" I hereby declare that I have read trough this report entitle "Design and evaluate the performance of Solar charging system for MY 2nd EYE project" and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Power Electronic and Drive)

Signature : …….

Supervisor's Name : Mr. ANUAR BIN MOHAMED KASSIM

Date : …….

DESIGN AND EVALUATE THE PERFORMANCE OF SOLAR CHARGING SYSTEM FOR MY 2ND EYE PROJECT

ZULHAIMIE BIN BOLOH

A report submitted in partial fulfillment of the requirements for the degree of Bachelor Electrical Engineering

Faculty of Electrical Engineering

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2012

I declare that this report entitle “Design and evaluate the performance of Solar charging system for MY 2nd EYE project” is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature	:	…….
Student Name	:	ZULHAIMIE BIN BOLOH
Date	:	…….

Thanks to my beloved mother and father

My Family

My supervisor

Mr. Anuar Bin Mohamed Kassim

And

Also my panels

Mr. Mohamed Azmi Said,

Mr. Johar Akbar Mohamat Gani

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ABSTRACT

Nowadays, there are many new technologies have been developed in order to support people with disabilities in our country including the blind sight. However, almost all of them still use a white cane to travel anywhere they want to go. Therefore, they still have limits to explore new places and still need support from others to help in order to move since the situation is unusual for them. White cane can only be used to detect obstacles in front of them on the surface when the rod touches the surface. As a result, a white cane is not effective in usage, since it limited on the surface only and not all areas. Blind people have difficulty when moving in a surrounding of many people. There is also a person that uses sensors to detect obstacles in front, left and right, top and bottom of a battery. But a battery that is used will not last long and had to restore power rechargeable battery that uses sensors to function again. The blind also have to bring the battery charger when the mobile device to any other area. Therefore, the propose a new tool that can support and guide the blind to be able to move anywhere they want during the day without lead storage batteries and spare battery charger. The proposed device is to add "solar" (device that uses light energy). In addition, the proposed device can help them not to charge the battery again and bring the battery charger for mobile devices anywhere in the daytime, because the device proposed will provide energy to the batteries received from the sun. In addition, the cost of this project is also much cheaper and the blind can have the device with ease.

ABSTRAK

Pada zaman sekarang, ada banyak teknologi baru yang telah dibangunkan dalam rangka menyokong orang kurang upaya di negara kita termasuk orang-orang buta penglihatan. Namun, hampir semua daripada mereka masih menggunakan tongkat putih untuk bergerak ke mana-mana yang mereka ingin pergi. Oleh kerana itu, mereka masih mempunyai batas untuk menjelajah tempat baru dan masih memerlukan sokongan daripada orang lain untuk membantu dalam rangka untuk bergerak kerana persekitaran yang tidak biasa bagi mereka. Tongkat putih hanya boleh digunakan untuk mengesan halangan di depan mereka di permukaan ketika tongkat menyentuh permukaan. Akibatnya, penggunan tongkat putih tidak sangat efektif kerana penggunaannya yang terhad dan tidak semua kawasan. Orang-orang buta mempunyai kesukaran apabila bergerak di kawasan yang mempunyai ramai orang. Terdapat juga tongkat yang menggunakan sensor untuk mengesan halangan di depan, kiri dan kanan, atas dan bawah dengan bantuan bateri. Tetapi bateri yang digunakan tidak boleh bertahan lama dan terpaksa dicas semula untuk mengembalikan kuasa bateri agar sensor pada tongkat boleh berfungsi semula.Orang buta juga terpaksa membawa alat pengecas bateri apabila bergerak ke mana-mana. Oleh sebab itu, kami mencadangkan alatan baru yang boleh menyokong dan membimbing orang buta untuk dapat bergerak ke mana pun mereka inginkan pada siang hari tanpa membawa bateri simpanan dan alat pengecas bateri. Peranti yang dicadangkan adalah menambah “solar” (Peranti yang menggunakan tenaga cahaya matahari).Selain itu, peranti yang dicadangkan boleh membantu mereka supaya tidak perlu mengecas bateri semula dan membawa alat pengecas bateri untuk bergerak ke mana-mana pada siang hari, kerana peranti yang dicadangkan akan memberi tenaga kepada bateri yang di terima daripada cahaya matahari. Selain itu, kos projek ini juga lebih murah dan orang-orang buta dapat memilikinya dengan mudah.

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LIST OF ABBREVIATION

AC	Alternating Current
ARV	Array Reconnect Voltage
C	Programming language
DC	Direct Current
CAD	Computer Aided Design
DSP	Digital Signal Processors
GPS	Global Positioning System
FYP	Final Year Project
I	Current
IC	Integrated Chip
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MPPT	Maximum Power Point Tracker
P	Power
PIC	A family of microcontroller
PV	Photovoltaic
PWM	Pulse Width Modulation
RPM	Rapid Prototype Modeling
SBM	Society of Blind Malaysia
SPV	Solar Photovoltaic
USB	Universal Serial Bus
UTeM	Universiti Teknikal Malayisia Melaka
V	Voltage
VR	Voltage Regulation
W	Watt

LIST OF SYMBOLS

R1	Resistor 1
R2	Resistor 2
Vin	Voltage Input
V	Voltage
I	Current
R	Resistor
P	Power
D	Duty Cycle
k	kelvin
T	Time
W/m2	Weber Per Square Meter
^{o}C	Degrees Celsius

LIST OF APPENDICES

CHAPTER 1

1 INTRODUCTION

1.1 Project Background

The population of disable person is increased year by year and the 80 percent of disable person is located in developing countries. The number of disabled people in Malaysia is estimated about 2.8 million people from a population of Malaysian people. This number of population include the disable person that cannot be traced by government. This project is timed to develop the system to help the blind people move without any complication. This developing system uses the microcontroller to control the obstacle sensor and gives the input to the vibration motor as a warning system. This project can use battery and solar for energy supply in the circuit. Focus of this project is to make the user of this system can afford to buy this product and user friendly to the blind man. The user comfortability is our priority to this product because it involves the blind man that cannot see the world. Therefore, the involvement of the blind man to this project is important to make it successfully.

1.2 Problem Statement

A problem statement is a concise description of the issues that need to be addressed before solve the problem. We must come out with the solution to make sure our project successful.

The problems of this project are: “Current device only use battery and causes problems to the blind person when they travel outside at day light”.

The way to solve the problem is to make a device that is compact and user friendly, as well as to design.

1.3 Objective

The objectives of this project are:

1. To design the configuration of solar charging system.
2. To evaluate the performance for My 2nd eye project in order to ensure the device can be operated independently without what parameters.

1.4 Scopes

The scope of this project is to build the 2nd eye for the impaired person by using a sensor unit, communication unit and power management. But, scope of this project focuses on power management namely solar charging system and battery charger controller. The proposed the device is design of solar charging, in order to further improve the efficiency of solar energy collection within a limited time. Solar energy can use day light when the blind man go to outside home.

CHAPTER 2

2 LITERATURE REVIEW

2.1 Introduction

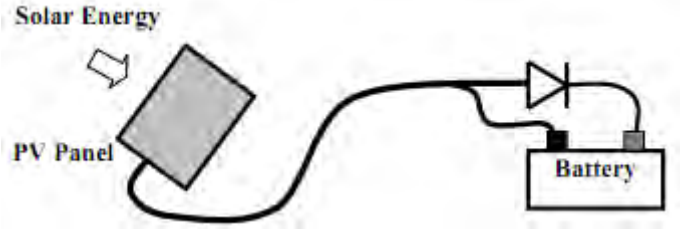
There are many products designed to help the disable person in order to improve the quality of life and they can live same as normal person. Especially to the visually impaired person that cannot see light of world. They cannot move with their own and must get help from the normal person to move anywhere. Many of them use the white cane to sense the obstacle around them. However, the white cane needs much training and also required help from others. This innovation is designed to help the blinds to move independently without any support from other people although in day light, because the device proposed will provide energy to the batteries in the form of solar energy from the sun.

2.2 Solar panel

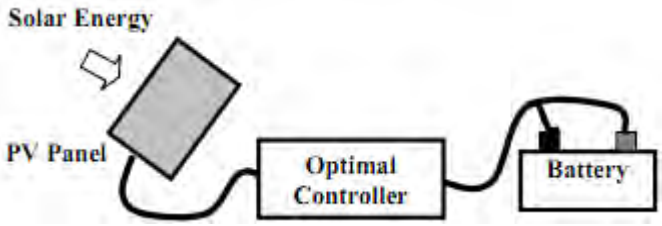
The Solar panel is a power transfer photo electricity component. It transfers sunlight energy to electric energy. Therefore, photo electricity component is called Solar cell. From physics point of view, solar panel is also called Photovoltaic (PV), which means that photo is light and voltaic is electrics [1].

Using solar power to charge batteries is not a new idea. A simple way to accomplish this is to connect a photovoltaic (PV) panel directly to a battery. To prevent the reverse current from the battery, a diode is usually used as shown in Figure 2.1 (a). The advantages of

such a system are the simplicity and low cost. The disadvantages are the PV panel can only provide charging current when its output voltage is higher than the battery voltage and the system does not always work at the optimal to convert the available solar power into electricity. A controller can be added between PV panel and the battery for improvement of the system performance as shown in Figure 2.1(b) [2].



(a) with diode



(b) with optimal controller

Figure 2.1: Solar Powered Battery Charger [2].

2.3 Solar Charge Controller

Charger controller can control charge in the battery from the photovoltaic systems. A battery charger is a device used to install energy into a secondary cell or battery, by forcing an electric current through it. The charge of the current depends upon the technology and capacity of the battery being charged.

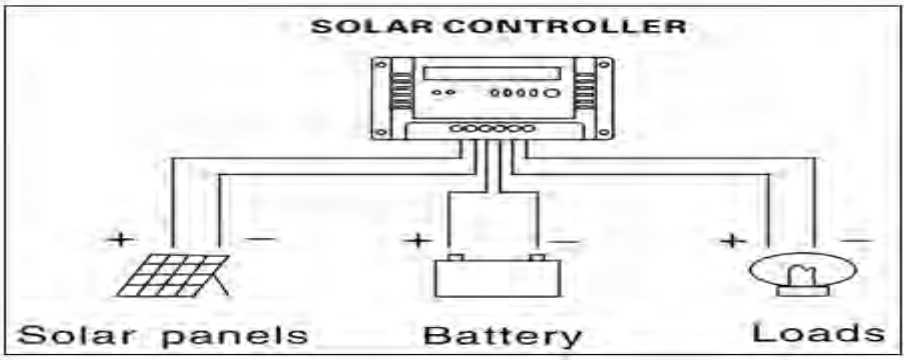


Figure 2.2: Solar Charge Controller.

Figure 2.2 show about charge controller set points. There are many differences between charging and discharging. Voltage regulation show maximum situation when charging and low voltage load disconnect when discharging [3].

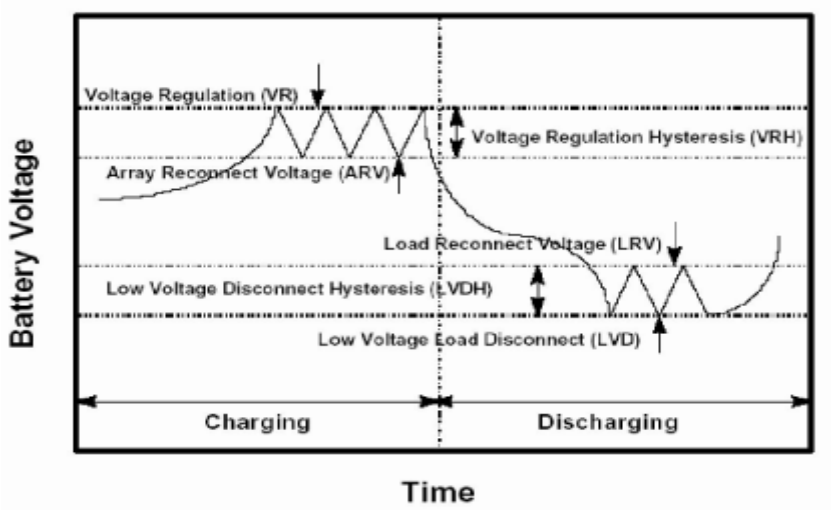


Figure 2.3: Charge Controller set points [3].

2.4 Maximum Power Point Tracking (MPPT)

To improve the performance of solar charging system the array Maximum Power Point Tracking (MPPT) can use from the PV [4]. It extracts additional power from PV array, under certain conditions. MPPT methods have been roughly classified into groups namely large-scale PV power systems, generally making use of digital signal processors (DSPs) or microcontrollers and small-scale PV power system, usually without digital controllers.

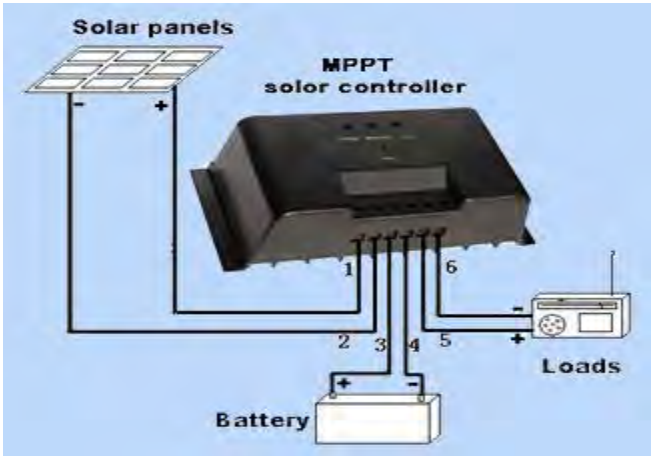


Figure 2.4: Charge controller using MPPT

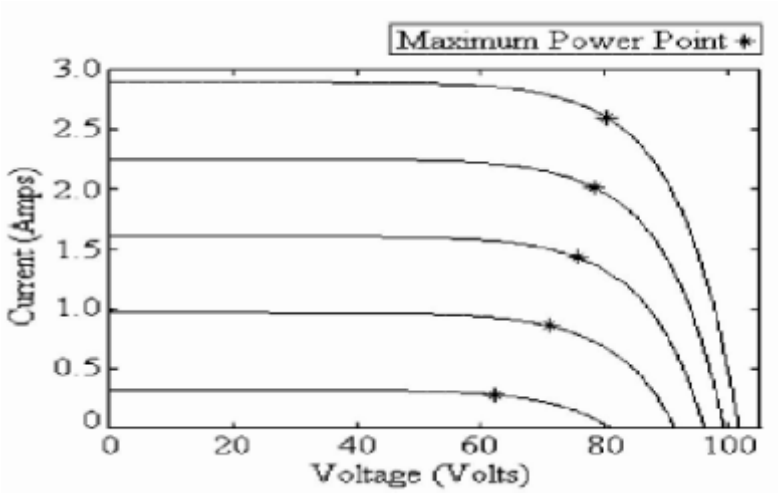


Figure 2.5: Photovoltaic (PV) array V-I curve [4].

2.5 Summary of Literature Review

The fields of literature review for this project are studied so far, includes are solar charging system, Solar Charge Controller and Maximum Power Point Tracker (MPPT). Solar Photovoltaic (SPV) technique is the most popular way of utilizing solar energy storage to supply the load power when solar power is not available. The power voltage characteristics of the Photovoltaic (PV) module varies depending upon atmospheric conditions and has unique peak on it.

For simulation process, the solar charge controller circuit must be developed to get a output to achieve the objective.

CHAPTER 3

3 PROJECT BACKGROUND

This project can be divided into two major parts which are software part and hardware part. The software part involves the development of the program for microcontroller to integrate the input with warning system, to perform the simulation and to set the frequency sound. While, the hardware part includes the design and development of the warning system, design of the controller and location of the speaker. Next, the hardware part includes the design and development solar charging for My 2nd Eye project. The system of this project also will be discussed in this chapter.

3.1 Hardware

The hardware for this project can be divided into mechanical parts, electrical and electronics parts. The mechanical parts consist of the solar panel, rechargeable battery and Distribution Board (DB). The electrical and electronics parts consists of microcontroller circuit, solar charge controller circuit, the components electronics such as capacitor, resistor, integrated chip (IC), voltage regulator, wires and connectors.

3.1.1 Solar Panel

Solar panels use heat energy (photons) from the sun to generate electricity through the photovoltaic effect. The structural (load carrying) member of a module can either be the top layer or the back layer. The majority of modules use wafer-based crystalline silicon cells

or thin-film cells based on cadmium or silicon. The conducting wires that take the current off the panels may contain silver, copper or other non-magnetic conductive transition.

Figure 3.1: Solar Panel.

Table 3.1: The specification of Solar Panel 12V 5W

ITEM	SPEC	UNIT
Maximum Power (+/-5%)	5	W
Voltage at Pmax (Vmp)	12	V
Current at Pmax (Imp)	0.417	A
Open Circuit Voltage (Voc)	21.6	V
Short Circuit Current (Isc)	0.534	A
Open Circuit Temperature Coefficient	0.65	% / ^{o}C
Short Circuit Temperature Coefficient	-80	mv / ^{o}C
Output Power Temperature Coefficient	0.5	% / ^{o}C
Wind Survivability	201	kph (125mph)
Hailstone Survivability	50	mph
Operating Temperature	-40 to +85	^{o}C
Monthly Energy Production (4hrs average sunlight per day)	0.6	kWh
Size	179 x 130 x 17	mm
Weight	0.75	kg (1.7lb)

From the Table 3.1 above, the value of standard voltage is 12V and the operating temperature is in the range of -40 to +85^{o}C. The solar panel power is controlled by Solar Charge Controller or Maximum Power Point Tracker. The solar panel is one type of Direct Current (DC) supply and needs the sun to produce power and voltage.