



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DESIGN AND DEVELOPMENT OF IN SHOE SHEAR
FORCE SENSOR FOR DIABETIC PATIENTS**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Power) with Honours.

by

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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Power) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Penyelidikan ini bertujuan untuk menyiasat dan membangunkan sensor tekanan dibawah tapak kaki, yang sesuai untuk digunakan oleh pesakit yang paling berisiko mengalami kerosakan tisu dan ulser. Projek ini memberi tumpuan kepada pembangunan pelbagai jenis sensor antaranya menggunakan piezoelektrik sebagai sumber kuasa untuk mengecas bateri, sensor tekanan, serta sistem perolehan data.

ABSTRACT

The research aims to investigate and develop an in shoe shear force sensors, that is suitable to be used by patients most at risk of tissue breakdown and ulceration. This project focus on developing sensor arrays using piezoelectric as source of power to charging the battery, pressure sensor, as well as data acquisition system.

DEDICATION

Allah, our creator.

Muhammad, our prophet.

To my beloved parents,

Hisham Bin Matan, my father.

Zainun Binti Taha, my mother.

My Supervisor, Pn. Emy Zairah Binti Ahmad.

My friends.

Without all of your support, advice and encouragement, I will not finishing my project.

Thank you for always supporting me and believing in me. I will never truly be able to express my sincere appreciation to all of you.

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LIST OF ABBREVIATIONS

PCA	Principal Component Analysis
PIC	Peripheral Interface Controller
PDP	Programmed Data Processor
ROM	Read Only Memory
RAM	Read Write Memory
CPU	Central Processing Unit
PIEZO	Piezoelectric Sensors
FSR	Force Resistive Sensor
LCD	Liquid-Crystal Display
PTF	Polymer Thick Film

CHAPTER 1

INTRODUCTION

1.1 Project Background

Diabetes may be a serious advanced condition which may have an effect on the whole body. Polygenic disease needs daily self-care and if complications develop, polygenic disease will have a major impact on quality of life and may scale back expectancy. Whereas there's presently no cure for polygenic disease, you'll be able to live a pleasurable life by learning concerning the condition and effectively managing it [1].

The purpose of this project is to monitor the pressure on the legs of the patient by management or cut back pain in feet and speed up the healing method. This method use arduino as the controller contains of pressure detector to grasp the overall worth of stress obligatory on the soles of the feet. This insole will use piezoelectric as the source and it will charge the battery and to operate the controller. The pressure sensor will detect the pressure below the feet and sending the data to the controller. By refer the table of pressure, the arduino will transmit the data to the display board and it will tell the patients the pressure value.

1.2 Problem Statement

The Ministry of health expected 3.6 million Malaysians aged eighteen years and on top of currently have polygenic disorder. Half of the quantity or concerning 1.8 million haven't been diagnosed and never underwent health screening, and don't seem to be attentive to the presence of the disease[2]. For diabetic, they must feel the pulses or indifference in hands, calves or feet. Injury to the system for diabetic feet can cause the patient to lose the flexibility to notice touch, pain, temperature changes, and changes within the joints of the foot either side or both sides.

So, to assist individuals with polygenic disease, this sole is an innovation to measure pressure on the soles of the feet whereas walking and thru the pressure, the patient be able to monitor what quantity they walk at a time therefore it facilitate to hurry up a healing process.

1.3 Objectives

The objectives of this project are:

- a) To develop an insole that can monitor shear force sensor for diabetic patients.
- b) To evaluate and analyse the performance of the developed system.

1.4 Scopes of the project

The scopes of this project are:

- a) This design consists of automatic charging for battery by using piezoelectric sensors and the pressure sensor to measure pressure on the soles.
- b) This system consist of two part which is software and hardware which is the piezoelectric and pressure sensor
- c) To test the functionality of the system design.

1.5 Outline of the project

This chapter have contains 5 sections. During this chapter is regarding the introduction of the project that consists of project background, objectives of project that has to be achieved, problem statement, scope of project, methodology of the project.

Chapter two describes regarding literature review involved a straightforward outline of the sources, however it always has associate structure design and combines each outline and synthesis. An outline could be a recap of the vital data of the supply; however a synthesis could be a re-organization, or a reshuffle, of that data. It had provides a new analysis of recent material or mix new with recent analyses.

Chapter three explains concerning the project methodology on the ways to describes activities to be taken to explore a research problem and also the principle for the applying of specific processes or methods used to classify, select, procedure, and

examine data applied to understanding the matter, thereby, permitting the reader to critically measure a study's overall validity and dependableness.

Chapter four defines the project result which contains the virtual reality flair. This chapter also deliberates and evaluate regarding the development and process of the software platform such as the programmed for the microcontroller.

Chapter 5 will be the conclusion and suggestion to the project in future undertaking.

CHAPTER 2

LITERATURE REVIEW

2.1 Software

In shoe shear sensing element is associate invention of innersole that we are able to observe the force below the feet. During this chapter, to get the idea and understanding concerning this project, some analysis has been considered supported the journals that are associated with the scope of this project work and methodology.

2.1.1 Arduino

Arduino boarding is intelligent to recite inputs such as light on a sensor, a digit on a switch and easy to use as arduino is an open source electronic podium. It can trigger a motor, turning on an LED and broadcasting something virtual. Before this, arduino has been the head of thousands of projects, from middling objects to advanced technical applications.

A universal public of industrialists such as students, hobbyists, performers, IT worker, and experts has join together around this open-source podium, their aids have additional up to an incredible number of available statistics that may be of great help to novices and specialists alike. Arduino runs on Mac, Windows, and Linux thus it is easy software for a beginner and bonus for advance users.

Arduino is quick turning into one in every of the foremost standard microcontrollers employed in robotics. There are many {different|many various|many alternative} varieties of Arduino microcontrollers that differ not only in design and features, however conjointly in size and process capabilities. All variety of Arduino microcontrollers can be program by the software that called “Arduino” and based on the C languages, the beginners are easy to use this software[3].

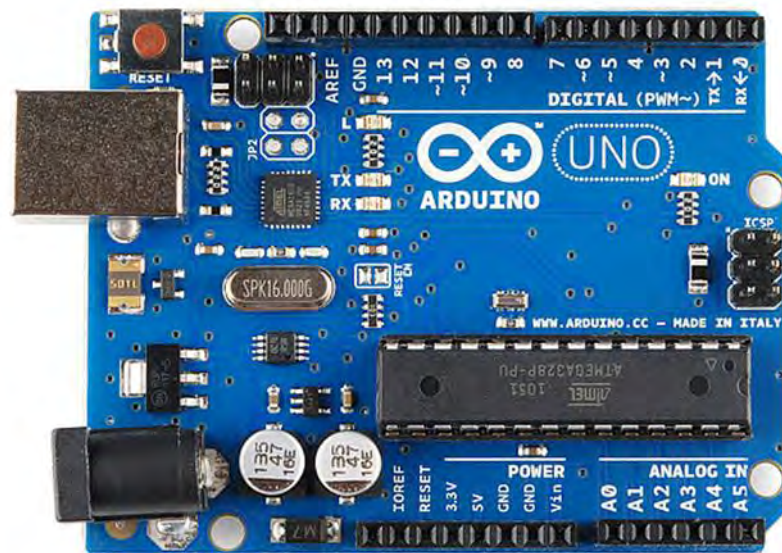


Figure 2.1 : Example of Arduino[4]

2.1.2 PIC microcontroller

The term PIC stands on behalf of Peripheral Interface Controller. At first this was advanced for supporting PDP processors to succeed its peripheral devices, and thus, named as a peripheral interface device. These microcontrollers area unit very firm and upfront to execute a program compared with completely dissimilar microcontrollers. PIC Microcontroller style relies on Harvard style. PIC microcontrollers are extremely well-liked because of their stress-free programming, wide ease of access, easy to