UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF CAR TEMPERATURE COOLING CONTROL BY USING MAGNET CODE

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Electronic Engineering Technology (Industrial Electronic) (Hons.)

by

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DECLARATION

I hereby, declared this report entitled Development of Car Temperature Cooling Control by Using Magnet Code is the results of my own research except as cited in references.

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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 of Electronic Engineering Technology (Industrial Electronic) with Honours. The member of the supervisory is as follow:

……

MR. EFFENDY ONN BIN SIAM

(Project Supervisor)

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ABSTRAK

Pada masa kini kebanyakan keluarga di Malaysia mempunyai lebih daripada sebuah kereta untuk kegunaan sehari-hari. Kereta merupakan kenderaan yang bergerak di atas jalan raya yang dapat membawa penumpang dan barangan serta lebih mudah digunakan berbanding pengangkutan awam. Namun begitu, kereta yang diletakkan di tempat meletak kenderaan yang terbuka akan menghadapi masalah peningkatan suhu di dalam kereta. Keadaan ini akan menyebabkan pemilik kenderaan berasa kurang selesa ketika memasuki kereta. Akibat daripada kenaikan suhu yang tinggi di dalam kereta, barangan di dalam kereta mudah rosak sebagai contoh komponen plastik di dalam kereta, komputer riba, pemain cakera, LCD, GPS dan sebagainya. Oleh yang demikian, sistem kawalan suhu diperlukan untuk mengurangkan peningkatan suhu di dalam kereta. Melalui projek ini, program yang ditulis di dalam cip kawalan mikro 16F777 akan mengawal sistem yang dibina. Penderia jenis LM35 pula akan mengesan suhu di dalam dan di luar kereta dan menghantar isyarat kepada cip kawalan mikro. Kipas digunakan untuk mengeluarkan haba panas dari dalam kereta dan tenaga solar digunakan sebagai sumber tenaga untuk menghidupkan kipas penyejuk. Perisian Magnet Code pula digunakan sebagai medium interaksi antara sistem dengan telefon bimbit pemilik kereta. Untuk hasil daripada ujian ini, haba panas dapat dikurangkan tetapi bergantung kepada haba yang terhasil sekiranya sukatan haba tinggi maka masa yang diambil untuk mengeluarkan haba adalah lebih lama.

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ABSTRACT

Most Malaysia families have more than one car for daily use. Cars are vehicles traveling on roads that carry passengers and goods and are easier to use than public transport. However, the car parked in an open car park will have problems with increasing temperature in the car. This will cause the vehicle owner to feel uncomfortable when entering the car. Due to the high temperature rise in the car, the items in the car are easily damaged as an example of plastic components in cars, laptops, disc players, LCDs, GPS and so on. Therefore, a temperature control system is required to reduce the temperature rise in the car. Through this project, programs written in the 16F777 microcontroller chip will control the system. LM35 sensors will detect temperature inside and outside the car and send signals to microcontroller. The fan is used to remove heat from inside the car and the solar energy is used as a source of energy to turn on the cooling fan. The Magnet Code software is used as a medium of interaction between the system and the car owner's smart phone. For the results of this test, hot air can be reduced but depends on the heat generated if the heat is high then the time taken to vent out the hot air is longer.

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DEDICATION

Alhamdulillah, praise to the Almighty Allah SWT. This thesis is dedicated to my beloved mother, father and brother who always give me their support Nazirah binti Ariffin, Abd Wahid bin Ramly and Mohammad Izwan bin Abd Wahid

To my supervisor,
Mr Effendy Onn bin Siam, thank you for your guidance, encouragement and kindness.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

˚C	-	Degree Celcius
SMS	-	Short Message Service
PV	-	Photovoltaic
J	-	Joule
KM	-	Kilometer
˚F	-	Fahrenheit
PIC	-	Programmable Integrated Circuit
RXD	-	Receiver
TXD	-	Transmitter
GND	-	Ground
m	-	Meter
>	-	More than

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CHAPTER 1
INTRODUCTION

1.0 INTRODUCTION

According to Department of Statistic Malaysia, our country population in the year 2016 is 31,660,000 people and in ranking number 41 in world populations. While in the year 2020, Malaysia population estimation around 32.4 million according to Economic Planning Unit Prime Minister Department. Meanwhile, from Malaysian Automotive Association vehicle that registered is 580,124 vehicle for the year 2016 while estimation from Trending Economics there will be 1460,000 cars registered in the year 2020. From information demonstrates that as the number of population is increasing, the number of the vehicle also increase because nowadays automobile is necessary for everyone.

A car air conditioning is one of an important element in our car and attempts to make driving more agreeable by controlling the temperature and humidity inside the car. Car air conditioning is customizable, enabling passengers to travel in a comfortable temperature at all times. However, it comes to an issue when the car is park below the sunlight at open parking.

As sunlight hits the window then enters the car and make interior and air inside the car became warm when park at open parking. The windows, since they are currently hotter than the air outside, exchange heat back to the air around the car as in 'steady state' theory state that the heat moves from hotter bodies to colder one and if the difference is bigger, the heat moves faster. (Zach, 2007)

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If the inside temperature is hotter, surroundings will generate more heat because of heat transferred around it. Thus, when the car is cool, the sun will heat it up more quickly, and the heat gained from sun same as heat lost due to the air. A current research carry out by Stanford School of Medicine uncover the critical effects of high internal temperatures of the car. Indeed, a parked car heat could raising even on mid-temperature days. From the research found that the average of temperature raising in one hour was around 22˚C and can result to be life threating particularly for little children **(Spector, 2005)**

Ordinarily, there are huge different between temperature inside a parked car with outside because during the normal sunny day can reach up to more than 20-30 degrees. The expansion in temperature is the consequence of conduction, convection and radiation makes heat absorbing materials and glass and car body respectively, while radiation is the most compelling component causes for increased temperature of the parked car. **(Almanjahie, 2008)**

From Malaysian Meteorological Department record, the mean maximum temperature at Malaysia is around 34˚C to 36˚C on March 2017. Meanwhile, for the past last year was 39.5˚C.

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1.0 PROBLEM STATEMENT

The temperature inside the car is one of a factor to keep comfort to the car passenger. The air conditioning system functioned to control the temperature but this system only operates with a car engine in operation. On the other hand, there is a problem when the car is park or left at open parking under the sunlight because the temperature inside the vehicle will increase resulting from the hot air flow inside the car.

1.2 OBJECTIVES

The objective of this project as follows;

a) To study and design car temperature cooling control that utilizes the solar energy.
b) To develop a system by using the MagnetCode software.
c) To analyze the effectiveness of cooling controller system.

1.3 SCOPE

Due to the time constraint frame allocated and to ensure the project successfully done, the scope limited within the following area:

a) To create a device as heat removing using a cooling fan.
b) Circuit design and its assemblage.
c) To analyze the data through the obtaining results.

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CHAPTER 2
LITERATURE REVIEW

In this chapter will show all the existing research that related to the project. All the information are required to design and build up the new project. The research will concentrate on each hardware and software that will be utilized for project development. With the research help, the idea for the suitable component for the project can be generate. The source of these research has to be worthy in the system format such as books, journals, articles, and websites.

2.0 Solar Radiation

Malaysia is situated in the central region with an average solar radiation of 400–600 MJ/m² per month. It has a promising potential to establish large-scale solar power installations; however, solar energy is still at the infancy stage due to the high cost of photovoltaic (PV) cells and solar electricity tariff rate. The Malaysian government is keen to develop solar energy as one of the significant sources of energy in the country.

Throughout the year, the temperature ranges between 22 ˚C and 33 ˚C (72–91 ˚F) and the average daily temperature are 26.5 ˚C. The monthly solar radiation in Malaysia is approximately around 400–600 MJ/m2. It goes higher during the Northeast monsoon period and lowers during the Southwest monsoon. Two places where have the best solar radiation in Malaysia are Kota Kinabalu (Sabah) and Bayan Lepas (Penang).

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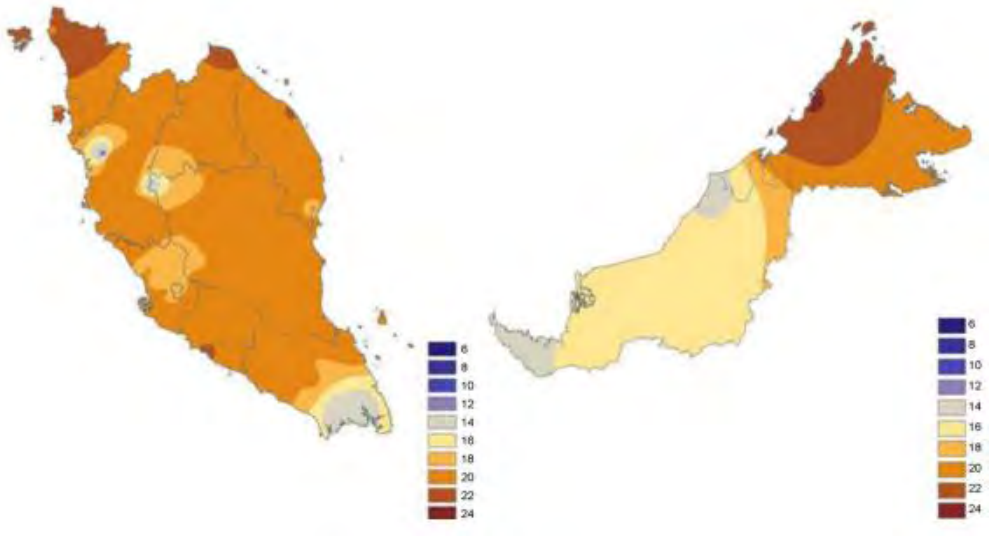

Figure 2.0: Annual Average Solar Radiation in Malaysia (MJ/m²/day)

Table 2.0: Annual Solar Radiation in Different Cities/Town in Malaysia

Region/Cities	**Annual average value (kWh/m²)**
Kuching	1470
Bangi	1487
Kuala Lumpur	1571
Petaling Jaya	1571
Seremban	1572
Kuantan	1601
Johor Bahru	1625
Senai	1629
Kota Bharu	1705
Ipoh	1739
Taiping	1768
Georgetown	1785
Bayan Lepas	1809
Kota Kinabalu	1900

In Malaysia, the solar energy applications can be divided into two main categories which is solar thermal application and photovoltaic (PV) technologies.

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Solar thermal is a technology where the heat from solar energy is harnessed for heating purposes while photovoltaic is a technology where arrays of cells which contain solar photovoltaic material convert the solar radiation into direct current electricity. (Mekhilef, 2012)

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2.1 Software Part

2.1.1 Android

Android is mobile operating coming from the technology mammoth by Google. This mobile operating system is based on the Linux Kernel and basically designed for smart devices. Once the Android app is installed on the device then each Android app has its own security sandbox. An app's code run in isolation from other apps as each process has its own Virtual Machine. Android also implements the principle of least privilege by that, each app can access only the components that are required to accomplish a specific task.

2.1.2 CCS C Compiler

One of a Microchip PIC Microcontroller Tool Solutions company product is CCS software that stands for Custom Computer Services. This software includes a lot of built-in libraries which enable to program a PIC Microcontroller without the deep knowledge of its internal architecture of PIC. It can develop with design through device programming and debug. C-Aware is the ideal environment to develop C program code with integrated built-in functions, performance analyzation, and statistics, and debugging compiled code in real-time while running on Microchip PIC devices.

Figure 2.1: CCS C Compiler

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2.1.3 Magnet Code

For controlling purpose, Magnet Code was develop the prototyping platform and can be installed in the Smartphone (with Android OS) to interface Smartphone with a Microcontroller or a computer. Each smartphone can be upgraded with controller feature by using Magnet Code software. It also provides a user-friendly graphical user interface. The communication between user and smartphone is by Bluetooth communication. Through the commands, the user can easily control any module in the Smartphone, such as take photo, record video, vibrate, send SMS and email. The user can easily create a layout for their App by using Magnet Code.

Figure 2.2: Magnet Code Icon

2.2 Bluetooth

Bluetooth is one of wireless technology nowadays. It functioned as exchanging data over short distances by using UHF radio waves in short-wavelength in the ISM band from 2.4 to 2.485 GHz from building personal area networks (PANs) and from fixed and mobile devices. Bluetooth is low-power consumption, with a short range based on low-cost transceiver microchips in each device.

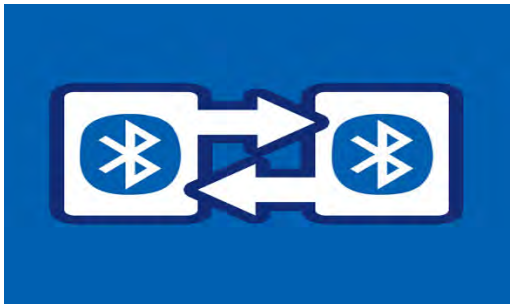

Figure 2.3: Bluetooth

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2.3 Hardware Part

2.3.1 Solar Panel

To generate a flow of electricity, a solar panel works by permitting photons, or particles of light, to knock electrons free from atoms. Solar panels actually comprise many, smaller units called photovoltaic cells. Each photovoltaic cell is basically a sandwich made up of two slices of semi-conducting material, usually silicon. To work, photovoltaic cells need to establish an electric field. Much like a magnetic field, which occurs due to opposite poles, an electric field occurs when opposite charges are separated. To get this field, manufacturers "dope" silicon with other materials, giving each slice of the sandwich a positive or negative electrical charge. (Dhar, 2013)

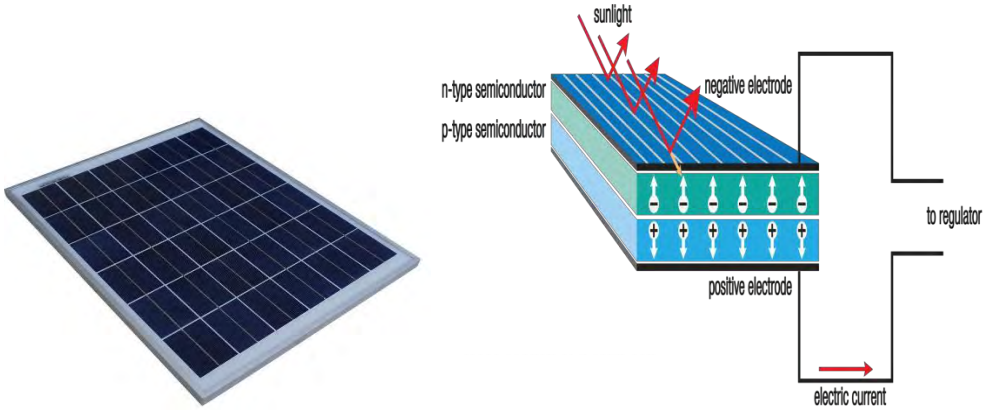

Figure 2.4: Solar Panel and Cross Section

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2.3.1.1 Types of Solar Cells

There are three basic types of solar cell that is Monocrystalline cells, Polycrystalline cells and the third type is the amorphous or thin-film solar cell.

(a) Monocrystalline cells

Solar cells made of monocrystalline silicon (mono-Si), also called single-crystalline silicon (single-crystal-Si). The regular monocrystalline solar cell is a dull black shading, and the sides of cells are usually missing as a result of the production process and the physical nature of monocrystalline silicon. Monocrystalline solar cells are made out of silicon ingots, which are cylindrical in shape. To improve performance and lower expenses of a single monocrystalline solar cell, four sides are removed of the cylindrical ingots to make silicon wafers, which is what gives monocrystalline solar panels their characteristic look.

Figure 2.5: Monocrystalline Solar Cells

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