

計畫編號: NSC99-2221-E018-009; 研究期間: 201008-201107

應用競爭性類神經網路融合數值資料與影像資訊於追蹤系統之研究

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摘要

雷達追蹤系統中，多目標追蹤(Multiple-Target Tracking, MTT)是不可缺少的重要技術。追蹤系統是否能夠正確的預估目標物的真實軌跡其中牽涉兩個問題: 資料結合(Data Association technique)與變速度(Maneuvering)檢測。本研究提出運用競爭式類神經網路(Competitive Hopfield Neural Network, CHNN)特殊的運算架構，發展一資料相關結合運算的程序，以輔助雷達追蹤系統。本研究同時運用影像處理技術，考慮目標物的形態與外觀等，提高目標物被辨認的機率，降低預估的誤差。影像經前處理後，接著擷取目標物的特徵，並運用相似度函數進行影像特徵辨識，最後，以結構相似度(Structural Similarity, SSIM)，求得目標物的影像數值資訊，同時配合 CHNN 資料結合技術與適應性程序追蹤輔助架構，能更準確追蹤目標。經模擬結果顯示，本研究提出的演算法能在複雜的追蹤環境中，有效降低追蹤多個變速度目標時的追蹤誤差。

The Research of Applying Competitive Hopfield Neural Network to Fuse Quantity Data and Image Information to Tracking System

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Abstract

Multiple-target tracking (MTT) is a prerequisite step for radar surveillance systems. Data association is the key technique in a radar multiple -target tracking system. A new approach to data association using both quantity data and image information is investigated in this project. In order to combine two different attributes, a fusion algorithm based on the Competitive Hopfield Neural Network (CHNN) is developed to match between sensor measurements and existing target tracks. When target maneuvering problems are occurred, an adaptive multiple-model maneuvering estimator is applied. Based on the computation algorithm, we convince that this approach can successfully solve the multiple -target tracking problems and have better performance.

Key words: Quantity data and image information;
Data association technique;
Competitive Hopfield Neural Network