BIFURCATIONS OF A FORCED RAYLEIGH EQUATION

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ABSTRACT

We discuss the bifurcations of a two-parameter averaged system of a forced oscillator of the form

$$\ddot{x} - \xi\dot{x} + \zeta x^2\dot{x} + x + \alpha x^3 = \psi\cos\Omega t \quad ,$$

where $\xi = 2$, $\zeta = 8$ and $3\alpha = 8\Omega$.

Local bifurcations of Hopf and saddle-node type and global bifurcations of saddle connection type are found to exist and are investigated. The normal forms techniques of Takens are used to investigate the degeneracies of the system at certain exceptional parameter points. Furthermore, the limit cycle behavior of the system is discussed from the point of view of existence and uniqueness. Numerical calculations are also used to support the various theoretical results.

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