Abstract

The study of RNNs has been an active topic during the past decade because of their advantages in terms of parallel computation, learning capability, function approximation and fault tolerance. NNs have been widely applied successfully in signal processing, automatic control, classification, knowledge acquisition, pattern recognition, combinatorial optimization, machine learning and other fields. In this thesis, delay-independent and delay-dependent global stability conditions for HNNs, SNNs, neutral type NNs are derived. First of all, global asymptotic stability and global exponential stability of SNNs with distributed delays are studied by constructing a new Lyapunov-Krasovskii functional and LMI approach. Then, novel delay-independent and delay-dependent stability conditions are derived for the considered SNNs with discrete and distributed delays by using Lyapunov functional, stochastic analysis approach and Itô's formula. The time-varying delay has been assumed to be continuous and bounded by a positive scalar and the time derivative of a time-varying delay being smaller than a constant is used for deriving stability conditions. In addition to the delay effects, stochastic effects constitute another source of disturbances or uncertainties in real system. On this basis, new less conservative delay-range-dependent LMI based stability conditions of SNNs with Markovian jumping parameters are derived. Furthermore, delay-dependent stability analysis of NNs with time-varying delays is addressed. Numerical examples and simulation results are given to show the effectiveness of proposed theoretical results.