Development of Electric Control System for Dual Power Driving Vehicles

曾揚翔、蔡耀文

E-mail: 9806179@mail.dyu.edu.tw

ABSTRACT

In recent years, the international oil price still rising and greenhouse effect the global warming, it causes to inflict heavy losses the economic development with people life and wealth of many country. Since 1997, a hybrid electric car was put into batch production in Japan by Toyota Prius. The kind of hybrid electric vehicle (HEV) utilization with a gasoline engine and an electric motor has the characteristics of low pollution and zero emission. In the environment protection and energy crisis, the HEV will have the opportunity to become the main car of automobile in the future.

The central purpose of this study is developed the driver and controller of electric control system for dual power driving vehicle including brushless direct current (BLDC) motor driver, lithium iron phosphate (LiFePO4) battery charging system, generator driver and major controller management system. In the electric control system, using high performance Texas Instruments TMS320LF2407 digital signal process (DSP) connects various controllers.

This study applies the electric control system for a parallel hybrid system and controls vehicle ’ s operation with energy management strategy under variation load condition. According to the construction of the experiment platform, the components have been allocated and real tests have verified the dual power function of the electric control system and control strategy.

Keywords : Hybrid electric vehicle (HEV)、Brushless direct current (BLDC)、Lithium iron phosphate (LiFePO4)、Digital signal process (DSP)

Table of Contents

REFERENCES

[1] H. David and S. Shoichi, “ Hybrid Electric Vehicles Take to the Streets ” , IEEE Spectrum, Nov. 1998.
[2] C. R. Norma and A. John, “ The Hybrid Phenomenon: High Gas Prices and Shifting Consumer Sentiment Point to Bright Prospects for Hybrid Cars ” , The Futurist, vol. 41, Jul. 2007.
[3] The Auto Channel, 2009-03-11, “ Toyota and Lexus Hybrids Top One Million Sales in the U.S. ” , Retrieved on 2009-03-28[4] Hybrid Synergy Drive, “ TOYOTA HYBRID SYSTEM THSII ” , Toyota Motor Corporation, 15 Jun. 2007.
[5] Zhen-Lin Fan, “ Study of Dynamic Simulation and Control of a New Parallel Hybrid Electric Power System ” , The Thesis, Department of Mechanical and Automation Engineering College of Engineering Dayeh university, 2005.
[6] Hong-Yi Su, “ Study of a New Parallel Hybrid Electric Power System ” , The Thesis, Department of Mechanical and Automation Engineering College of Engineering Dayeh university, 2005.
[7] Te-Sheng Su, “ Development of High Power 20kW Brushless DC Motor Driver and Application of Novel Parallel Hybrid Electric Vehicle ” , The Thesis, Department of Mechanical and Automation Engineering College of Engineering Dayeh university, 2008.
[8] Ruei-Hong Dai, “ DSP Based 20kW Generator/Lithium Battery Management System and Application of Parallel Hybrid Electric Vehicles ” , The Thesis, Department of Mechanical and Automation Engineering College of Engineering Dayeh university, 2008.
[9] Jia-Hao Jhuang, “ Development of Electrical Control System and Performance Analysis for a New Parallel Hybrid Electric Heavy Motorcycle ” , The Thesis, Department of Mechanical and Automation Engineering College of Engineering Dayeh university, 2007.
[10] Z. Yang Pan and F. Lin Luo, “ Novel Soft-Switching Inverter for Brushless DC Motor Variable Speed Drive System ” , IEEE Trans. on Power Electronics, Vol. 19, no. 2, pp. 202-207, Mar. 2004.
[11] Yimin Gao and Mehrdad Ehsani, “ A Torque Speed Coupling Hybrid Drivetrain Architecture, Control, and Simulation ” , IEEE Fellow, vol. 21, no. 3, May. 2006.
[12] Texas Instruments “ TMS320LF2407A-EP DSP CONTROLLERS ” Texas Instruments Inc., 2002.
[13] Texas Instruments “ AC Induction Motor Control Using Constant V/Hz Principle and Space Vector PWM Technique with TMS320C240 ” Texas Instruments Inc., 1998.
[14] International Rectifier – The Power Management Leader. 2007. International Rectifier. 15 Aug. 2005.
[15] B. Pevec, D. Voncina,D. Miljavec, and J. Nastran, “ Extending the Low-Speed peration Range of PM Generator in Automotive Applications Using Novel AC – DC Converter Control ” , IEEE Transactions on Industrial Electronics, vol. 52, no. 2, Apr. 2005.
[16] R. W. Erickson, “ Fundamentals of Power Electronics ” , New York: Chapman & Hall, 1997.
[17] S. Rees and U. Ammann, “ New gate control unit for automotive synchronous rectifiers, ” in Proc. PCIM Europe ’ 03, Nuremberg, Germany, 2003, pp. 95 – 101.
[18] Mohamed A. Awadallah, Student Member, and Medhat M. Morcos, Senior Member, “ Automatic Diagnosis and Location of Open-Switch Fault in Brushless DC Motor Drives Using Wavelets and Neuro-Fuzzy Systems ” , IEEE Trans. on Energy Conversion, Vol. 21, no. 1, pp. 104-111, Mar. 2006.