

Applying Fixed Parameters' and Random Parameters' Filters in Tracking Systems

莊凱智、鍾翼能

E-mail: 9419731@mail.dyu.edu.tw

ABSTRACT

Filtering technique plays an important role in radar tracking systems. It is used to do the computation of both tracking prediction and estimation. It also can offer the information for other tracking procedures such as data association and maneuvering adaptive procedure, etc. Two kinds of filters which are fixed parameters and random parameters, are analyzed in this thesis. Moreover, we also apply both filtering techniques to radar target tracking systems. According to the computer simulation results, the filter with random parameters has better performance.

Keywords : Filtering technique、Fixed parameter filter、random parameter filter、radar target tracking system.

Table of Contents

封面內頁 簽名頁 授權書	iii	中文摘要	iii
.	iv	英文摘要	v
.	vi	目錄	vii
.	x	表目錄	xi
第一章 緒論	1	1.1 研究動機	1
研究背景	1	1.1.1 研究動機	1
系統	4	1.1.2 研究動機	1
.	5	1.1.3 章節大綱	2
.	10	第二章 雷達系統	2
.	10	2.1 雷達的起源	4
.	10	2.2 雷達構造介紹	4
.	10	2.3 雷達天線	10
.	10	2.3.1 天線特性	10
.	10	2.3.2 定向	11
.	12	2.3.3 增益	11
.	12	2.3.4 角解析度	13
.	13	2.4 雷達方程式	13
.	14	2.4.1 雷達方程式推導	14
.	14	2.4.2 距離解析度	14
.	14	2.4.3 雷達方程式推導	14
.	15	第三章 濾波器原理	19
.	19	3.1 固定參數濾波器	19
.	19	3.1.1 - Tracker濾波器	19
.	19	3.1.2 - Tracker濾波器	19
.	21	3.1.3 固定係數增益的選擇	23
.	23	3.2 隨機參數濾波器	24
.	26	3.2.1 卡門濾波器之系統狀態模式	24
.	26	3.2.2 卡門濾波器之數學運算	28
.	32	3.2.3 卡門濾波器之非線性系統模式	28
.	32	3.2.4 卡門濾波器有許多重要性質	35
.	37	第四章 資料相關結合技術	37
.	37	4.1 簡介	37
.	37	4.2 多目標追蹤系統之數學模式	37
.	37	4.3 One-Step Conditional Maximum Likelihood理論	41
變速度目標追蹤	44	5.1 簡介	44
應性變速度追蹤理論	44	5.2 適應性變速度追蹤理論	44
使用固定參數濾波器的模擬追蹤	50	第六章 目標模擬追蹤	48
.	50	6.1 使用固定參數濾波器的模擬追蹤	48
.	50	6.2 使用隨機參數濾波器的模擬追蹤	57
.	66	第七章 結論	67
.	66	參考文獻	67
目錄 圖2.1雷達的簡單方塊圖	6	圖2.2 雷達各部份產生的各種脈沖以及它們之間的定時關係	9
.	9	圖3.1卡門濾波器的系統流程圖	25
.	31	圖4.1資料相關結合之概念圖	38
.	31	圖4.2四個目標模擬追蹤圖	49
.	49	圖6.1研究方法流程圖	49
.	49	圖6.2四個目標的位置與速度誤差圖	51
.	52	圖6.3四個目標的位置與速度誤差圖	52
.	52	圖6.4四個目標模擬追蹤圖	54
.	52	圖6.5四個目標的位置與速度誤差圖	55
.	55	圖6.6四個目標模擬追蹤圖	59
.	55	圖6.7四個目標的位置與速度誤差圖	60
.	60	圖6.8四個目標模擬追蹤圖	62
.	62	圖6.9四個目標的位置與速度誤差圖	63
.	62	表目錄 表6.1四個目標的初始條件	50
.	50	表6.2四個目標的加速度區間設定	50
.	50	表6.3模擬追蹤結果(無加速度目標)	54
.	54	表6.4模擬追蹤結果(有加速度目標)	56
.	54	表6.5四個目標的初始條件	56
.	57	表6.6四個目標的加速度區間設定	57
.	57	表6.7模擬追蹤結果(無加速度目標)	61
.	61	表6.8模擬追蹤結果(有加速度目標)	64

REFERENCES

- [1] Samuel S. Blackman, " Multiple-Target Tracking with Radar Applications " .
- [2] Bar-Shalom, Y., " Tracking Methods in a Multi-target Environment " , IEEE Trans. Automa. Contr., Vol. Ac-23, pp. 618-626, Aug 1978.
- [3] Emre, E. and Aeo, J., " A Unifying approach to Multi-Target Tracking " , IEEE Trans. Aerosp. Electron. Syst., Vol. AES-25, pp. 520-528, July. 1989.
- [4] Gish, H. and Mucci, Ronald, " Target state Estimation in a Multi-target Enviroment Using Multiple Sensors " , IEEE Trans. Aerosp. Electron. Syst., Vol. AES-23, pp. 60-72, jan. 1987.
- [5] Brumback, B.D. and Srinath, M.D., " A Fault-Torlerant Multisensor Navigation System Desgin " , IEEE Trans. Aerosp. Electron. Syst., Vol. AES-23, pp. 738-755, Nov. 1987.
- [6] Magarini, M. and Spalvieri, A., " Optimization of decentralized quantizers in rate constrained data fusion systems " , Geoscience and Remote Sensing Symposium, 2000. Proceedings. IGARSS 2000. IEEE 2000 International , Volume: 3 , 24-28 July 2000.
- [7] Koval, V., " The competitive sensor fusion algorithm for multi sensorsystems " , Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications, International Workshop on., 2001. , 1-4 July 2001.
- [8] Vershinin, Y.A. and West, M.J., " A new data fusion algorithm based on the continuous-time decentralized Kalman filter " , Target Tracking: Algorithms and Applications (Ref. No. 2001/174), IEE , Volume: 1 , 16-17 Oct. 2001.
- [9] Vershinin, Y.A., " A data fusion algorithm for multisensor systems " , Information Fusion, 2002. Proceedings of the Fifth International Conference on , Volume: 1 , 8-11 July 2002.
- [10] Weixian Liu and Yilong Lu and Fu, J.S., " Data fusion of multiradar system by using genetic algorithm " , Aerospace and Electronic Systems, IEEE Transactions on , Volume: 38 , Issue: 2 , April 2002.
- [11] Yu Xu and Yihui Jin and Yan Zhou, " Several methods of radar data fusion " , Electromagnetic Compatibility, 2002 3rd International Symposium on , 21-24 May 2002.
- [11] Jae-Jun Kim and Singh, T. and Llinas, J., " Large scale simulation of a distributed target tracking system " , Information Fusion, 2002. Proceedings of the Fifth International Conference on , Volume: 1 , 8-11 July 2002.
- [12] Benaskeur, A.R., " Consistent fusion of correlated data sources " , IECON 02 [Industrial Electronics Society, IEEE 2002 28th Annual Conference of the] , Volume: 4 , 5-8 Nov. 2002.
- [13] Guosheng Yang and Feng Zhu and Lihua Dou, " An engineering method for multi-sensor track fusion " , Autonomous Decentralized System, 2002. The 2nd International Workshop on , 6-7 Nov. 2002.
- [14] McErlean, D. and Narayanan, S., " Distributed detection and tracking in sensor networks " , Signals, Systems and Computers, 2002. Conference Record of the Thirty-Sixth Asilomar Conference on , Volume: 2 , 3-6 Nov. 2002.
- [15] Mort, N. and Prajitno, P., " A multisensor data fusion-based target tracking system " , Industrial Technology, 2002. IEEE ICIT '02. 2002 IEEE International Conference on , Volume: 1 , 11-14 Dec. 2002.
- [16] Jie Tian and Jie Chen and Lihua Dou and Yuhe Zhang, " The research of test and evaluation for multisensor data fusion systems " , Intelligent Control and Automation, 2002. Proceedings of the 4th World Congress on , Volume: 3 , 10-14 June 2002.
- [17] Jin Xue-bo and Sun You-xian, " Optimal fusion estimation covariance of multisensor data fusion on tracking problem " , Control Applications, 2002. Proceedings of the 2002 International Conference on , Volume: 2 , 18-20 Sept. 2002.
- [18] Xue-bo Jin and You-xian Sun, " Optimal estimation for multisensor data fusion system with correlated measurement noise " , Signal Processing, 2002 6th International Conference on , Volume: 2 , 26-30 Aug. 2002.
- [19] Chamberland, J.-F. and Veeravalli, V.V., " Decentralized detection in sensor networks " , Signal Processing, IEEE Transactions on [see also Acoustics, Speech, and Signal Processing, IEEE Transactions on] , Volume: 51 , Issue: 2 , Feb. 2003.
- [20] Khawsuk, W. and Pao, L.Y., " Decorrelated state estimation for distributed tracking using multiple sensors in cluttered environments " , American Control Conference., 2003. Proceedings of the 2003 , Volume: 4 , June 4-6, 2003.
- [21] Huimin Chen and Kirubarajan, T. and Bar-Shalom, Y., " Performance limits of track-to-track fusion versus centralized estimation: theory and application [sensor fusion] " , Aerospace and Electronic Systems, IEEE Transactions on , Volume: 39 , Issue: 2 , April 2003.