

智慧型控制在線性超音波馬達之應用

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摘要

本論文主要是發展一 T-型自我組織-反覆式類神經模糊網路(Takagi-Sugeno-Kang-Type Self-Organizing Recurrent Neural Fuzzy Network ; T-SORNFN)控制系統於線性超音波馬達軌跡跟隨。首先,透過網路結構與參數的調整法則訓練T-SORNFN 學習超音波馬達的逆向動態(Inverse Dynamics)。在T-SORNFN 中的模糊規則可以任意的增加或刪除,以獲得適當的大小的網路結構,並利用監督式的梯度下降法推導網路參數的調整法則以加速網路的收斂。另外,推導一變動的學習率以確保網路學習的收斂。再者,一結合 T-SORNFN 和PD 控制器的逆向動態控制系統被發展來控制線性超音波馬達於變動的環境,並且利用遞迴式最小平方方法(Recursive Least-squares)來線上調整網路的輸出權重值,以獲得更精密的近似效果。硬體方面,以個人電腦為基礎,並結合仿真公司的MRC-6810 伺服控制卡、AB1A 驅動器、並應用Visual C++軟體撰寫程式,最後透過實驗平台,來驗證本論文所提方法的有效性。

關鍵詞: 反覆式類神經模糊網路, 線性超音波馬達, 李阿普諾夫穩定法則, 遞歸式最小平方方法。

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