$error(t) = \sum_{i=1}^{3} \sqrt{[x_{1i} - x_{2i}]^2 + [x_{2i} - x_{3i}]^2}$ Fig.2 shows the synchronized state of system (17) and the synchronous error with the initial value randomly chosen from $[0,1]$.

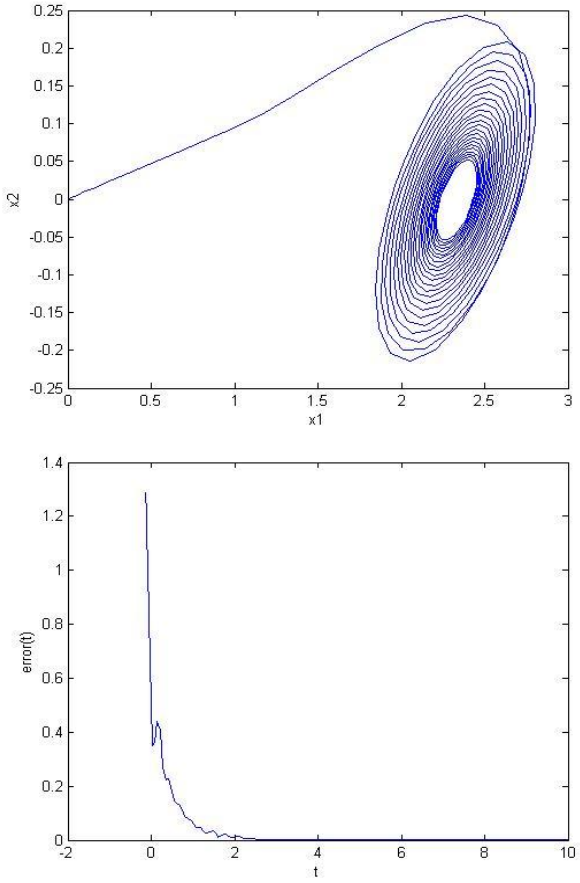

Fig.2 the synchronized state of system (17) and the synchronous error.

5. CONCLUSIONS

In this paper, global synchronization problem is investigated for a general complex networks with coupling delays. A novel theorem is obtained about synchronization of the coupled systems by employing Lyapunov-Krasovskii functional. The condition obtained in this paper is expressed in the form of linear matrix inequalities, which has less variables and easy to be computed and checked by resorting to Matlab LMI Toolbox. The proposed network model may shed some new lights on the synchronization with one delay coupling. Furthermore, there are abundant dynamical behaviors in arrays of coupled systems with different coupling schemes and it deserves to be further studied in future. Finally, the example is utilized to illustrate the usefulness of the derived methods by simulation results.

References

1. Wang J, Xu Z New study on neural networks: the essential order of approximation. Neural Netw 23:618–624, 2010.

2. Wang G, Cao J, Wang L, Franklin J. Global dissipativity of stochastic neural networks with time delay. J Franklin Inst 346:794–807, 2009.

3. Trestian I, Ranjan S, Kuzmanovic A, Nucci A, Googling the internet: profiling internet endpoints via the World Wide Web. IEEE Trans Neural Netw 18:666–679, 2010.

4. Yuan ZZ, Cai JP, and Lin ML. Global synchronization in complex networks with adaptive coupling. Mathematical Problems in Engineering, Article ID 826721, 2010.

5. L ü JH, Chen GR. A time-varying complex dynamical network model and its controlled synchronization criteria. IEEE Transactions on Automatic Control, 50:841–846,2005.

6. Li CG, Chen GR. Synchronization in general complex delayed dynamical networks with coupling delays. Physica A 343:263－278, 2004.

7. Gao HJ, Lam J, Chen GR. New criteria for synchronization stability of general complex dynamical networks with coupling delays .Phys. Lett. A 360:263－273, 2006.

8. Li K, Guan SG, Gong XF. Synchronization stability of general complex dynamical networks with time-varying delays. Phys. Lett. A 372: 713－727, 2008.

9. Li HJ, Yue D. Synchronization stability of general complex dynamical networks with time-varying delays: A piecewise analysis method. J Comput Appl Math 232:149–158, 2009.

10. Song QK Synchronization analysis of coupled connected neural networks with mixed time delays Neurocomputing, vol. 72, no. 16-18, pp. 3907-3914, 2009.

11. Wang Y, Wang ZD, Liang JL. A delay fractioning approach to global synchronization of delayed complex networks with stochastic disturbances. Phys Letters A 372:6066–6073, 2008.

12. Shao HY. New delay-dependent stability criteria for systems with interval delay. Automatica, vol. 45, no. 3, pp. 744-749, 2009.

13. Li T, Wang T. Exponential Synchronization for Arrays of Coupled Neural Networks with Time-delay Couplings. J Control, Automation, 9(1):187-196, 2011.