UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND IMPLEMENTATION OF SMART BIOMETRIC CHAIR FOR CLASSROOM ATTENDANCE SYSTEM

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronics Engineering Technology (Telecommunications) 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 Electronics Engineering Technology (Telecommunications) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Dalam arus globalisasi ini, teknologi kini merupakan salah satu aspek yang semakin mengembang maju, termasuk teknologi berkaitan biometrik. Sehubungan itu, tujuan dokumen ini dibuat adalah untuk mengkaji penghasilan projek prototaip bertajuk “Design and Implementation of Smart Biometric Chair for Classroom Attendance System”. Prototaip ini merupakan sebuah projek inovasi berkaitan sistem kedatangan yang berasaskan cap jari. Peranti ini berkebolehan mengimbas dan mengesan cap jari pelajar bagi tujuan pengambilan kedatangan. Namun, sehingga kini kaedah pengambilan kedatangan masih lagi diambil atau direkod secara manual dengan menggunakan kaedah pengambilan kedatangan berasaskan kertas, dimana pelajar dikehendaki menandatangani kedatangan mereka sebelum kelas bermula. Kaedah ini semakin lapuk dan tidak efisyen kerana terdapat kebarangkalian bahawa pelajar boleh memalsukan tandatangan mereka. Oleh itu, peranti ini boleh membantu dalam meningkatkan tahap kecekapan pengambilan kedatangan pelajar kerana mereka perlu mengimbas dan mengesan cap jari mereka terlebih dahulu sebelum kelas bermula. Setelah proses mengimbas dan mengesan, maklumat mereka disimpan dalam pangkalan data dan maklumat tersebut boleh dilihat melalui laman web. Dengan itu, peranti ini boleh menyumbang kepada institusi pendidikan dari segi pengambilan kedatangan yang lebih efisien justeru menjadikan kaedah ini lebih dipercayai berbanding kaedah pengambilan kedatangan berasaskan kertas.

ABSTRACT

Nowadays, technologies are rapidly advancing in the technological world, including biometric technologies. Therefore, the purpose of this paper is to study the development of “Design and Implementation of Smart Biometric Chair for Classroom Attendance System”, an innovative fingerprint-based attendance device. The proposed device is able to scan and detect students’ fingerprint for their attendances to be recorded. However, ‘till this day, attendances are still being recorded manually using a sheet-based attendance method. Furthermore, students are required to sign their attendance before a class starts. This method is very inefficient as there are probabilities that the students can fabricate their signatures. Therefore, this device is capable to make the attendance recording method more efficient as the students have to scan their fingerprints once they are seated. After the scan has been made, their data is kept in a database and their data can be seen through a website. Hence, this device is enable to contribute to the educational institutions in terms of attendance recording in a more efficient way thus make it more reliable compared to the sheet-based attendance method.

DEDICATION

To my beloved parents, I dedicate all my thanks and gratitude to both of them for constantly providing me love and care with motivational encouragement and also constantly supporting me both morally and financially.

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Thanks to Allah, The Lord of The World. With His grace of blessings, I have completed the Bachelor's Degree Project II report entitled "Design and Implementation of Smart Biometric Chair for Classroom Attendance System" in a timely manner.

In preparation of this paper, I would like to offer my utmost gratitude to Dr. A.K.M. Zakir Hossain as my supervisor in constantly teaching me with his valuable and informative knowledge, guiding me with patience throughout the semester in preparation for this paper. Also, not to forget my co-supervisor, Mr. Nurulhalim bin Hassim for providing me with his insights on the project.

I would also like to thank those who have helped me in every way, so that the paper can be completed. May Allah reward all for their kindness. Ameen.

I realized that this paper is far from perfect, therefore criticisms and suggestions are welcome from all entity to construct and shape me to be successful in the near future.

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CHAPTER 1

INTRODUCTION

1.1 Background

Biometrics includes a vast number of technologies in which different human characteristics are used to identify authenticity. This includes a person's face, hand, voice, iris print, fingerprint, or even signature, which can be used to verify the identity of people who wants to gain access to computers, planes, databases or other areas that are limited. Based on (Sumit Singh, 2015), the skin on human fingers and also palms displays a swirl motion-like patterns of ridges and valleys. The author further stated that these patterns are unique for every person and it is scientifically proven (Sumit Singh, 2015). This proves that biometric system is the most effective and flexible method in verifying information whether in accessing high-security areas or recording attendance.

Therefore, a biometric system is introduced to apply to an existing attendance system. Biometric will provide a solution to an attendance system (Kaium Khan *et al.*, 2019).

In this section, research studies are carried out based on the previous works that are related to this project. It outlines the commonalities and differences point of views between researchers and their methods in applying a biometric system, specifically a fingerprint system to an attendance system.

1.2 Problem Statement

According to (Krishnamurthi *et al.*, 2015), nowadays, attendances are still being recorded manually, for example a teacher calling out students names one by one. The author further stated that this method is time-wasting and troublesome (Krishnamurthi *et al.*, 2015). Moreover, to support the statement, (Kaium Khan *et al.*, 2019) mentioned that a signature is likely to be fabricated if the attendance recording is a sheet-based attendance system. Hence, a biometric-based attendance system is introduced to replace the outdated paper-based method. According to the authors in (Kaium Khan *et al.*, 2019), it is stated that a biometric system is utilized to scan biological traits on humans.

Based on (Sumit Singh, 2015), the skin on human fingers and also palms displays a swirl motion-like patterns of ridges and valleys. The author further stated that these patterns are unique for every person and it is scientifically proven (Sumit Singh, 2015). Furthermore, (Arunkumar and Arun Raja, 2015) expressed that accuracy and reliability are the two most critical criteria for biometric applications with advanced embedded computers too. Hence, why biometric system is popular and universally used for identification purpose (Kaium Khan *et al.*, 2019).

Based on (Krishnamurthi *et al.*, 2015), a fingerprint-based system automatically recorded the attendance. However, (Kamelia *et al.*, 2018) suggested that biometric interface requires the user to place a finger on a disc scanner that will be read. According to the authors in (Krishnamurthi *et al.*, 2015), they stated that the process of attendance management in integrating fingerprint authentication, it consists of two processes which are enrolment and authentication. The paper further stated that during the registration process, the unique biometric traits of the user is recorded and saved in a memory (Krishnamurthi *et al.*, 2015). Meanwhile, (Krishnamurthi *et al.*, 2015) stated that during

the authentication process, the recorded biometric traits are compared to all the existing data in a flash memory to matchmaking.

1.3 Objective

The objectives of this research are as follows:

I. To develop a biometric fingerprint-based classroom attendance system.

II. To construct a database that keeps the information of the class for non-concerning personnel.

III. To execute benchmarking to an existing attendance systems.

1.4 Scope of Research

The work scopes that will cover in this project comprise the following areas:

The fingerprint-based biometric system will verify and record attendance via a fingerprint reader and the recorded information can be monitored through computer devices such as laptops or personal computers in real-time using Wi-Fi. The target groups for this project are students and teachers. Students will place their fingerprint onto the fingerprint reader for their attendance to be verified and recorded, meanwhile teachers will monitor the attendance through their laptops or personal computers via a website database. The microcontroller that will be used in this project is NodeMCU ESP8266. It has an additional feature which is the Wi-Fi module that creates a connection that allows teachers to monitor the attendance. Furthermore, as for the database to keep the data, a

PHP-coded website will be used to store attendances. Lastly, a prototype of the fingerprint reader module will be attached to a chair to allow the attendance process being made.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this part chapter, a thorough literature research has been conducted based on the previous works to better understand the research problem being studied. Detailed discussion has been done and analysed on the relationships of each works obtained from various authors that are relevant to this project.

2.2 An Introduction to Biometrics System

A biometric technology or system is basically a design authentication system that identifies a person by determining the originality or authenticity of a particular human body structure or behavioural trait owned by a person. A crucial aspect in creating and developing a functional biometric system is to assess how a person is identified. Depending on the application factors, a biometric system can be called an identification system or a verification system.

A verification system recognizes a person's body traits by comparing the recorded biometric characteristics with the person's own recorded biometric template system. It conducts a one-to-one comparison to determine the identity of the claim individual truth. A verification system accepts or rejects a submission request for identification.

An identification system recognizes a person by searching the entire template database for a match. It conducts one-to-many comparisons to establish the identity of the