ELECTRIC CAR VOLTAGE MONITORING SYSTEM

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This report is submitted in partial fulfillment of the requirements for the award of Bachelor of Electronic Engineering (Computer Engineering) With Honours

Faculty of Electronic and Computer Engineering
Universiti Teknikal Malaysia Melaka

April 2009

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

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Sesi Pengajian	:	**2005/2009**

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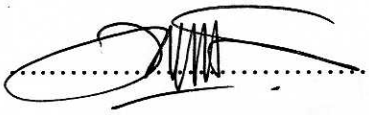
Signature : 

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Dedicated for my beloved family

ACKNOWLEDGEMENT

First and foremost I would be thankful to God Almighty Allah S.W.T for giving me a good health throughout the entire project. I would like to extend my heartfelt gratitude to all that have been contributed especially to my supervisor Prof. Madya Dr. Ahmad Jamal bin Salim for his supervision and guidance. Furthermore, I want to express my special thanks to all of faculty staff, PSM committee for their guidance, time, patience and professionalism. Besides, my appreciation goes on to my beloved parents and to all my extended family because of their full support, inspiration and encouragement in pursuing this project. Without my family members as well as my fellow friends, this project will not succeed. Those, whom have contributed to my project implementation formally, personally are greatly appreciated.

ABSTRACT

The automobile industry continues to grow by leaps and bounds, and due to the increase in the number of vehicles worldwide, air-pollution continues to increase. Though the automobile manufacturers have reduced the emission of greenhouse gases such as hydro-carbons, carbon monoxide, carbon dioxide etc., from the vehicles, they cannot produce a zero-emission friendly vehicle unless they produce an electric vehicle (EV). Furthermore, because of the short of fuel resources, people have been thinking to use an electric car as an alternative vehicle. An electric car needs an efficient and reliable voltage monitoring system to prevent breakdown and flat battery. The monitoring system should be user-friendly and able to do precise monitoring. A main objective of this project is to design and develop the low cost digital voltmeter by using Microchip PIC Microcontroller. There are 4 phases of methodology to complete this project which are literature review, PIC source code development, hardware development and write thesis. The expected result of this project is the circuit will be able to measure and display the remaining voltage of the battery pack of the electric vehicle and automatically activate the charging circuit. Alarm will also be activated to warn user of the battery condition. Hopefully, this project also can be implemented in automotive industry especially in our national car.

ABSTRAK

Industri kenderaan semakin berkembang sepanjang tahun dan menyebabkan peningkatan jumlah kenderaan seluruh dunia membawa kepada pencemaran udara yang semakin berleluasa. Walaupun syarikat pembuat kenderaan berjaya mengurangkan pembebasan gas-gas rumah hijau seperti hidro-karbon, karbon monoksida, karbon dioksida dan sebagainya daripada ekzos kenderaan, mereka tidak berupaya mencipta kenderaan bebas pengeluaran gas-gas rumah hijau melainkan mereka mencipta kenderaan elektrik. Tambahan pula, sekarang ini, sumber minyak dunia semakin berkurangan, pengguna berfikir menggunakan kenderaan elektrik sebagai kenderaan alternatif. Kenderaan elektrik memerlukan sistem pengukuran voltan yang effisen dan boleh dipercayai untuk mengelakkan kerosakan bateri dan bateri kehabisan kuasa. Sistem ini mudah digunakan oleh pengguna dan mampu membuat pengukuran yang persis. Objektif projek ini adalah untuk merekabentuk dan mencipta voltmeter digital menggunakan mikropengawal Microchip PIC. Terdapat 4 fasa dalam metodologi untuk menyempurnakan projek ini iaitu kajian latar belakang, pembinaan "source code" PIC, pembinaan hardware dan penulisan tesis. Keputusan yang dijangka daripada projek ini membolehkan litar berfungsi dengan mengukur dan memaparkan jumlah voltan yang dikeluarkan oleh pek bateri kereta elektrik secara masa nyata dan secara automatik mengaktifkan litar pengecas. Litar amaran juga akan diaktifkan untuk memberi amaran kepada pengguna tentang keadaan bateri. Projek ini diharapkan dapat diaplikasikan di dalam industry automotif khasnya kereta nasional Malaysia.

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LIST OF ABBREVIATION

EV	–	Electric Vehicle
PIC	–	Peripheral Interface Controller / Programmable Intelligent Computer
LCD	–	Liquid Crystal Display
LED	–	Light Emitting Diode
ADC	–	Analog to Digital Converter
AC	–	Alternating Current
DVM	–	Digital Voltmeter
SOC	–	State of Charge
DC	–	Direct Current Voltage
VRLA	–	Valve Regulated Lead-Acid
ICE	–	Internal Combustion Engine
PHEV	–	Plug-in Hybrid Electric Vehicle
BEV	–	Battery Electric Vehicle
ASCII	–	American Standard Code for Information Interchange
PCB	–	Printed Circuit Board
IC	–	Integrated Circuit

LIST OF APPENDIX

KEYWORDS

1. Electric Car
2. Voltage Monitor
3. Voltmeter

CHAPTER I

INTRODUCTION

1.1 INTRODUCTION

The automobile industry continues to grow by leaps and bounds, and due to the increase in the number of vehicles worldwide, air-pollution continues to increase. Though the automobile manufacturers have reduced the emission of greenhouse gases such as hydro-carbons, carbon monoxide, carbon dioxide etc., from the vehicles, they cannot produce a zero-emission friendly vehicle unless they produce an electric vehicle (EV). An electric vehicle is an emission free, environment friendly vehicle. However, the electric vehicles remain unpopular among the consumers due to their lack of performance and their inability to travel long distances without being recharged. So, vehicles that embrace both the performance characteristics of the conventional automobile and the zero-emission characteristics of the electric vehicles are greatly anticipated by the general consumers and the environmentalists alike. These lead manufacturers to come up with a vehicle that is acceptable by the consumers and also meets the performance of the conventional vehicle with much less emissions.

Leading car manufacturers like Toyota and Honda have already started mass producing EV cars, Prius and Insight respectively, which are now becoming very popular among the consumers for their incredible mileage and less emissions. In the coming years many more automobile manufacturers will come up with their own EVs. The electric motor in the hybrid electric vehicle receives its power from a dedicated battery pack. The beauty of the EV is that energy can be fed back into the battery for storage, e.g., during regenerative braking (which is otherwise wasted as heat in a conventional vehicle).

Original idea was to build a low-cost intelligent digital voltmeter that can work as standalone device or portable, but can also be connected with electrical appliances. The digital voltmeter will be implemented in electric car to continuously monitor the voltages of the battery packs. It is to prevent the flat battery occurs as well as warning the user the current battery condition.

1.2 PROJECT OBJECTIVES

The main objective is to develop a low-cost voltage monitoring system to be implemented in any electric appliances especially for EV. An alarm system will be designed as an early warning to prevent flat battery. Furthermore an indicator circuit will also be designed to display the remaining power available in battery. In addition there is also a battery condition inspection to continuously inspect the battery condition and indicate a warning if replacement needed as well as to design an automated battery charging system.

1.3 PROBLEM STATEMENT

Current days, because of the short of fuel resources, people have been thinking to use an electric car as an alternative vehicle. The electric car has been introduced in the early 1830. An electric car needs an efficient and reliable voltage monitoring system to prevent breakdown and flat battery. The monitoring system should be user-friendly and able to do precise monitoring based on the extreme condition such as temperature, interference and EMI shielding.

1.4 SCOPE OF WORK

In this project, there are 3 scope of work must be implemented to make sure the project is successfully. Firstly, is by collecting the data and information regarding the project as well as the current technology involving the design of the electric car voltage monitoring. Next is by designing a low cost circuit by using Microchip PIC Microcontroller as well as develop the machine code of the PIC through MPLAB assembler for this project. Then, the last part is to implement the actual and real time-tested circuit to the prototype electric car system.

1.5 SHORT BRIEF OF PROJECT METHODOLOGY

In this PSM I, project methodology is divided into literature review, PIC source code development and hardware design development. The combination of both parts will be added on the PSM II report. The project methodology details were show in Chapter 3 in this report.

In literature review, all the information regarding this project will be stated such as types of PIC is used, state of charge which is the main concept of the project, the operations of digital voltmeter, and the battery condition.

In the PIC source code development, the PIC source code for this project will be developed by using MPLAB software. The MPLAB software is used to build the source code or program in assemble language.

In the hardware development, the circuit will be simulated in Proteus software. Once the simulation is correct, the circuit will be tested on the breadboard. After that, the circuit will be transferred on the PCB when all the connections on the breadboard are running properly. LCD will be used as the main indicator and display module for displaying the remaining voltage of battery. Other optional display module is LED Bargraph.

1.6 REPORT STRUCTURE

This report consists of five chapters which are Introduction, Literature Review, Methodology, Results and Discussions, Conclusion and Suggestions.

Chapter 1: Introduction; will discuss about project background, project objectives, problem statement, scope of work, short brief of project methodology and overview the remaining chapters.

Chapter 2: Literature Review; will present the reviews of some references from previous project, journals, articles, books and datasheet. All the materials were useful to succeeding this project.

Chapter 3: Methodology; will discuss the way to process this project. This project was divided into two parts which are software development and hardware design. The details process for the both part will totally presented in this chapter.

Chapter 4: Results and Discussions; will presents the result of the implementation of the project. More details on operation of the project and the entire

test taken will also be discussed. Any problem encountered on both software and hardware will also be discussed.

Chapter 5: Conclusion and Suggestions; will described the conclusion of the entire project operation, project findings, project achievement analysis and suggests the future further studies. The data processed will helps in determining the achievement of project's objectives.