Simulation and Experiment of Vehicle Collision Avoidance System

金仲浩、陳志鏗

E-mail: 345438@mail.dyu.edu.tw

ABSTRACT

In this thesis, a Radar-Based Vehicle Collision Avoidance System (VCAS) is established to help the vehicle from collision by providing light alarms when the vehicle is at a danger of collision. Also, the Active Braking System (ABS) is activated in emergency braking. The simulation system has been implemented by cooperating vehicle model with sensor equipment in CarSim with a controller built in Simulink/MATLAB. The VCAS has also been validated through an experimental vehicle equipped with a millimeter-wave radar using MotoTron ECU microcontroller. In design of VCAS controller, three collision avoidance algorithms from automobile manufacturers are used to estimate the safe distance from the front vehicle. A light-braking status will be triggered when the actual distance from the front vehicle is smaller than safe distance. Similarly, a heavy-braking with ABS control, will be triggered if the estimated collision time is smaller than 1.5 sec. A curve lane collision avoidance strategy is also proposed to detect if the front vehicle is in the same lane or not. The VCAS controller program built in MotoTron ECU is developed according to the proposed algorithm. A vehicle road running test is utilized to verify the effectiveness of the proposed algorithm.

Keywords: Active Brake、Avoidance Collision Controller、Millimeter-wave radar

Table of Contents

中文摘要 
ABSTRACT

謝誌

目錄

簡目錄

表目錄

第一章 緒論

1.1 前言

1.2 文獻回顧

1.3 研究動機與目的

1.4 本文架構

第二章 防撞警示控制器設計

2.1 模擬環境建立

2.2 煞車安全距離法則

2.2.1 Mazda安全距離法則

2.2.2 Honda安全距離法則

2.2.3 Jaguar安全距離法則

2.3防撞控制器設計

2.4電腦模擬結果

2.4.1 CASE 1前車靜止防追撞

2.4.2 CASE 2前車急煞防追撞

2.4.3 CASE 3彎道防追撞

第三章 實車煞車系統改裝介紹

3.1 煞車系統元件介紹

3.2 煞車系統油路介紹

3.3 雷達元件介紹

第四章 實車測試

4.1 實驗架構

4.2 實驗場地介紹與安全措施

4.3 雷達特性測試

4.4 雷達距離測試
4.3.2 無線傳輸測試

4.3.3 ISO測試

4.4 實車測試

4.4.1 前車靜止

4.4.2 前車急煞 (車速30km/h)

4.4.3 前車急煞 (車速40km/h)

第五章 結論

参考文獻

[1] 中華民國內政部統計處, 99年致人傷亡之道路交通事故統計。


[16] 蘇建彰, "汽車ABS控制之硬體迴路模擬與實驗", 大葉大學碩士論文 2004。

[17] 黃俊仁, "應用駕駛模擬器開發智慧型運輸系統實驗平臺之軟硬體規劃設計", 交通部運輸研究所 2005。

[18] 严豪緯, "CAN匯流排即時訊息排程與頻寬分配", 大葉大學碩士論文 2005。


[20] 林俊維, "車輛模擬駕駛之硬體迴路模擬與實車測試比較之研究", 大葉大學碩士論文 2010。