SMART FOOTWEAR ENERGY GENERATOR

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BACHELOR OF ELECTRICAL ENGINEERING TECHNOLOGY

(Industrial Automation & Robotics) WITH HONOURS

2020

Faculty of Electrical and Electronic Engineering Technology

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Bachelor Of Electrical Engineering Technology

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A thesis submitted

in fulfillment of the requirements for the degree of

Bachelor of Electrical Engineering Technology

(Industrial Automation & Robotics) with Honours

Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2020

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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Sesi Pengajian: 2020

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I hereby, declared this report entitled SMART FOOTWEAR ENERGY GENERATOR is the results of my own research except as cited in references.

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ABSTRAK

Tenaga hijau berasal dari sumber semula jadi seperti angin, hujan, cahaya matahari, air pasang, tumbuhan alga. Sumber tenaga tersebut boleh diperbaharui, yang bermaksud secara semula jadi terhasil. Sebagai perbandingan, bahan bakar fosil adalah sumber yang langka yang akan memakan masa berjuta-juta tahun untuk dihasilkan dan mulai menurun dengan penggunaannya. Sumber tenaga boleh diperbaharui mempunyai kesan persekitaran yang jauh lebih sedikit daripada bahan bakar fosil, yang menyumbang kepada perubahan iklim dengan menghasilkan pelepasan seperti gas rumah hijau sebagai produk sampingan. Tenaga hijau menggunakan sumber tenaga yang tersedia di seluruh dunia, termasuk di kawasan luar bandar dan pedalaman yang tidak mempunyai akses kepada tenaga elektrik. Kaedah yang digunakan adalah sensor piezoelektrik yang disambung secara bersiri selari dengan litar jambatan yang terdiri daripada 17 unit diod Schottky. Sensor piezoelektrik digunakan bagi menghasilkan tenaga dan mengecas kapasitor 10µF 25V dan juga mengecas bateri LiPo 3.7V 40mAh selepas itu Arduino akan menghantar isyarat ke paparan LCD dan menunjukkan nilai voltan bateri. Untuk hasilnya, hubungan antara voltan kapasitor dan voltan bateri adalah berkadar terus dengan masa yang diambil dan bilangan tekanan yang diberikan. Berdasarkan analisis dan dapatan saya, sensor piezoelektrik berjaya mengecas bateri LiPo tetapi ia hanya dapat bertahan dalam masa yang singkat. Untuk hasil akhir projek penjana tenaga kasut pintar ini, semua objektif berjaya dicapai. Sensor piezoelektrik dapat memberi tenaga dan memberikan nilai voltan dan mengecas bateri tetapi dalam jumlah yang sedikit. Selain itu, LCD berjaya memaparkan nilai voltan dari bateri dan kapasitor dengan jelas walaupun bacaannya tidak tepat seperti multimeter.

ABSTRACT

The green energy comes from natural sources such as wind, rain, sunlight, tides, plants of algae. Those sources of energy are renewable, meaning they are naturally replenished. By comparison, fossil fuels are a scarce resource that will take millions of years to produce and begin to decline with use. Also, renewable energy sources have much less environmental impact than fossil fuels, which contribute to climate change by producing emissions such as greenhouse gases as a by-product. Green energy uses energy sources that are readily available throughout the world, including in rural and remote areas which do not have access to electricity otherwise. Method used are piezoelectric sensors that connected in series parallel to the bridge circuit which consists of 17 units of Schottky diode. The piezoelectric sensors are been forced to generate energy and charge the 10µF 25V capacitor and also charging the 3.7V 40mAh LiPo battery after that the Arduino microcontroller will send the signal to the LCD display and display the battery voltage. For the result, the relationship between the voltage of capacitor and voltage of battery are directly proportional to the time taken and number of steps. Based on my analysis of data, the piezoelectric sensor is managed to charge the LiPo battery but its only can hold in a short time. For the final result of this smart footwear energy generator project, all objectives had successfully achieved. The piezoelectric sensor can energize and supply a voltage value and charging the battery but in a small quantity. Other than that, LCD successfully display the value of voltage from battery and capacitor clearly even though the reading is not precise as multimeter but it's can show and read slightly the same.

DEDICATION

I acknowledge my sincere dedication, honors and gratitude to both of my parents for their love, encouragement, supports, and sacrifices throughout whole of my life. Without their sacrifices and encouragement, I cannot possibly reach this stage. Special gratitude also dedicated to my brother and also my sisters which always support and advise me in whatever I do in my life. Special thanks to all of lecturers especially my supervisor Puan Rohaina bt Jaafar, my co-supervisor En Arman Hadi bin Azahar and also my academic advisor Ts Puan Rosnaini binti Ramli who had taught and guided me throughout my studies and during this Bachelor Final Project 2. I would like to thank all my friends who always been with me throughout this challenging semester and help me during movement control order (MCO). An endless thank you for my friend Ahmad Hanzalah Bin Hani that's help me in hardware configuration and wiring. I hope all of their supports and encourage will help me make this project a success.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude and appreciation to the lecturers who have helped me to succeed in Bachelor Degree Project 2. I really appreciate all the sacrifices and knowledge to my mentor that has given to me. I also thank you for giving me the opportunity to become a mentee under Puan Rohaina binti Jaafar for her encouragement, knowledgeable ideas and opinions, time consideration, spirit and being the guidance through the time of completing my Bachelor Degree Project (BDP). Here also I want to express my appreciation to my co-supervisor, Mr. Arman Hadi bin Azahar for all their comments, ideas and helps in guiding me improving my BDP. My thanks and appreciation also dedicate to both of my panels, Ts Maslan Bin Zainon as Panel 1 and Ts Sulaiman bin Sabikan as panel 2 that willing to observe my BDP, giving the positive comments which helps me to gain knowledge and improve the project in this period of time.

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CHAPTER 1

INTRODUCTION

This chapter consist the overview of the project, problem statement, the objectives by doing this project and scope of the project. This should set out the key reason for doing this project and the concept of how it will be making this project.

1.1 Introduction

The green energy comes from natural sources such as wind, rain, geothermal heat, sunlight, tides, plants of algae. Those sources of energy are renewable, meaning they are naturally replenished. By comparison, fossil fuels are a scarce resource that will take millions of years to produce and begin to decline with use. Also, renewable energy sources have much less environmental impact than fossil fuels, which contribute to climate change by producing emissions such as greenhouse gases as a by-product. Green energy uses energy sources that are readily available throughout the world, including in rural and remote areas which do not have access to electricity otherwise. Advances in renewable energy technology have reduced the prices of solar panels, wind turbines and other green energy sources, putting the power to produce electricity in people's hands rather than those of oil, gas, coal and utility companies. Green energy can also substitute fossil fuels for motor vehicles in major areas of use including electricity, water and space heating, and coal.

Figure 1.1: Renewable Energy

Piezoelectricity, or also known as a piezoelectric effect, is the appearance of an electrical potential across the sides of a crystal by squeezing it under mechanical stress. In practice, the crystal becomes a kind of tiny battery with a positive charge on one side and a negative charge on the opposite side. If we connect the two faces together to create a circuit, the current flow. In the reverse piezoelectric effect, a crystal becomes mechanically stressed when voltage was applied across its opposite faces.

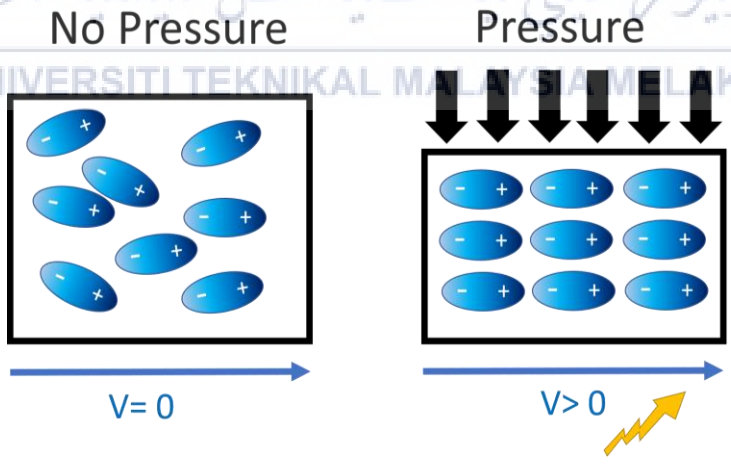

Figure 1.2: Piezoelectric squeeze to produce energy

1.2 Overview

Nowadays, the demand of the electrical energy is increasing but power generation conventional resources are not enough to cover all the needs. For the reason, many researches and engineers are working to find the best solution and come out with non-conventional ways of electrical power generation. There are plenty number of methods that can be produced to generate electricity. 'Smart Footstep Energy Generation' is a one of an effective method by which electricity can be produced.

The most common activity in human life is walking. At Figure 2.3, by walking, person who walks can loses energy to the surface in the form of vibration, impact and sound due to the transfer of the weight and also through foot falls during every step taken. This kind of energy can be converted in the usable form mechanical energy of footsteps into electrical energy by using transducers. It can be implemented on many public areas such as roads and bus stations but the main reason is to implemented it at rural area because their place is lack of electric.

This system essentially converts foot force energy to electrical energy by using piezoelectric sensors. Piezoelectric sensor is a transducer that can transform electricity to electricity generation.

Figure 2.3: Human walking