UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SMART FUEL SYSTEM

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor's Degree in Computer Engineering Technology (Computer Systems) (Hons.)

by

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TAJUK: **SMART FUEL SYSTEM**

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor's in Computer Engineering Technology (Computer Systems) (Hons.). The members of the supervisory committee are as follow:

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ABSTRAK

Pada masa kini, jumlah pengguna kenderaan khususnya di Malaysia semakin hari semakin meningkat naik. Namun, sebagai pengguna kenderaan mereka tidak dapat mengelak daripada mengguna bahan penting untuk menghidupkan sesebuah kenderaan iaitu minyak. Untuk merujuk kuatiti semasa bekalan minyak yang masih ada di dalam tangki, pengguna akan merujuk meter minyak. Walaubagaimanapun, meter minyak yang biasa ada pada kenderaan pada masa kini tidaklah cukup membantu pengguna kenderaan secara lebih terperinci apatah lagi untuk mengetahui jumlah harga yang perlu diisi semula oleh pengguna. Ditambah lagi dengan harga minyak di negara ini yang tidak konsisten. Projek ini direka untuk menyelesaikan mesalah pengguna kenderaan tadi dengan rekaan meter yang memaparkan jumlah minyak yang perlu diisi oleh pengguna kenderaan terus kepada nilai ringgit (RM) dan liter (ℓ)). Selain itu, satu laman web direka untuk pengguna mengemaskini harga semasa bagi setiap per liter minyak jika berlaku sebarang perubahan harga minyak dan seterusnya membolehkan projek ini membuat pengiraan berdasarkan harga minyak terkini. Dengan ini, pengguna kenderaan tidak lagi perlu risau untuk menjangka sendiri jumlah yang perlu diisi semula oleh mereka kerana paparan LCD akan memaparkan terus jumlah yang patut diisi dalam nilai ringgit (RM) dan liter (ℓ).

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ABSTRACT

In our globalization and challenging world nowadays, the number of passenger on vehicles in Malaysia increase from days to days. However they could not escape from using fuels for their variety unique of vehicles. Fuel meter is a device to monitor amount of fuel used. However, normally fuel meter found in vehicles nowadays is not good enough to help motorists in more detail, its let users alone to find out the total price need to be refilled by the user. As addition the fuel price in this country is not consistent. But today I would like to invent new fuel meter that will display amount of fuel that need to be refill by vehicle user in Ringgit (RM) and Liter (ℓ). A website is designed for users to update the current price per liter of fuel in case of any changes in the price of fuel and thus enable the project to make calculations based on current fuel prices. So that it will become easier for them to fulfill their needs because they just needed to refer on LCD screen if want to know how much fuel price balance they need to refill either in Ringgit (RM) and Liter (ℓ).

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DEDICATION

Every challenging work needs self efforts as well as guidance of elders, especially those who were very close to our heart.
My humble effort I dedicate to my sweet and loving

Father & Mother,

Whose affection, love, encouragement and prayers of day and night make me able to get such success and honour,

Along with all hardworking and respected

Lecturers

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

°C	-	Celcius
AT	-	ATtension
A	-	Ampere
AC	-	Alternating Current
AREF	-	Analog-To-Digital Converter (ADC)
B	-	Byte
CSS	-	Cascading Style Sheets
DC	-	Direct Current
GND	-	Ground
HTML	-	Hypertext Markup Language
ICSP	-	In Circuit Serial Programming
IDEA	-	Integrated Development Environment
IOIO	-	Pronounced YoYo
I	-	Input
IOREF	-	Voltage Corresponding To The I/O
ℓ	-	Liter
LED	-	Light-Emitting Diode
LCD	-	Liquid Crystal Display
MHz	-	Megahertz
MB	-	Mega Byte
mA	-	Mili Ampere
O	-	Output
PC	-	Personal Computer
PHP	-	Hypertext Preprocessor
PWM	-	Pulse Width Modulation
RF	-	Radio Frequency
RM	-	Ringgit Malaysia
SPI	-	Serial Peripheral Interface
SDLC	-	System Development Life Cycle

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V	-	Voltage
USB	-	Universal Serial Bus
Wi-Fi	-	Wireless Fidelity

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CHAPTER 1
INTRODUCTION

This chapter explains the introduction of the project, problem statements, the objectives of the project being done, scope of the project, project significant and also the conclusion of the introduction part.

1.1 Project Background

Smart Fuel System was a project that display amount of fuel that need to be fill by vehicle user in Ringgit (RM) and Liter (ℓ). By using this system, the vehicle user knows how much price of the fuel accurately needs to refill without need to predict the price of fuel to make a payment during plan a journey. This system will be implemented by using Arduino microcontroller. Ultrasonic sensors were used to measure the volume of fuel remaining in the tank, then Arduino microcontroller gets the volume of the fuel left and the volume will convert to Ringgit (RM) and Liter (ℓ) then it will be displayed at the Fuel Meter. Besides, the vehicle user also were free to set current fuel price on its own according to the current changes in fuel price on this country. An website will be created as an alternative if to change the current changes in fuel prices per liter. A Wi-Fi Module will used to connect this website to Arduino microcontroller.

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1.2 Problem Statement

The vehicle users in Malaysia today are becoming increasingly crowded. This is because the vehicle is basic transportation where it is quite important for every citizen in the country. By the way, the fuel is a major source for vehicles so the usage for it is very important and widely for vehicle user. However, for each vehicle users often do not know the remaining fuel supplies remain in the fuel tank. Besides that, the vehicle users also do not know how much fuel to be filled exactly once each time they want to refuel because standard fuel gauge meter does not actually help much to this problem. In addition, a fuel price in Malaysia especially Petrol and Diesel is inconsistent cause effected from global fuel marketing industry. Since few years ago, the fuel price is always changing from month to month in this country. This situation makes it difficult for vehicle user as they should expect fuel prices to be filled based on the amount of fuel left in the tank.

1.3 Project Objectives

The main objective of this research is deeply concentrated on aspect as listed below:

1. To apply Ultrasonic concept in fuel tank system.
2. To develop Arduino application in order to display price fuel need to refill.
3. To design a fuel tank prototype that enhances the functionality an Database Website usage.

1.4 Project Scope

For this project, it can be divided into 2 part; the first is the software part and second is the hardware part. Firstly for software part, its responsible is to making the programming code for the circuit. In this project, there are 2 programming part which are for the circuit using C++, HTML, JavaScript, CSS and PHP. By using C++

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Programming in Arduino Software, the current volume of fuel remaining will be change to Ringgit (RM) and Liter (ℓ) before display on LCD Screen. By using HTML, JavaScript, CSS and PHP, a website including database will be created as an platform for user to change the current changes in fuel prices per liter. Wi-Fi Module will used to connect this database to Arduino microcontroller.

Next for hardware part, it's the section that responsible with the designing and constructing the circuit and also does the troubleshooting to the circuit. This project used Arduino Microcontroller to control the whole program in this project. Ultrasonic Sensor will measure the current volume of fuel remaining in the tank and the data will sent to Arduino Microcontroller. Arduino Microcontroller will received the data convert the fuel volume left into Ringgit (RM) and liter (ℓ). Finally, the value will be appear on LCD screen.

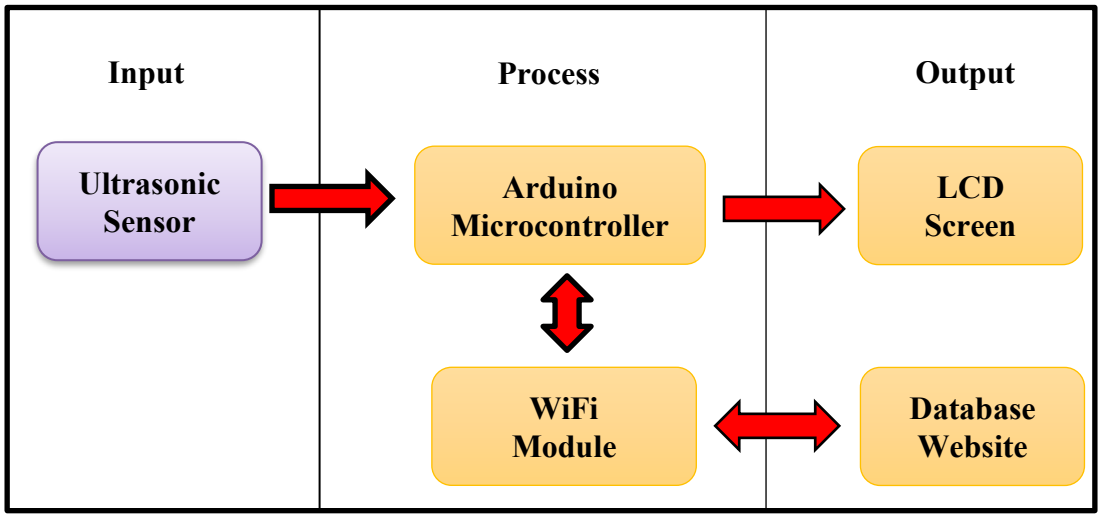

Figure 1.1: Block Diagram.

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1.5 Conclusion

In a nutshell, the smart fuel system uses Arduino and Android application to update the current fuel price with Ultrasonic sensors that will help the system to perform better. The purpose of this project is to eliminate the problem that vehicle users often do not know how much fuel their vehicles were in short supply and solve a problem if current fuel price have changed in Malaysia when influenced inconsistent fuel price.

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CHAPTER 2
LITERATURE REVIEW

In this chapter, there will have a discussion of the research background that related with this project. All the result in the concept of the literature framework will shows that the relationship between research projects with the theory and concepts in the figure or a suitable model about this project.

2.1 Meter Fuel Gauge

Figure 2.1: Auto Meter 5710 Phantom Electric Programmable Fuel Level Gauge (Source: <http://www.amazon.com/Auto-Meter-5710-Electric-Programmable/dp/B000P6IKBA> 29/5/16)

Figure 2.1 is show the example of Meter Fuel Gauge. The Meter Fuel Gauge is used to show the level of fuel remained in a tank as facilities for vehicle users. Typically used in most transport such as motorcycle, cars and so on these is also be used for any tank. The gauge is consists of two parts:

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1. The indicator
2. The sensing unit

Usually, the sensing unit uses a float connected to a potentiometer, commonly for a modern automobile have a printed ink design. When the tank is going to empties and the float will drops and slides is moved contact together with the resistor, the resistance is increased here. Besides that, when the resistance is going at a certain point, it will going to turn on a "Low Fuel Supply" light on some transport. Meanwhile, the indicator unit is measuring the amount of electric current flowing through the sending unit. After that, when the tank level is high or maximum, the current is allow to flow, so the needle points to "F" means a full tank. The least current is also will flowing when the tank is empty and the needle points to "E" means that there is enough fuel left in the tank for a few kilometers ago left (Jack Erjavec, 2005).

2.1.1 System of Fuel Gauge

The system of fuel gauge also can be fail and safe. If an electrical fault opens, the electrical circuit causes the indicator to show the tank as being empty rather than full. Steel or wear of the potentiometer will provide wrong about readings of fuel level. This system has a potential risk associated with it. An electric current is sent through the variable resistor to where a float that connected, so that the value of resistance depends on the fuel level. Mostly automotive fuel gauges such resistors are on the in the side of the gauge, means inside the fuel tank. Then, there was a risk when sending current through such a resistor has a fire hazard and an explosion risk associated with it. By the way, this resistance sensors are also shows an increased failure rate with the incremental additions of alcohol in automotive gasoline fuel. The alcohol can cause increases the corrosion rate at the potentiometer as it is ability that can carrying a current. Besides, an applications of Potentiometer for alcohol fuel also use a pulse and hold methodology, with a periodic signal being sent to decide fuel level decreasing the corrosion potential (Erjavec and Jack 2005).

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2.1.2 How Fuel Gauge Work

According to Karim Nice (2001) there are two main parts to a fuel gauge, Firstly, the sender which measures the quantity of fuel in the tank and secondly, the gauge which displays level of fuels for the vehicles users. In the article, Karim Nice said the sending unit is located in the fuel tank of the car. Figure 2.2 show the relationship between sending unit and fuel gauge. It consists of a float, usually made of foam connected to a thin, metal rod. The end of the rod is installed to a variable resistor. Then, the concept more resistance there is, the less current will flow for a resistor as an electrical device that resists the flow of electricity. Then, the variable resistor that consists of a strip of resistive material will connected on one side to the ground for a condition in a fuel tank. A wiper is function to connect to the gauge slides along this strip of material, to instruct the current from the gauge to the resistor. If the wiper is near close to the grounded side of the strip, then there will a low resistive material in the path of the current, so smallest resistance become. If the wiper is at the end of the strip, there is high resistive material in the current's path, so the more resistance become. The learning about how standard fuel meter gauge work to this project is this prototype design a same concept of the tank that will be used to fill with the fuel, but this prototype used an ultrasonic sensor to measure the fuel to test accurately measuring work to measure the fuel better than standard meter fuel gauge.

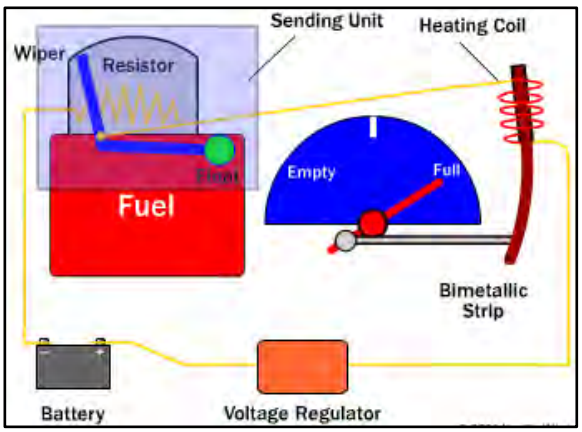

Figure 2.2: How Fuel Gauge Work (Karim Nice, 2001)

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