MECHANICAL ENGINEERING STUDENT SEMINAR

Thursday, December 26, 2024, at 13:00, D. Dan and Betty Kahn Building, Room 217.
Online: https://technion.zoom.us/j/98705407210

Dynamics of super-harmonic escape from truncated quasilinear and strongly non-linear potential well.

Youval Kanciper

Advisor: Prof. Oleg Gendelman

The problem of escape attracted a lot of attention over an extended period of time. Recently, the analytic approach towards this sort of problem had been suggested in the context of the primary 1:1 resonance. The effect of the secondary resonances is well-known from early numeric simulations, but the analytic approach capable of predicting the escape threshold and safe basins in the space of initial conditions is still missing. In this study we address a particular case of this problem, namely a particle under super-harmonic excitation in a one degree-of-freedom weakly anharmonic truncated quartic potential well. This system itself was studied before, though not so much in the context of analytic approaches.

Using our predetermined escape condition, an analytic approach is used in order to derive predictions to the shape and values of the escape boundary and the safe basins. Initially this is done for the simple case of a zero-initial phase harmonic forcing and zero initial conditions. Using some transformations, the analytic predictions are then further generalized to be applicable to more general cases such as the case of any initial phase in the harmonic forcing as well as non-zero initial conditions all of which led to rather remarkably accurate analytic predictions.

Lastly, using some of the aforementioned results, combined with previous analytic results made on the main 1:1 resonant behavior in the strongly non-linear system, an attempt is made to explore the super-harmonically excited system in the strongly non-linear case.

Note: the seminar will be given in Hebrew

Seminars Coordinator: Assoc. Prof. Gal Shmuel .