



**Faculty of Electrical and Electronic Engineering Technology**



**DESIGN A SHOE CHARGER PIEZOELECTRIC EFFECT**

اونيورسي تيكنيكل مليسيا ملاك  
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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**Bachelor of Computer Engineering Technology (Computer Systems) with Honours**

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**DESIGN A SHOE CHARGER PIEZOELECTRIC EFFECT**

**PUGAANESWARI A/P VELAUTHAM**

**A project report submitted  
in partial fulfillment of the requirements for the degree of  
Bachelor of Electronics Engineering Technology with Honours**



**Faculty of Electrical and Electronic Engineering Technology**

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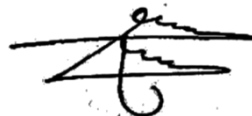
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## DECLARATION

I declare that this project report entitled “**Design a Shoes Charger Using Piezo-Electrical Effect**” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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## APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Computer Engineering Technology (Computer Systems) with Honours.

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## DEDICATION

*I owe my gratitude to my beloved father, mother, and friends. Thank you also to my Final Year Project Supervisor, Dr. Jamil Abedalrahim. Alsayaydeh Jamil who has guided me throughout this journey. Beyond thankful to everyone who was with me this far to complete this thesis.*



## ABSTRACT

Electricity has a huge impact on the environment. Electricity is generated in a variety of ways, using both renewable and non-renewable energy sources. These resources are depleting day by day, and the environment is becoming increasingly contaminated as a result of global warming. Hence, we require some clean, sustainable energy to safeguard the environment and minimise power outages. The main purpose of this initiative is to improve electricity generation processes. The application of the project is to create electricity by turning a person's body weight into clean, long-term electrical energy. In addition, the aim of shoe charger using piezoelectric effect project is to design a charger which can be fitted into shoes and utilised to generate electricity while walking. The piezoelectric generates electricity and stored in a battery which can use later to charge the smartphone.. The piezoelectric is the power source for the auto lacing and LEDs that link in this shoe charger in this project. The piezoelectric act as power source for the Arduino Uno, which will be coupled to a servomotor and an LED. However, the purpose of this shoe charger project is to reduce the issue of time spent waiting for a device to charge completely. As a result of the walking action, the generator will create roughly 2-4 V DC voltage. Due to the output voltage does not reach the specified charging voltage. To increase the output voltage to the appropriate charging level, a AC/DC converter circuit will be designed.

## ***ABSTRAK***

Tujuan utama inisiatif ini adalah untuk menambah baik proses penjanaan elektrik. Aplikasi projek ini adalah untuk mencipta tenaga elektrik dengan mengubah berat badan seseorang menjadi tenaga elektrik jangka panjang yang bersih. Selain itu, tujuan projek pengecas kasut piezoelektrik adalah untuk membangunkan pengecas yang boleh dipasang ke dalam kasut dan digunakan untuk menjana elektrik semasa berjalan. Piezoelektrik menjana elektrik, yang disimpan dalam bateri dan digunakan untuk mengecas telefon pintar. Piezoelektrik ialah sumber kuasa untuk pengikat automatik dan LED yang memaut dalam pengecas kasut ini dalam projek ini. Piezoelektrik, sebagai contoh, ialah sumber kuasa untuk Arduino Uno, yang akan digandingkan dengan servomotor dan LED. Bagaimanapun, tujuan projek pengecas kasut ini adalah untuk mengurangkan isu masa yang dihabiskan untuk menunggu peranti dicas sepenuhnya. Hasil daripada tindakan berjalan, penjana akan menghasilkan lebih kurang 2-4 V voltan DC. Oleh kerana voltan keluaran tidak mencapai voltan pengecasan yang ditentukan. Untuk meningkatkan voltan keluaran ke tahap pengecasan yang sesuai, litar penukar AC/DC akan direka bentuk



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## LIST OF SYMBOLS

$\Omega$	-	Ohm
	-	
	-	
	-	
	-	
	-	
	-	
	-	





## LIST OF ABBREVIATIONS

$V$	-	Voltage
$R$	-	Resistance
$I$	-	Current
AC	-	Alternating Current
DC	-	Direct Current



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## CHAPTER 1

### INTRODUCTION

This project is a combination of sports and technology, and it is always fun to use gadgets while running. In this project, mainly focus on how the piezoelectric generates electricity. The current that produced by piezoelectric will be stored in a power bank(battery) which can use to chage phone. Then, the stored battery also will act as power supply to arduino which will make the servo motor function. The arduino and servo motor fix into the shoe for auto lacing. Moreover, the current is battery also will supply to led which can be use when needed. In this show, a pedometer LCD display which can count walking step, and count calories burnt.

This section covers the project's introduction which includes objectives, problem statements, scope, methodology, and report structure of the project.

#### 1.1 Background

Because of the incremental demand day-by-day with population increase in the Electrical Distribution System, electrical energy generation has become a more important aspect in the power system nowadays. Despite the fact that power creation can be accomplished in a variety of methods, this technology is unique in that electrical energy is generated utilising piezo sensors based on the Piezo Electric Effect concept. Piezo comes from the Greek term "Piezein," which meaning "to press or squeeze." Energy consumption

has increased as a result of population growth, resulting in a lack of non-renewable energy resources. This is overcome by generating power from this renewable resource.

Then, this project aims to design a shoe charger using piezoelectric effect which can produce electric to charge handphone. As we all know that walking burns a lot of energy every day, the aim of this project is to create a portable charger that can transform kinetic energy into energy that can be used to charge electronic devices. Besides that, this project is focused and research on how a piezoelectric can produce current and able to use it as power supply.

This section covers the project's introduction, which includes objectives, problem statements, scope, methodology, and report structure of this project.

## 1.2 Problem Statement

Nowadays, individuals continuously rushing through their jobs and we have many things to complete and solve every day. As a result, we frequently hear the phrase "not enough time". Unfortunately, time does not wait for anyone, so we must find a way on how to conserve time. Electronic devices now very important in our daily lives. The gadget's manufacturer usually gives the charger, and the user must connect it to the power supply to charge mobile phone and this cause the user need to wait a long time for the device to be fully charged.

Apart from that, energy is generated utilizing oil, charcoal, and a variety of other natural resources, all of which pollute the environment. Using a charger will increase the amount of power used, which will increase pollution in the environment. Furthermore, renewable energy will be required to meet our future need because these natural resources will be depleted in the future and to reduce pollution.

Furthermore, traditional chargers do not allow consumers to move about while charging their personal devices. As a result, the user is unable to perform other tasks and must wait until the electronic device is fully charged. Moreover, people will not be able to tie their own shoelaces especially children and disabled people. Then users do not feel easy to count their walking steps daily and calculate their total calories burned manually where this can be a reason for users to lose interest in exercise. Last, emergency light such as flashlight also need in darker place.

### 1.3 Project Objective

Main goal of shoes charger project is to build a shoe charger that utilises the piezoelectric effect. Specifically, the objectives are as follows:

- a) To design a circuit that converts the piezoelectric output to meet the need to charge electronic devices.
- b) To implement the product design into a shoe that can be used to charge a handphone while walking.
- c) To design automatic shoe lacing for user and on/off light when needed.

## 1.4 Scope of Project

Based on the main objective of this project, it is aim to generate electric using piezoelectric effect. This project is about charging a mobile phone using the electric that produced by the piezoelectric. Piezoelectric materials are materials that produce electric current when they placed under mechanical stress. Therefore, when the user press the piezoelectric while walking the piezoelectric will produce current because mechanical stress given on piezoelectric and the electric produce by piezoelectric will be stored in battery. The piezoelectric connect in parallel connection and then it connect to bridge rectifier. In this project, the bridge rectifier is a converter that converts alternating current to direct current that rectifies main AC input to DC input. Capacitor and 4 diodes used to design the bridge rectifier. The capacitor will give a stable discharge of current to charge the power bank and the capacitor has the ability or capacity to store energy meanwhile the diode use to convert the piezoelectric AC current to DC current. A led connect in bridge rectifier, where the LED will light on when the piezoelectric is pressed. The purpose of LED in bridge rectifier is to show the piezoelectric generate electric when it pressed. This project also have extra features to shows that piezoelectric can also be input for Arduino Uno. The extra features is auto lacing function and Light function. The Arduino is the system control in this project where it connected to servomotor and LED. The mg90s metal gear servo use in this project for auto lacing function. The servomotor function controlled by the programming that have saved in Arduino Uno and a variable resistance used to rotate the servomotor to function as auto lacing in this shoe charge. Moreover, Arduino UNO also connected as input to switch and led. Therefore, LED function controlled with slide switch, when the switch on the supply will flow through and the LED will light on.

## 1.5 Aim of Project

Aim of this project is to create a device which can produce electric power from energy that would otherwise be wasted. This project is extremely easy, but it is extremely beneficial. When this device is used on a large scale, it can produce a large amount of electricity, which can then be used to advance civilization.

## 1.6 Advantage of Project

### i. Save time consume

Consumers will charge their devices when work on their everyday tasks. Moreover, Life is becoming more hectic such time passes. As a result, people should make the most of their time. Aside from that, electronic devices play an important role in completing or performing everyday tasks. Consumer must currently plugin the adapter to power supply and wait for the battery completely charge. As a result, users can spend more time waiting for their device to completely charge. This project's main goal is to find a way to prevent users from running out of power on their mobile devices by allowing them to charge them while on the move. In addition, this smart shoe has three additional features such as auto lacing, light, and count step walking and calories burn. As a result, these extra features aid in the reduction of time spent.

### ii. Save the environment

The objective of this study is to develop an electromagnetism-based charger, which can generate electricity. It is classified as green energy, which means that it is energy that is replenished naturally. Almost all electric companies produce energy from gasoline,

charcoal, and a number of other natural resources, and the regular charger uses that power source. As a result, shoes charger using piezoelectric project can classified as environmentally friendly because it does not pollute atmosphere.

iii. Easy to use

Shoes charger using piezoelectric project is intended to be simple to use for people at all levels. The architecture for the auto-lacing device mainly benefits children and the elderly. The circuit implement into shoes will carefully positioned to preserve the shoes comfort capacity.

iv. Economical



Consumer does not have to spend money for electrical use because this system produces its own energy to charge gadgets, use as a torch light, and count steps by applying mechanical force to it, unlike a standard charger that uses a power supply. This able to save a lot of money while also allowing consumer to charge their devices.

v. Healthy lifestyle

Since it needs mechanical force, this project may also encourage a healthy lifestyle. In other words, it is important for it to be functional to engage in physical activity such as walking or running. Users can exercise regularly by jogging, running, or playing games while also charging their electronic devices.