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Degenerate Hopf Bifurcation in DDEs and Endemic Bubbles

We consider 2-parameter families of retarded functional differential equations (RFDE) which undergo Hopf bifurcation from an equilibrium, but for which the crossing condition of the Hopf theorem is violated (such a degeneracy is codimension 2). We classify the possible bifurcation diagrams in terms of the nonlinearities of the RFDE, and we apply the results to an SIS disease model incorporating delayed behavioral response.