Slowly varying parameters in time periodic delayed system

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The main goal of this research is to estimate the dynamics of a parametrically excited slowly varying delayed system around the parameter set where the Hopf bifurcation of the stationary period-one solution occurs. This slow passage through the Hopf point from stable to unstable causes a shift in the critical parameters, where the escape is actually experienced. This shifted parameter points, where the gradually changing quasi-stationary solution loses its stability, predicted by using a modified multiple scales asymptotic method. In this work the perturbed parametrically excited system is transformed to the non-autonomous Hill-type equation considering a finite number of modulations. The applicability of the method is critically discussed and a comparison is made with time domain simulations. The effect of the parametric excitation subjected to gradually changing parameter induces periodic forcing with small amplitude that contributes to the long time behavior of the solution. The case presented in this paper is important for an industrial case to describe a milling process that follows the machine workspace with varying dynamics.