應用適應性濾波演算法則於車輛回音消除及故障訊號分析

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摘 要

本研究應用適應性濾波演算法則於車輛視聽系統回音消除以及故障訊號分析。本論文分為三部分，第一部份為改善車廂內聲學回授效應；本研究以適應性演算法則來消除車廂內聲學回授效應，過去，大多數的視聽系統回音消除都是以傳統最小均方誤差演算法（LMS）為基礎，但其收斂速度不理想;故本研究利用可變收斂因子演算法（VSS APA），使收斂因子可根據系統得到理想值。第二部分，應用適應性線性增強系統（Adaptive Line Enhancement）於轉動機械故障訊號分析，可藉由轉動機械的聲音及振動訊號來判別機械是否故障；由於量測到的訊號通常不一定單純只有轉動機械的訊號，往往還會量測到其他不需要的訊號，在這裡稱為雜訊（noise），如環境的背景噪音等。為了有效將背景噪音消除，得到所需要的故障訊號，提出線性增強系統可降低環境的背景噪音。大部分線性增強系統都以最小均方誤差演算法（LMS）為基礎，本研究利用可變收斂因子仿射投影演算法則的收斂因子可達到理想值為優點，應用在線性增強系統。本研究第三部份，應用兩階段適應性濾波器系統（Two-Stage Adaptive Filtering System）對引擎冷卻風扇作故障訊號分析。由於引擎冷卻風扇裝設位置在引擎旁，在量測冷卻風扇聲音訊號時，不僅量測到風扇聲音同時也會連引擎噪音以及環境背景噪音（如車體的震動聲音）也接收進來。這些干擾的噪音可分為兩種一種是窄頻的引擎噪音，另一種為寬頻噪音，如車體的振動噪音。為解決這些問題，提出了兩階段適應性濾波器系統，這個系統結合了傳統適應性濾波器的優點以及線性增強系統的優 -v勢，適應性濾波器的雜訊消除可消除單頻噪音，線性增強系統可降低寬頻噪音。 本研究應用的演算法結合仿射投影演算法(APA)和可變收斂因子最小均方演算法(VSS LMS)的優點，因為仿射投影演算法輸入訊號為矩陣，比傳統演算法輸入為向量的資料更完整，使預測的權重向量更準確又快速。但由於仿射投影演算法的收斂因子為固定的，本研究利用發展完整的可變收斂因子最小均方演算法來調整收斂因子，使收斂因子可根據系統得到最理想值。為了驗證本研究所提出之可變收斂因子仿射投影演算法的效果，則將可變收斂因子仿射投影演算法與傳統演算法模擬比較，結果顯示可變收斂因子仿射投影演算法性能較優越並且適合用於本研究系統中。

關鍵詞 : 聲學回授，適應性濾波器，線性增強，故障診斷，可變收斂因子仿射投影演算法

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