無人自行車操控動態建立與控制

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摘 要

本研究主要為建立一數學模型，以車體的自由度加上前、後輪滾動、前叉轉向角等九個自由度為廣義座標，並使用Lagrange方法推導運動方程式。在推導過程中，加入輪胎與地面滾動的拘束條件，推導出無人自行車動態方程式。 在推導數學方程式的過程中，為減少人為計算錯誤及有系統、有效率的整理計算數學方程，因此利用數學符號軟體Maple輔以計算。接著，撰寫Matlab程式求解微分方程，給予適當的初始條件，以驗證數學模型的正確性。在電腦模擬方面，本文主要在於無人自行車穩定操控之運動控制。給定不同的初始前叉角度，控制無人自行車能夠穩定操控而不傾倒。 本研究所推導之運動方程式，均以能量觀點模擬驗證其正確性。期望藉此發展無人自行車運動控制的理論，並尋求關鍵性的控制技術與其硬體實現，以達到無人自行車穩定操控的目標。

關鍵詞 : 無人自行車，動態，操控。

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