MECHANICAL ENGINEERING STUDENT SEMINAR

Wednesday, November 06 2024 at 13:30, D. Dan and Betty Kahn Building, Room 217.
Online: https://technion.zoom.us/j/98237476984

Nonlinear wave phenomena in bilinear discrete chain

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In recent years, the field of nonlinear lattices has accumulated significant attention. Those structures present an intriguing combination of discreteness and nonlinear effects, leading to the development of a range of applications, such as energy harvesters, shock absorbers, vibration mitigation, and deployable structures. Nevertheless, the full potential of these nonlinear lattice structures remains largely unexplored, with new phenomena continually being discovered.

The current understanding of these emerging phenomena is even more lacking when considering discrete systems incorporating piece-wise-linear (PWL) nonlinearity. Such systems appear in applications such as vibrating beams with unilateral supports and valve-springs dynamics. In addition, models incorporating PWL nonlinearity are widely adopted for enabling analytical treatment of complex mechanical structures and lattices with nonlinear interactions.

This seminar will delve into one of the simplest of these systems, namely a 1-D lattice with nearest-neighbor interactions characterized by a symmetric bilinear nonlinearity. Our theoretical study has revealed the formation of complex wave phenomena emerging in the system, such as traveling waves, traveling modulation waves and discrete breathers. The latter are a special discrete vibration state characterized by spatially-localized oscillating waves that can be of stationary or propagating nature. In the seminar I will present analytical results, some exact and some based on approximations, along with results of numerical simulations.

Note: the seminar will be given in Hebrew

Seminars Coordinator: Assoc. Prof. Matthew Suss.