Abstract

This thesis examines the effect of discrete time delay on the collective dynamics of coupled limit cycle oscillators that are at Hopf bifurcation while retaining both phase and amplitude variations. The study is primarily theoretical in which extensive analytical and numerical investigations have been carried out. The model systems studied include two coupled Hopf bifurcation oscillators, its generalization to $N$ oscillators (where $N$ can be a large number and even tend to infinity), a novel single oscillator model with time delayed feedback terms and finally an externally driven system of coupled limit cycle oscillators. In addition, an experimental study of two coupled nonlinear electronic circuits has also been carried out. The experiments confirm some of the theoretical results particularly the important finding of death among identical oscillators.