Limit-cycle oscillators subject to a delayed feedback

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The coexistence of two stable limit cycles exhibiting different periods is examined for a nonlinear oscillator subject to a delayed feedback. For the case of a weakly nonlinear oscillator, we discuss the validity of a previously determined phase equation. For the case of a strongly nonlinear oscillator, we derive a phase equation and analyze its bifurcation diagram. Our analysis is motivated by previous experimental studies of chemical oscillators controlled by a delayed feedback.