Conclusions and Future Work

We have studied stability analysis of the equilibrium point for fuzzy Hopfield neural networks, fuzzy Cohen - Grossberg neural networks, fuzzy Bidirectional Associative Memory neural networks, fuzzy Cohen - Grossberg Bidirectional Associative Memory neural networks, fuzzy cellular neural networks with multiple time varying delays and Markovian jumping recurrent neural networks with time varying delays including both discrete and distributed delays. We applied generalized Lyapunov functional, stochastic analysis approach and Ito differential formula to obtain delay dependent conditions for ensuring the stability of the considered neural networks. Moreover, free weighting matrices and the convex combination conditions have been used to reduce the conservatism caused by the time varying delays. On this basis, new less conservative delay-dependent LMI based sufficient stability conditions have been derived for the addressed problems. Furthermore, all results are obtained under mild conditions, assuming neither differentiability nor strict monotonicity on activation functions. Our results can be easily verified and can be applied to Cohen-Grossberg neural networks, recurrent neural networks and cellular neural networks. The obtained results are more general and less restrictive than the previous results in the literature. The results obtained in this thesis also provide set of criteria for determining the global stability of Hopfield neural networks, Cohen - Grossberg neural networks, BAM neural networks, CGBAM neural networks with discrete and distributed time varying delays. In addition, the numerical examples are provided to illustrate the applicability of the results using LMI toolbox in MATLAB. Comparison with other stability conditions in the literature shows our conditions are more powerful ones to guarantee the widest stability region.
Impulsive effects may be unavoidable. For instance, in implementation of electronic networks, the state of the network is subject to instantaneous perturbations and experiences abrupt changes at certain instants, which may be caused by switching phenomenon, frequency change or other sudden noise, that is, it exhibits impulsive effects. Neural networks are often subject to impulsive perturbations that in turn affect dynamical behaviors of the systems. Therefore, it is necessary to take both time delays and impulsive effects into account on dynamical behaviors of neural networks. In future, we extend our results to study sufficient conditions for stability of fuzzy neural networks with time delays and impulsive effects.