機械手之運動誤差模型與誤差敏感度分析

葉培青、紀華偉

E-mail: 9314957@mail.dyu.edu.tw

摘 要

機械手臂的應用與日俱增，各式各樣的機械手臂發展出來以適應各種不同的應用與環境。本論文研究LCD製造廠所需之兩軸式基板搬送機械手臂，本論文研究機械手臂之機構設計進行運動分析與逆向運動分析及定位誤差分析。機械手臂之運動模型將每一連桿模擬成一理想齊次轉換矩陣，手端之運動及定位即為所有連桿之理想齊次轉換矩陣乘積。由於元件之尺寸誤差，幾何誤差及元件組裝之配合公差，背隙等因素，導致機械手臂經由齊次轉換矩陣計算出手端的位置與方向之結果並不正確。重新推導新的轉換矩陣直接考量各項誤差的影響，可估算出手端正確的位置與方向。本研究推導的運動模型可估算手臂元件誤差相對於定位誤差之間的敏感度。根據定位誤差敏感度分析，可決定元件各誤差因子對於定位精度的影響力大小，對於元件各誤差因子施以適當之允差設計，實現機械手臂高定位精度的目標。

關鍵詞 : 齊次轉換矩陣 ; 誤差因子 ; 定位誤差敏感度分析

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