The Study of Safe Distance and Reaction for Traveling Vehicles

張源鎰、林海平

E-mail: 9222167@mail.dyu.edu.tw

ABSTRACT

The application of new technologies of semi-conduct, computer, and communications on the transportation vehicle can improve the vehicle safety and accelerate the vehicle performance dramatically. And this vehicle can also communicate with all other information suppliers at any time. This is called the Intelligent Vehicle (IV). This research will study the dynamic safety of the vehicle when it is in driving situation. It will also accelerate the communications between ’ ’driver and vehicle ’ ’ to increase the overall driving safety. There are two parts which will be carried out separately in this research. And then the results will be integrated to upgrade the vehicle dynamic safety. The separate parts are: (1)Driving Monitoring and Warning System： To monitor the vehicle situations (i.e. speeds, relative position with other vehicles,…) and judge the dynamic safety and give warning if necessary. In addition to the warning system, the research on audio control will also be studied to accelerate the communications between “ driver and vehicle ” to decrease the driver loading. (2)Vehicle Dynamic Control： As the vehicle is judged to be “ in danger ” and still there are no response from the driver, the computer will take over the control and react some responses to avoid the danger.

Keywords : intelligent vehicle ; vehicle dynamic control ; subsystem ; intelligent transportation system

Table of Contents

目錄 封面內頁 簽名頁 授權書 iii 中文摘要 v 英文摘要 vi 誌謝 vii 目錄 viii 圖目錄 xi 表目錄 xiii 符號說明 xiv 第一章 緒論 1 1.1前言 1 1.2文獻回顧 2 1.3 研究目的 4 1.4本文架構 5 第二章 距離測距系統 6 2.1雷射測距方法簡介 6 2.2雷射槍規格與介紹 9 2.2.1資料格式 11 2.2.2參數格式 11 2.2.3 UltraLyte下載格式 12 2.2.4 速度/距離資料訊息的格式 13 2.2.5測量資料訊息格式 14 2.2.6雷射測距系統訊號之傳接方式 15 2.2.7 開始位元(Start Bit)與停止位元(Stop Bit) 16 2.2.8終端裝置(DTE)與電腦(DCE) 20 第三章 危險及警告判斷控制法則的建立 21 3.1危險及警告判斷控制法則 21 3.3行車模型的建立 26 第四章自動煞車系統的理論與實作 29 4.1 煞車系統的原理 29 4.2自動煞車系統的設計概念 30 4.3車輛行駛阻力模型的建立 31 4.4自動煞車器的設計 33 4.5自動煞車系統的設計 35 第五章 模擬及實驗之結果分析 39 5.1雷射測距系統控制與模擬 39 5.1.1 雷射測距控制程式 39 5.1.2雷射測距系統實際測試之結果 41 5.1.3模擬實際車況之結果及反應 42 5.2控制法則之結果模擬 43 5.2.1 控制法則趨勢圖 43 5.2.2 兩車行車模型之模擬分析 45 5.3自動煞車系統實驗結果與分析 47 5.3.1實驗平臺 47 5.3.2控制介面 49 5.3.3自動煞車實驗結果 51 第六章 結論及建議 54 參考文獻 56 附錄A.1 59 附錄A.2 60

REFERENCES

參考文獻 [1] Ayumu Doi and Tetsuro Butsuen, “ Development of a rear-end collision avoidance system with automatic brake control, ” JSAE Review 15, pp.335-340, 1994.

[2] Fukashi Sugasawa and Hiroshi Ueno, “ Development of Nissan ’ s ASV, ” Proceeding of the IEEE, pp.254 -259,Sept., 1996.

[3] Hiroyuki Kamiya and Yasuhiko Fujita , “ Intelligent Technologies of Honda ASV, ” Proceedings of the IEEE intelligent Vehicle Symposium, pp. 236-241 Sept., 1996.

[4] Hirofumi Watanabe and Satoru Kondo, “ Introduction to Suzuki ASV Technologies, ” Proceedings of the IEEE, pp. 219 -223 Sept., 1996.

[5] Akio Takahashi and Nobuyoshi Asanuma, “ Introduction of Honda ASV-2 (Advanced- safety Vehicle-Phase 2), ” Proceedings of the IEEE intelligent Vehicle Symposium , pp.694-701, 2000.

[6] Peter Seiler and Bongsob Song, “ Development of a Collision Avoidance System ” , SAE Transactions, pp.1334-1340, 1998.

[7] Shih-Ken Chen and Jayendra S. Parikh, “ Developing a Forward Collision Warning System Simulation, ” Proceeding of the IEEE intelligent Vehicle Symposium, pp.338-343, 2000.

[8] Y. Seki, J .Ohya, M. Miyoshi, “ Collision Avoidance System for Vehicles applying Model Predictive Control Theory, ” Proceeding of the IEEE, pp.453-458, 1999.

[9] Kyongsu Yi, Jintai Chung, “ Nonlinear Brake Control for Vehicle CW/CA Systems, ” Vol.6, No.1, pp.17-24, March 2001.

[10] Akira Higashimata, Kazutaka Adachi, Takenori Hashizume, Satoshi Tange , “ Design of a headway distance control for ACC, ” JSAE Review 22, pp.15-22, 2001.

[11] Bo Cheng, Masahiro Hashimoto, Takamasa Suetomi, “ Analysis of driver response to collision warning during car following, ” JSAE Review

23, pp.231-237, 2002.
[12] Takamasa Suetomi and Koji Kido,“ Driver Behavior Under a Collision Warning System — A Driving Simulator Study,” SAE Transactions, pp.75-81, 1997.
[13] S.N Sidek, M.J.E Salami,“ Design of intelligent braking syst- em,” Proceeding of the IEEE, vol.2, pp. 580 -585, 2000.
[14] Yoji Seto, Takuya Murakami et al,“ Development of a Headway Distance Control System,” SAE Transactions, pp.77-84, 1998.
[15] Hajimu Masuda and Yasuhisa Hirosima,“ Development of Dai- hatsu ASV2,” Proceedings of the IEEE intelligent Vehicle Sym- posium, pp.708-713, 2000.
[16] Tomofumi Morita and Hiroyuki Takahashi et al,“ An Approach to the Intelligent Vehicle,” Intelligent Vehicles '93 Symposium, pp.14-16, July 1993.
[17] Hiroshima and Itoh,“ Development of a Collision Avoidance System,” Daihatsu Technical Review, No.102, pp.77-82, 1992.
[18] Mikio Sugimoto, Kenichi Aoyama et al,“ Realization of head-on collision warning system at intersections-DSSS: driving safety support systems”, Proceedings of the IEEE Intelligent Vehicles Symposium 2000, pp. 731 -735, Oct., 2000.
[19] Hideo Akaki,“ Development of rear-end collision avoidance,” Technical Notes, JSAE Review 18, pp.301-322, 1997.
[20] 許幼岳,”應用車輛防撞之測距系統”, 大葉電機系論文, 2002.
[21] 林宗宏,’’RS-232入門淺論’’,儒林出版社,1990.
[22] 張皓傑,’’Borland C++ Builder 6.0 程式設計’’,和碩科技, 1999.
[23] 張智星,’’Matlab程式設計與應用’’,清蔚科技, 2000.
[24] 範逸之、陳立元、賴俊朋,’’visual Basic與RS232串列通訊制’’,文魁資訊股份有限公司, 2000.
[25] 雷射槍規格說明書.