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Period doubling bifurcation and chaos exhibited by an isotropic plate

The scenarios leading by period doubling bifurcation to chaos are illustrated and analyzed using an example of one layer flexible plate. The derived two partial differential equations govern a motion of thin isotropic plates in relation to the deffection function $w(x, y, t)$ an the stress function $F(x, y, t)$ (for a case of stationary problem they correspond to von Karman equations). Three different boundary conditions are considered.

Using difference operators the problem is reduced to that of solving ordinary differential and algebraic equations. A suitable numerical algorithm is proposed.

Furthermore, using a longitudinal load as a control parameter a Hopf bifurcation as well as the period doubling bifurcations have been detected, which finally lead to chaos. Chaotic behaviour have been analysed using a Poincaré mapping and the Fast Fourier Transform (FFT).

A few important conclusion have been given.

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