Stability of Delay Differential Equations with Applications in Population Dynamics

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The thesis is concerened with the stability theory of neutral functional differential equations(NFDEs) and global stability analysis of some population dynamical systems with delays.

An equation is called an NFDE, if the rate of change of its state depends not only on its past states but also on the past rates of change of its state. It is known that, in many application fields, such as population ecology and control engineering et al., more realistic models are usually described by the NFDEs. Hence, during the past forty years, the stability theory of NFDEs has been studied extensively. However, it is clear that, since the presented results are mainly established based on the methods of Liapunov functionals or Razumikhin-Liapunov functions or characteristic functions, the applications of these results are actually not easy. Thus, to explore more easily verifiable stability criteria for NFDEs is still a very important subject. One of the purposes of the thesis is devoted to consider this problem. In the thesis, we also consider some population dynamics with delays.

The thesis is organized as follows. The introduction on the thesis is given in Chapter 1. In Chapter 2, we establish some important differential difference inequalities, which play very important roles in the thesis. Stability and instability of NFDEs are considered in Chapter 3 and 4, respectively. In Chapter 5, 6 and 7, we consider global or local stability properties of three classes of population dynamics. In these dynamics, the delays may be even unbounded. The results not only improve, generalize and complete the known works, but also further reveal some new properties for some population systems with delays. The summary of the thesis is given in Chapter 8.