Radar Estimation Algorithm Using Neural Network Approach

許順棚、鍾翼能

E-mail: 9605040@mail.dyu.edu.tw

ABSTRACT

The multiple-target tracking algorithm is more important than that of tracking single target in a radar system. It will solve the problems of between radar measurements and existing targets. There is one new data association technique denoted Competitive Hopfield Neural Network (CHNN) is investigated in this thesis. It will take care of the computation of the relationships and to obtain the better tracking results. In order to compare the performance of the radar tracking algorithm, there are three approaches which are Multiple Model Estimator, One-Step Conditional Maximum Likelihood, and Maneuvering Estimation are conducted. According to the simulation results, we know that the performance of the proposed approach is the best one.

Keywords : Neural network ; maneuvering ; Data association

Table of Contents

REFERENCES

1. S. Blackman, ”Multiple Target Tracking With Radar Applications, ” Artech House, 1986. 2. Y. Bar-Shalom, and T.E. Formann, “ Tracking and Data Association, ” Artech House, 1988. 3. Y.N. Chung, D.L. Gustafson, and E. Emre, “ Extended Solution to Multiple Maneuvering Target Tracking, ” IEEE Trans. Aerosp. Electron. Syst. Vol. AES-25, pp.876-887,1990. 4. Y.N. Chung and Y.N. Hu, “ A Decentralized Estimation Approach for Target Tracking Problems, ” to appear in Journal of Control Systems and Technology, Vol. 1, No. 4, 1993. 5. Y. Bar-Shalom and T. Edsion, “ Sonar Tracking of Multiple Targets Using Joint Probabilistic Data Association, ” IEEE Journal of Oceaning Engineering, Vol. OE-8, No.3, 1983. 6. S. Kingsley and S. Quegan., “ Understand Radar Systems, ” McGRAW-HILL book Co.1992. 7. E. Emre, and J. Seo, ” A Unifying Approach to Multi-Target Tracking , ” IEEE. Trans. Aerosp. Electron. Syst., Vol. AES-25, pp. 520-528, 1989. 8. R.A. Singer, ” Estimating Optimal Tracking Filter Performance for Manned Maneuvering Targets, ” IEEE Trans. On Aerosp. and Electron. Syst., Vol. AES-5, pp. 473-483, July 1970. 9. Bar-Shalom, Y. , ” Tracking Methods in a Multi-Target Environment, ” IEEE Trans. Automa. Contr. , Vol., AC-23, pp. 618-626, Aug.1978. 10. Stein, J. J. , and S.S. Blackman , ” Generalized Correlation of Multi-Target Tracking Data, ” IEEE Transactions on Aerospace and Electronic Systems, AES-II, Nov. 1975, pp. 1207-1217. 11. Sea, R. G., ” Optimal Correlation of Sensor Data with Tracks in Surveillance Systems, ” Proceeding of Sixth International Conference on Systems Sciences, Jan. 9-11, 1973, Honolulu, HI, pp.424-426. 12. Fortmann, T. E., and S. Baron, ” Problems in Multi-Target Sonar Tracking, ” Proceeding of the 1978 IEEE Conference on Decision and Control, San Diego., CA, Jan. 1979, pp.1182-1188. 13. Chang, K. C., Chong, C.Y., and Bar-Shalom, Y., “ Joint Probabilistic Data Association in Distributed Sensor Networks, ” IEEE Trans. Automa. Contr., Vol. AC-31, pp. 889-897, Oct. 1986. 14. Bullock, T. E., Sangsuk-Iam, S., Pietsch, R., and Boudresu, E. J., ” Sensor Fusion Applied to System Performance Under Sensor Failures, ” Proceedings of SPIE. Vol. 931, Sensor Fusion, 1988. 15. Reid, D. B., “ An Algorithm for Tracking Multiple Targets, ” IEEE Trans. Automa. Contr., Vol. AC-24, pp. 843-854, Dec. 1979. 16. R. A. Singer, and K.W. Behnke, ” Real-Time Tracking Filter Evaluation and Selection for Tactical Applications, ” IEEE Trans. on Aerosp. and Electron. Sys., Vol. AES-7, No.1, pp. 100-110, March 1970. 17. B.D.O. Anderson , and J.B. Moore, ” Optimal Filtering, ” Pretice Hall Inc., 1979. 18. A.Farine, and F. A. Studer, “ Radar Data Processing, ” Research Studies Press Ltd., 1985. 19. Byron, Eddle., “ Radar Principles, Technology, Applications, ” Prentice-Hall Inc. 1993. 20. S. Haykin, “ Adaptive Filter Theory, ” Prentice-Hall Inc.1991. 21. Hovanessian, S. A., “ Radar System Design and Analysis, “ Artech House, Inc., 1984. 22. P.D.Hanlon and P.S. Maybeck,"Interrelation Ship of Single-Filter and Multiple-Model Adaptive Algorithms,"IEEE Trans. Aerosp. Electron. Syst. Vol. AES-34,PP.934-946,1998. 23. R.L.Popp,K.R.Pattipati,Y.Bar-Shalom&M.Ysddanapudi, "Parallelization of a Multiple Tracking Algorithm with Superlinear Speedups, "IEEE Trans. Aerosp. Electron. Syst. 24. K. Mehrotra & P.R.Mahapatra, "A Jerk Model for Tracking Highly Maneuvering Targets, " IEEE Trans. Aerosp. Electron. Syst. Vol AES-33,pp.1094-1106 ,1997. 25. Pau-Choo Chung, Ching-Tsorng Tsai, E-Ling Chen and Yung-Nien Sun “ Polygonal Approximation Using A Competitive Hopfield Neural Network “ , Patten Recognition, Vol.27,No,11, pp,1505-1215,1994 26. Neural Networks Algorithms, Applications, and Programming Techniques James A. Freman/David M.Skapora. Addison Wesley 27. Neural NetworkDesign Matin T.hagan, Howard B.Demuth, Mark Beale THOMSON 28. D. J. Kershaw & R. J.Evans, "Waveform Selective Probabilistic Data Association," IEEE Trans. Aerosp. Electron. Syst. Vol . AES-33, pp.1180-1189,1997. 29. S-T.Park&J.G.Lee,"Design of a Practical Tracking Algorithm with Radar Measurements,"IEEE Trans. Aerosp. Electron. Syst. Vol AES-34, pp. 1337-1345, 1998. 30. E.Mazor,J Dayan,A.Averbuch

&Y.Bar-Shalom,"Interacting m Multiple Model Methods in Target Tracking: A Survey," IEEE Trans. Aerosp. Electron. Syst. Vol AES-34,pp.103-124,1998. 31. R.E.Bethel & G.J.Paras, "A PDF Multisensor Multitarget Tracker,"IEEE Trans. Aerosp. Electron. Syst. Vol AES-34,pp.153-169,1998. 32. H.Lee & I-J Tahk,"Generalized Input-Estimation Technique for Tracking Maneuvering Targets, " IEEE Trans. Aerosp. Electron. Syst. Vol AES-35,pp.1388-1403,1999. 33. P.Swerling ," Radar Probability of Detection for Some Additional Fluctuating Target Cases ,"IEEE Trans. Aerosp. Electron. Syst. Vol AES-33,pp.698-709,1997. 34. Y.N. Chung and M.T. Lin , ” A Muliti-Target Tracking Algorithm Using Variable Sampling Rate , ” J. of Control. Vol.3, No.1, PP.33-41,1995. 35. N.Okello & B.Ristic, ” Maximum Likelihood Registration for Multiple Dissimilar Sensors, ” IEEE Trans. Aerosp. Electron.Syst.Vol.39,No.3, pp.1074-1083,2003.