UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SMART IOT FEET IDENTIFICATION SYSTEM USING ARDUINO AND BLYNK APPS

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

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

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ABSTRAK

Sistem Pintar Pengenal pasti Kaki *Internet of Thing (IoT)* menggunakan Arduino dan aplikasi *Blynk* adalah penggunaan sistem untuk mengukur ukuran kaki yang tepat tanpa melakukan banyak langkah dan pada masa yang sama menentukan tekanan pada kaki sesuatu individu. Fungsi tambahan ini dapat membantu dalam menganalisis interaksi antara permukaan dan kaki di mana ini juga dapat menjadi penilaian dalam menentukan masalah kesihatan di masa akan datang. Pendekatan pertama akan menggunakan Pengesan Ultrasonic untuk mengesan kaki dengan sewajarnya dan bertindak sebagai pembaris antara sesuatu ukuran panjang yang tertentu. Pendekatan kedua adalah menggunakan penderia tekanan sebagai sensor tekanan untuk mengesan beban fizikal yang diberikan oleh kaki manusia. Kedua-dua sensor ini kemudian akan memberikan input kepada pengawal mikro. Ini adalah pendekatan ketiga, Arduino. Arduino MKR1000 yang bertindak sebagai pengawal mikro akan menerima data dari penderia, mengubahnya melalui Penukar Analog ke Digital (*ADC)* dan menghasilkan keluaran yang dinginkan contohnya seperti ukuran piawai UK untuk kasut dan unit Pascal untuk tekanan. Pendekatan terakhir adalah dengan menggunakan modul Wifi yang akan bertindak sebagai platform bagi pengawal untuk memindahkan data ke aplikasi *Blynk* dan memaparkannya dalam ukuran masa nyata. Sistem ini dapat dihidupkan dan dimatikan dengan menekan butang tekan dengan mudah, penderia kemudiannya akan mengesan objek dan menghasilkan isyarat dengan bantuan Arduino sebagai pengawal dan memaparkannya dalam *LCD* dan dalam pengesanan masa nyata aplikasi *Blynk*.

ABSTRACT

Smart IoT Feet Identification System using Arduino and Blynk Apps is a system use to measure the accurate foot size without doing much work and at the same time determine the pressure on one's feet. This additional function may help in analyzing the interaction between supporting surface and the foot where this can also be an assessment in determining any health problem in the future. The first approach will use Ultrasonic Sensor to detect foot accordingly and act as a ruler between a certain length. Second approach would be using Force Sensitive Sensor as a pressure sensor to detect any physical load given by the human feet. Both of this sensor will then give input to the micro controller. This is the third approach, Arduino. Arduino MKR1000 will receive the data from the sensor, convert it thru Analog Digital Converter (ADC) and produce desire output such as UK standard size for shoes and Pascal unit for pressure. The last approach is by using Wi-Fi module that will act as a platform for the controller to transfer the data into the Blynk Apps Inventor and display it in a real-time tracking data. The system can be turn on and off with a simple press of a push button, the sensor will detect an object and produce the signal with the help of Arduino as a controller and display it in LCD and in real-time tracking of Blynk apps.

DEDICATION

First and foremost, all praise to Allah, the Almighty, my Creator, my Sustainer, for everything I received since the beginning of my life. Next, my appreciation goes to the Universiti Teknikal Malaysia Melaka (UTeM) for providing the research platform and Institut Teknikal Jepun Malaysia (JMTi) for allowing me to use their student's research paper as a reference. My utmost appreciation goes to my supervisor, Ir. Ts. Mohammad Afif Bin Kasno, Institute of Universiti Teknikal Malaysia Melaka (UTeM) for all his support, advice and inspiration. His constant patience for guiding and providing priceless insights will forever be remembered. Also, my special thanks to my diploma's lecturer, Ir. Ierwan Bin Said Institut Teknikal Jepun Malaysia (JMTi) who constantly giving advice and support throughout this project. Finally, from the bottom of my heart, a gratitude to my pillar of strength, my family for all the emotional and financial supports that they have gave me. This project cannot be done without them. Not to forget a big gratitude to all my friends for their patience and understanding in helping me finish this project.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In this modern world, multipurpose shoes are no longer an unusual topic in the community. Entrepreneur were brain storming everything to offer customers the best of product could ever possibly be made. For example, with an increasing market in shoes production, customers are offered with various kind of shoes speciality such as a shoe that can light up for kids, shoes that can changing colour if in contact with water, and for medical purposes was not left behind. Public demand on comfort medical footwear has been spiking over the years.

Measuring pressure are already known to be used in a difference purpose. Contemplate to medical view, measuring the pressure distribution is useful as it advances us with information about gait pathology and allow a broad-spectrum of its applications for example in medical research or an indoor and outdoor activities. Ground contact forces can be measure by evaluate the weight or load of the human either in usual activities such as standing, walking or in challenging activities such as sports.

The major goal of this paper is to develop the Smart IoT Feet Identification System using Arduino and Blynk Apps that goes along with health condition designed for shoes. It is also to eliminate the old system that literally use the physical ruler or even by just guessing the size of shoes approximately. This system is aiming to help

customers to easily find the correct size and attain insight view of pressure distribution through their foot at the same time.

1.2 Problem Statement

Nowadays, buying shoes is taking so much time as there is so much option offered in the market plus it requires the buyers to wear almost each of every shoe to determine the suitable size as some of them is not standardize and not accurate. This problem worsens up when it comes to online shopping. The seller will only provide the sizing chart where is often the buyers do not even know their own size in either normal standard size such as EURO and UK size and they ended up buying the wrong size.

In addition, as various types of shoes are being offered, the demand of medical comfort footwear keep on increasing however the production is still lacking. This is because this type of shoes requires more research to make it into reality. For example, arch is very important in shoes design as it help to lessen the foot pain and make walking and standing much more comfortable. However, to design a suitable design, arch measurement is needed. Only less than 10 company that produced and fulfilled this needed and most of them even based outside of Malaysia. This only resulting in difficulty of reach out for the product and obviously a very expensive product.

Furthermore, in medical field, foot pressure is used as a relationship between supporting surface and the foot. One of the process involving passive function where it will provide the first stage of pressure. This first stage is referring to cushioning any influence of forces that the human body projected while standing, running or walking. The internal forces will then be generating by the muscles. This force will then be

transferred to the ground so that it can get the body to accelerate during the human push-off.

Referring to third law of Newton's rule, action equals reaction will show the highest interactive are during walking and forces are then transferred back-to-back from the ground and the human body. From this project, we may produce a good product that have two purpose at the same time. One is measuring the foot size and the second one is to assess pressure that might be a help data for any related health analysis. All we need is a faster technology to help us improving our lifestyle and shorten our times in spending on simple things.

1.3 Research Objective

In order to ensure the system, work properly, the objective of the project must be stated clearly. The objective of this project is:

a) To study the fundamental theory and related application for footwear measurement system.

b) To develop the smart IOT Feet Pressure Measurement System using Arduino and Blynk Application.

c) To analyze the performance of developed smart IOT Feet Pressure Measurement system in terms of feasibility with normal footwear consumers.

1.4 Expected Output

Expected output for this project is to create a medium for the customers to easily choosing the right size footwear by measuring the feet itself and at the same time determine pressure distribution through their feet. This project will give a new experience and chances for the customers to get an easier shoe buying process and at the same time might help in alleviate their health problems. Hopefully, this project will accomplish its function and be useful to the society.

1.5 Scope of Research

The target user of the system will be aiming for public community and a bit extra scope on medical special care customers. As part of a strategy, a small plantar will be used as a layout based to measure the feet and all the sensor will be set up on the plantar. The data included will consist of the standard size available in the market and the pressure measurement. The design itself will be designed based on suitability and reliability of the proper customers' needs in terms of footwear.

1.6 Conclusion

As a conclusion, Smart IoT Feet Identification System using Arduino and MIT App Inventor is a simple and useful system which can be used to measure the accurate foot size without doing much work. Moreover, by determine the pressure on one's feet may help in analysing the interaction between supporting surface and the foot where this assessment might help in determining any health problem in the future. The sensor

will detect an object and produce the signal with the help of Arduino as a controller and display it in LCD.

As explained the circuit can be made useful in shopping area and can make the shoes buying process so much easier and faster at the same time giving an earlier assessment on the foot pressure that might can help in rehabilitation and health. This chapter have stated the overall understanding of the system. In the next Chapter 2, we will be discussing the Project Methodology and Literature Review for this system.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Chapter before has been discussing about the problem statement, objectives and also the project's scope. Now in this chapter, it will be discussing the literature review and existing product. For this project, the comparison is made based on product sizing measurement system, technology that have been used, and the availability for the customers. The literature review is commonly based on the several resources such as journal articles, web page, website, interviews, technical report and white paper.

This area will portray around the writing survey and as well as venture technique. The data about this application idea collected from manual, printed source and web source will be concentrated on aims to help in the development of better application meets in every one of the necessities. In general, the aims of this chapter are to make a literature review which is about any previous project or product that developed and has related with this project. Comparison and observation are made between the previous projects, and then the problem and issue will be identified where a new contribution and improvement could be made.

A shoe is an essential thing in every day's life. However, choosing a shoe can be crucial when the size is one of the avoidance obstacles. In addition to it when the customers have a lots of comfort criteria needed to fulfill. For shoes sizing, during the Roman civilization, they used "barley corn" to measure feet. However, the proper

system was then first introduced in 1324 called the English Linear Measure by King Edward II as a standard English unit of shoes measurement. This system differentiate between adult's sizes and children's sizes with the scale starts with the smallest rational size and the adults with bigger size.

Whilst one the most common shoes standard size is in European (Continental) size. It was first introduced in the middle of 19th century by a French man and making it became the most standardize shoe sizing system (EU) in the whole Europe, except for England. Next is the standard common shoe size which is UK size. It is also originated from barley corns system and were introduced around 1880 to provide better fits. Last but not least, us size. The US shoe size system (US size) is based on the UK system. It was introduced in the mid-19th century. However, the US and UK methods for measuring length differ from one another as the US size 10 is equivalent to the UK shoe size 8.

While that, foot pressure distribution measurement of is very useful in medical field for easy assessment of foot and gait pathologist [1]. It can be used to determine the impact of foot orthoses and shoe modifications, along with different materials used in the clinic to cover the forefoot, in plantar pressure measurements for the lower extremity and foot with musculoskeletal disorders. The efficacy of orthotic posting, padded hosiery and different materials used to produce foot orthoses have been measured using in-shoe pressure measurement single-patient reporting. Therefore, this project will be developed to measure foot size and evaluated foot pressure distribution during standing in healthy young and elderly subjects as a first step towards clinical research

US Sizes	Euro Sizes	UK Sizes	Inches
6	39	5.5	9.25"
6.5	39	6	9.5"
7	40	6.5	9.625"
7.5	40-41	7	9.75"
8	41	7.5	9.9375"
8.5	41-42	8	10.125"
9	42	8.5	10.25"
9.5	42-43	9	10.4375"
10	43	9.5	10.5625"
10.5	43-44	10	10.75"
11	44	10.5	10.9375"
11.5	44-45	11	11.125"
12	45	11.5	11.25"
13	46	12.5	11.5625"
14	47	13.5	11.875"
15	48	14.5	12.1875"
16	49	15.5	12.5"

Table 2.1:Shoe size international conversion chart

2.2 Background

In order to develop this project, a few researches on the past paper specifically on this type of criteria have been made. The related topic searched is Smart Feet Identification, Smart Insole with IOT, Pressure Platform for Health and much more. Unfortunately, there are almost none in terms of automatic shoes measurement device have ever been made and available in the market. The past researcher does have a few good thesis papers on this subject however no physical evidence product yet to be shown. On top of that, most of the paper is outdated for example, Foot Measuring Machine, E.J. Bliss, is made in 1933. These systems should be discussing with respectively to the related specifications in terms of technical and the wide range of application. This yields the arch measurement.