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Application of trajectories in extended phase space for identification of external excitement

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Abstract: External excitation plays a dominant role in forming periodic oscillation modes, as it sustains the free oscillations in the system at the frequencies that are equal to or a fractional or multiple value of the frequency of the external excitation. The effect of the polyharmonic external excitation causes the emergence or onset of novel properties in the system. Thus, the linear mechanical system may have an infinite number of the resonance frequency ranges corresponding to harmonics of the external excitation. The phenomenon of dynamic smoothing is also an evidence of the polyharmonic nature of the external excitation. Dynamic smoothing manifests itself by the decreased effect of the positional friction forces as it is displayed in the graphs of transient processes in the mechanical systems. Therefore, some assumptions, for instance, those concerning the monoharmonic nature of changes in the external excitation, which are commonly used in studying the real mechanical systems, are not always correct. The application of phase trajectories and its mappings on plane “acceleration – displacement” is suggested by author to nonparametric identification of external excitement forms systems models. The efficiency of the given method had estimated by it’s comparison with a known method of non-parametric identification.

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