The Influence of Machine Saturation on Bifurcation and Chaos in Multimachine Power Systems
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A bifurcation theory is applied to the multimachine power system to investigate the effect of iron saturation on the complex dynamics of the system. The second system of the IEEE second benchmark model of Subsynchronous Resonance (SSR) is considered. The system studied can be mathematically modeled as a set of first order nonlinear ordinary differential equations with ($\mu = X_c/X_L$) as a bifurcation parameter. Hence, bifurcation theory can be applied to nonlinear dynamical systems, which can be written as $dx/dt = F(x;\mu)$. The results show that the influence of machine saturation expands the unstable region when the system loses stability at the Hopf bifurcation point at a less value of compensation.

Keywords: Machine Saturation, Hopf Bifurcation, Chaos, Subsynchronous Resonance, Damper Windings.