Stochastic Modelling of State Space of Rotating Rotor Systems

Vladimir M. Sokol

Institute for Advanced Studies,
1/27 Raanan St., Arad 89044, Israel
E-mail: vmsokol@012.net.il

Key words: nonlinear stochastic system; rotating rotor; parameters measurement; dot mapping; state space.

Random factors and processes influencing onto the rotor system (including properly rotor as the solid body rotating around its axis and detained by its bearing surfaces in supports, bearing mount assemblies of a rotor, the devices or the fields providing rotation, and also external elements of an attached rotor loading) in the general case allow considering, that the rotor system is the nonlinear stochastic system. The analysis of such rotors systems is rather difficult; for all that, complexity of mathematical modeling and analysis complexity of nonlinear stochastic systems is intensified by complexity of continuous system measurement of mechanical parameters of a rotating rotor.

The method of continuous identification of system of parameters of a rotating rotor, which is based on measurement and calculation of all complex of parameters by means of sensors system located in supporting planes of a rotor (or close to them), allows to determine by means of computing system the parameters values corresponding to instant rotor position. The set of these parameters values is the dot mapping of a rotor state. The sequence of such dot mappings, which is limited to an operating time of rotor system, is its state space during a full work cycle. The state space allows proceeding to the differential description of nonlinear system by means of Poincare's sections, to display stochastic process of a rotor rotation in view of probable fluctuations, and also to supervise a rotor state on nonlinear kinks of its characteristic in view of probable bifurcations and occurrences of harmful attractors.