

Effects of Hard Limits on Bifurcation, Chaos and Stability

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摘要 An SMIB model in the power systems, especially that

concerning the effects of hard limits on bifurcations, chaos and

stability is studied. Parameter conditions for bifurcations and

chaos in the absence of hard limits are compared with those in the

presence of hard limits. It has been proved that hard limits can

affect system stability. We find that

(1) hard limits can change unstable equilibrium into stable one;

(2) hard limits can change stability of limit cycles induced by

Hopf bifurcation;

(3) persistence of hard limits can stabilize divergent trajectory

to a stable equilibrium or limit cycle;

(4) Hopf bifurcation occurs before SN bifurcation, so the system

collapse can be controlled before Hopf bifurcation occurs. We also

find that suitable limiting values of hard limits can enlarge the

feasibility region. These results are based on theoretical

analysis and

numerical simulations, such as condition for SNB and Hopf bifurcation, bifurcation diagram,

trajectories, Lyapunov exponent, Floquet multipliers, dimension of

attractor and so on.

关键词 [SMIB system, Bifurcations, chaos, stability, feasibility region](#)

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