The Research of Radar Tracking System Using Multiple Model Algorithm

E-mail: 205256@ mail.dyu.edu.tw

ABSTRACT

The multiple-target tracking algorithm plays an important role in a radar system. The key techniques for improving the tracking accuracy include data association and maneuvering estimation algorithm. In this dissertation, a data association denoted one-step conditional maximum likelihood algorithm is proposed to improve the tracking capability. Moreover, an improve algorithm denoted the adaptive multiple model estimator is developed in this dissertation. When target maneuvering movement is occurred, maneuver detection and acceleration estimation algorithms are applied to modify the parameters of the tracking filter. In this algorithm, a bank of Kalman filters is applied to improve the tracking accuracy of radar surveillance. Based on computer simulations, we can convince this approach will obtain the better tracking results.

Keywords : Adaptive Multiple Model Estimator   Data Association Technique   Kalman Filters

Table of Contents

REFERENCES

[1]Y. Bar-Shalom and T.E. Fortmann, Tracking and Data Association, Academic Press, INC. 1989.

[2]K.C. Chang, C.Y. Chong, and Y. Bar-Shalom, " Joint Probabilistic Data and Association Distributed Sensor Networks," IEEE Trans. Automa. Contr., Vol. AC-31, pp. 889-897, 1989.

[3]E. Emre and J. Seo, " A Unifying Approach to Multi-Target Tracking," IEEE Trans. Aerosp. Electron. Syst., Vol. 25, pp. 520-528, 1989.

[4]S.S. Blackman, " Multiple Hypothesis Tracking for Multiple Target Tracking," IEEE Aerosp. Electron. Syst. Magazine., Vol. 19, pp. 5-18, 2004.

[5]B. Zhou and N.K. Bose, " A Comprehensive Analysis of Neural Solution to the Multi-target Tracking Data Association Problem," IEEE Trans. Aerosp. Electron. Syst., Vol. 29, pp. 260-263, 1993.

[6]Yi-Nung Chung, Pao-Hua Chou, and Maw-Rong Yang, " Mulitple-Target Tracking with Competitive Hopfield Neural Network-based Data Association" , IEEE Trans. Aerosp. Electron. Syst. Vol. 43, No. 3, pp. 1180-1188, 2007.

[7]K. Mehrotra and P.R. Mahapatra, " A Jerk Model for Tracking Highly Maneuvering Targets," IEEE Trans. Aerosp. Electron. Syst., Vol. AES-33, pp. 1094-1106, 1997.

[8]H. Lee and I.J. Tahk, " Generalized Input-Estimation Technique for Tracking Maneuvering Targets," IEEE Trans. Aerosp. Electron. Syst., Vol. AES-35, pp. 1388-1403, 1999.

[9]M. R. Morelande and S. Challa, " Maneuvering Target Tracking in Clutter using Particle Filters," IEEE Trans. Aerosp. Electron. Syst., Vol. AES-41, pp.252-270, 2005.

[10]P. Swerling, " Radar Probability of Detection for Some Additional Fluctuating Target Cases," IEEE Trans. Aerosp. Electron. Syst., Vol. AES-33, pp. 698-709, 1997.

[11]P.D. Hanlon and P.S. Maybeck, " Interrelationship of Single-Filter and Multiple-Model Adaptive Algorithms," IEEE Trans. Aerosp. Electron. Syst., Vol. AES-34, pp. 934-946, 1998.

[12]E. Conte, M. Lops, and G. Ricci, " Adaptive Detection Schemes in Compound-Gaussian Clutter," IEEE Trans. Aerosp. Electron. Syst., Vol. AES-34, pp. 1058-1069, 1998.

[13]D.J. Kershaw and R.J. Evans, " Waveform Selective Probabilistic Data Association," IEEE Trans. Aerosp. Electron. Syst., Vol. AES-33,

pp.1180-1189, 1997.

[14]S.T. Park and J.G. Lee, " Design of a Practical Tracking Algorithm with Radar Measurements," IEEE Trans. Aerosp. Electron. Syst., Vol. AES-34, pp. 1337-1345, 1998.

[15]E. Mazor, J. Dayan, A. Averbuch and Y. Bar-Shalom, " Interacting Multiple Model Methods in Target Tracking: A Survey," IEEE Trans. Aerosp. Electron. Syst., Vol. AES-34, pp. 103-124, 1998.

[16]N. Karim Kemih, Malek Benslama Merabtine, and Filali Salim, " Generalized Predictive Control Using Conjugate Gradient Method Applied," ICIC Express Letters, Volume 1, Issue 2, December, pp. 99-104, 2007.

[17]Yi-Nung Chung, Dend-Jyi Juang, Tsung-Chun Hsu, Chi-Hsian Chang, Maw-Rong Yang, and Shun-Peng Hsu, " An Extended Multiple-Model Estimator Radar Maneuvering Target Tracking," Journal of Aeronautics Astronautics and Aviation Series A, Vol. 40, No. 2, pp. 99-104, 2008.

[18]D. McErlean, and S. Narayanan, " Distributed detection and tracking in sensor networks," Signals, Systems and Computers, 2002. Conference Record of the Thirty-Sixth Asilomar Conference on, Vol. 2, 3-6 Nov. 2002.

[19]K. A. Fisher and P. S. Maybeck, " Multiple Adaptive Estimation with Filter Spawning," IEEE Trans. Aerosp. Electron. Syst,. Vol. 38, No.3, pp. 755-768, 2002.

[20]P.C. Chung, C.T. Tsai, E.L. Chen, and Y.N. Sun, " Olygonal Approximation Using A Competitive Hopfield Neural Network," , Pattern Recognition, Vol. 27, No. 11, pp. 1505-1512, 1994.

[21]S. Kumar, Neural Networks: A Classroom Approach, Mc Graw Hill, 2005.

[22]A.F. James and M.S. David, " Neural Networks: Algorithms, Applications, and Programming Techniques," Addison Wesley, 1991.

[23]N. Okello and B. Ristic, " Maximum Likelihood Registration for Multiple Dissimilar Sensors," IEEE Trans. Aerosp. Electron. Syst., Vol. 39, No. 3, pp. 1074-1083, 2003.

[24]Chengjian Lin, Yongcheng Liu, and Chiyung Lee, " An Efficient Neural Fuzzy Network Based on Immune Particle Swarm Optimization for Prediction and Control Applications," International Journal of Innovative Computing, Information, and Control, Vol. 4, No. 7, pp. 1171-1172, 2008.