Ivana Kovacic is a Subject Editor for Nonlinear Oscillations in Journal of Sound and Vibration (Elsevier), Mechanics Research Communication (Elsevier) and Meccanica (Springer). Previously, she also served as an editor in Journal of Mechanical Engineering Science, Part C and European Journal of Mechanics A- Solids.

She is the Head of the Center for Vibration-Acoustic Systems and Signal Processing CEVAS at her faculty, which received the status of the Center of Excellence from the highest Serbian research authorities - the National Council for Scientific and Technological Development in 2015.