



SMART SAFETY CASE USING FINGERPRINT
AND HEARTBEAT DETECTOR TO REDUCE THE
POSSIBILITY OF BREACHING



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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**SMART SAFETY CASE USING FINGERPRINT AND
HEARTBEAT DETECTOR TO REDUCE THE
POSSIBILITY OF BREACHING**

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

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Tajuk: SMART SAFETY CASE USING FINGERPRINT AND HEARTBEAT
DETECTOR TO REDUCE THE POSSIBILITY OF BREACHING

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I hereby, declared this report entitled “SMART SAFETY CASE USING FINGERPRINT AND HEARTBEAT DETECTOR TO REDUCE THE POSSIBILITY OF BREACHING” is the results of my own research except as cited in references.



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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 (Industrial Electronics) with Honours. The member of the supervisory is as follow:



ABSTRAK

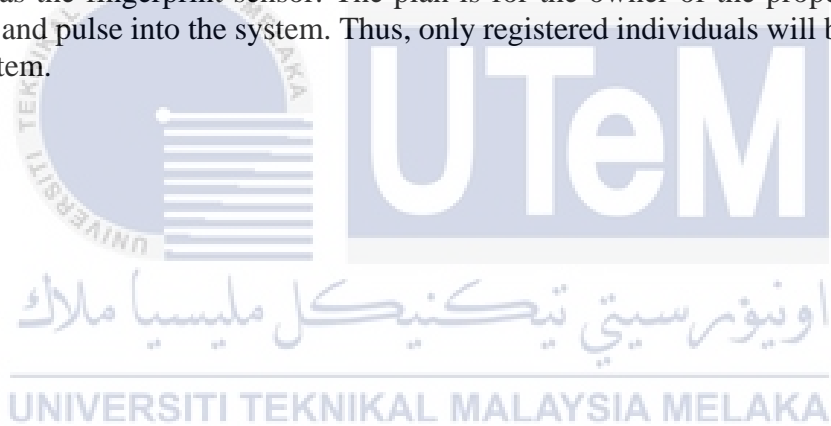
Teknologi berkembang semakin maju dikala dunia berkembang supaya dapat menaik taraf dan memudahkan kehidupan seharian manusia. Dalam masa yang sama, teknologi juga disalahgunakan untuk melakukan gejala negatif seperti mencuri atau merompak. Bagi menyelamatkan dan mempertahankan barang-barang berharga sesuatu individu, sistem kunci diperkenalkan. Sistem kunci adalah sistem yang mana hanya boleh diakses oleh tuan punya kunci sahaja. Pada mulanya, sistem kunci analog diperkenalkan. Setelah teknologi semakin maju, sistem kunci menggunakan barangan elektrik diperkenalkan kerana sistem analog mudah diatasi dan juga bagi menambahbaik sistem kunci. Objektif projek ini adalah untuk mencuba menambahbaik sistem kunci yang sedia ada dengan menggunakan beberapa penderia dan juga mikropengawal. Mikropengawal yang digunakan adalah Arduino UNO manakala penderia yang digunakan adalah Sensor XD-58C sebagai penderia denyutan nadi dan DY50 Optical Fingerprint sebagai penderia cap jari. Perancangannya adalah tuan empunya barang akan mendaftar cap jari dan denyutan nadi ke dalam sistem. Maka dengan ini hanya individu yang berdaftar sahaja akan boleh membuka sistem kunci tersebut.

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ABSTRACT

Technology is evolving as the world progresses in order to upgrade and simplify everyday life. At the same time, technology has also been abused for negative symptoms such as theft or robbery. In order to save and safeguard an individual's valuables, a key system was introduced. The lock system is a system that can only be accessed by the key holder. Initially, an analogue lock system was introduced. As technology progressed, key systems using electrical products were introduced because analogue systems were easy to solve and to improve key systems. The objective of this project is to try to improve the existing lock system using several sensors and microphones. The microprocessor used is the Arduino UNO while the sensor used is the XD-58C Sensor as the pulse sensor and the DY50 Optical Fingerprint as the fingerprint sensor. The plan is for the owner of the property to register fingerprints and pulse into the system. Thus, only registered individuals will be able to open the lock system.



DEDICATION

This thesis is dedicated to:

My beloved parents, Mohamad bin Adam and Norhayati binti M.Salim

My supervisor, Ts. Mohd Anuar bin Adip.

And all my friend.

Thank you for their encouragement and unconditionally support.



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CHAPTER 1

INTRODUCTION

1.1 Overview

This project is for testing the other ways of unlocking system. As known, there are several ways for unlock system. Such as, mechanical lock system, keypad lock system etc. This project is focusing on fingerprint and heartbeat unlocking system. The major component that are used in this project is Arduino UNO, pulse sensor module (Sensor XD-58C) and DY50 Optical Fingerprint reader. Initially, user need to register their fingerprint and normal heartbeat rate. Once the data stored in the system, only the registered user can unlock the system for example safety case. The system has several conditions so that it cannot be unlocked easily with the two requirements. For example, when the user is forced to unlock the system, more likely the heartbeat will rise because of nervous etc. Hence the system will not be unlocked since user has registered the normal or steady state of their heartbeat rate. For another example, if the fingerprint is correct but no heartbeat, the system will not proceed to the next process too. Owner's finger might have been cut off.

1.2 Problem Statement

In Malaysia, the average number of stealing cases is 312.9 over these 3 years based on Jabatan Perangkaan Malaysia. Individuals lost thousands worth of money due to stealing cases. Most of the cases happened because the owner hid their belongings but not hiding it in a lockable case. To keep the items safe, ones need to keep the items in a lock space. It is harder for people to access to someone's stuffs when it is put in a locked space. The idea is to make a case that can be lock and unlock by a registered user but without needing to bring keys along their side.

1.3 Objectives

- 1) To study the differences of human pulses and fingerprint using sensors.
- 2) To develop a lock system using sensors and microcontroller.
- 3) To analyse the performance of the lock system whether it is good enough to be a lock system that can keep one's belonging.

1.4 Scope of Research

The scope of this project is to focus on how a biometric system works, how different individual has different fingerprints and how a system read fingerprints and pulses. The system will be tested on simulation based on how the sensors detect fingerprints, how to keep the data in memory and how to differentiate the fingerprints.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, will present literature review article that related to the development of lock system. Many other researchers have done their research about how to improvise the lock system whether it is analogue or electrical or even both. From the research, many knowledges can be grasp and many errors can be avoided. The technology used might be almost same, but the application is different.

2.1.1 History of lock system

From the dawn of modern civilisation, by using mechanical devices known as locks, our ancestors developed a need to keep their belonging to themselves. Initially, those locks were just simple knots made of rope or other materials (they were used only to detect if somebody tried to open them), but as time went on and new technologies were developed, real wood and metal locks began to be used worldwide. Modern historians of the day are unsure which ancient civilization first created mechanical locks, and many believe that Egyptians, Greeks, and Romans developed these skins independently of each other.

History of mechanical locks began in Ancient Egypt more than 6 thousand years ago, where locksmith first managed to create simple but effective pin tumbler lock-made entirely from wood. It consisted of a wooden

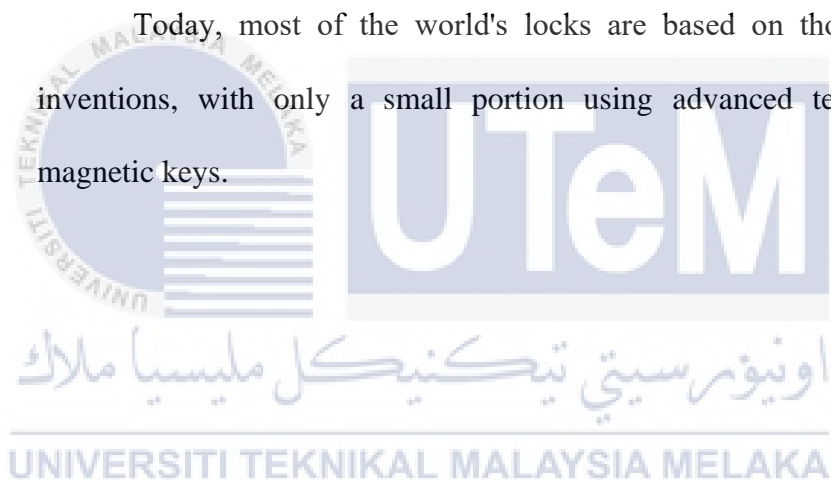
post appended to the door, and a horizontal bolt sliding into the post. This boulder had set of openings filled with pins. Specially designed large and heavy wooden key was shaped like modern toothbrush with pegs matching the holes and pins inside the lock. This key could be inserted into the opening and lifting which would move the pins and allow the movement of the security bolt.

Locks finally began to improve during the 1st millennia BC, with the technologies and designs introduced by Greeks and Romans. Greek locks were generally considered unsafe but inspired the Roman innovators who quickly managed to improve Greek and Egyptian locks by introducing metals as their primary materials. By using iron locks, Romans were finally able to have not only very strong protection against brute-force attacks, but also keys that could be worn in pockets, on as a pendant or even infused into rings were for the first time small as well.

Innovation in the field of locks was completely grounded to a halt after the fall of the Roman Empire in the 1st century A.D. Locksmiths in the European dark and middle ages did not have technology or funds to create new protection techniques, but this time they were using new tactics to try to confuse or compound lockpickers. They created multiple key mechanisms, increasingly complicated key designs instead of one simple lock, obscured keyholes with detailed ornaments, created fake keyholes (with fake mechanisms inside), and more.

Progress finally came in 18th century, when technological advances finally enabled engineers to create small and sturdy mechanisms. This new wave of lock innovation was led by the inventions of Robert Barronin 1778 (double-acting tumbler lock), Joseph Bramah in 1784 (Bramah lock, unpickable for 67 years), Jeremiah Chubb in 1818 (detector lock with high internal security), Linus Yale, Sr. in 1848 (first pin tumbler lock), James Sargent in 1857 and 1873 (first combination lock and first time lock mechanism), Samuel Segal in 1916 (first jemmy-proof lock) and Harry Soref in 1924 (first padlock).

Today, most of the world's locks are based on those engineer's inventions, with only a small portion using advanced techniques like magnetic keys.



2.2 Propose Method

2.2.1 Micro controller

2.2.1.1 Arduino

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. Arduino is an open-source platform (M. Banzi,2009), computing platform based on a simple microcontroller board, and a development environment for writing software for the board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs.

In this modern day, Arduino are used a lot in microcontroller (A. M. Gibb,2010) to build a simpler and easier system. The choice of choosing this controller perform is because the Arduino much user friendly and more approachable for understanding compared to the LabView and Raspberry PI platform due to Arduino using a C++ language but much easier command and header library as well as provide example. The control system that will be used is by using the PID tuning control such as fuzzy logic. The Arduino that Will be using are either UNO or MEGA depends on the further research or trouble shooting.

An Arduino can help you read information from input device (M. Margolis, 2011). From other microcontroller platform that are only available for physical computing system. Plus, Arduino can simplify the process of working with microcontrollers in term of interfaces. There are several advantages of Arduino offers to used:

When compared with other microcontroller platform Arduino are relatively inexpensive and even an expensive version of Arduino module can be construct manually but pre-construct with built-in system proved to low-cost usage. The difference Arduino with other microcontroller system is that this software can interact any computer processor platform just mention earlier. Some microcontrollers only compatible with Windows.

2.2.1.2 Raspberry Pi

The Raspberry Pi Compute Module 3 + (CM3 +) is a mechanically compatible DDR2-SODIMM series Module system (SoMs) that contains processor, memory, eMMC Flash (on non-Lite variants) and Supporting electrical circuitry. These modules allow a designer to leverage the hardware and the Raspberry Pi The software stacks and forms factors in its' own customized systems. Additionally, these modules have additional IO Interfaces above and beyond what's on the Raspberry Pi A / B boards.

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2.2.2 DY50 Optical Fingerprint

There are two types of biometric sensors or access control systems which are Physiological Biometrics and Behavioral Biometrics. The biometrics of physiology mainly include face recognition, fingerprinting, hand geometry, iris recognition and DNA. Whereas the biometrics of behavior include recognition of keystrokes, signatures and voices. The system for the recognition of fingerprints is the biometric technique most commonly used.

Fingerprint Recognition includes taking a person's fingerprint image and recording its features such as arches, whorls, and loops along with edge outlines, minutiae, and furrows. Fingerprint matching can be achieved in three ways, like minutiae, correlation and ridge

Fingerprint readers are fabricated with pre-programmed information sets embedded in them. The reader identifies the individual fingerprint by their templates which are stored in the memory of the reader. To read the data on the fingertip, the reader reflects infrared light to the fingertip to capture the fingerprint ridge and minutiae and store it in the reader's memory as a template. Figure 1 shows how a fingerprint reader operates.

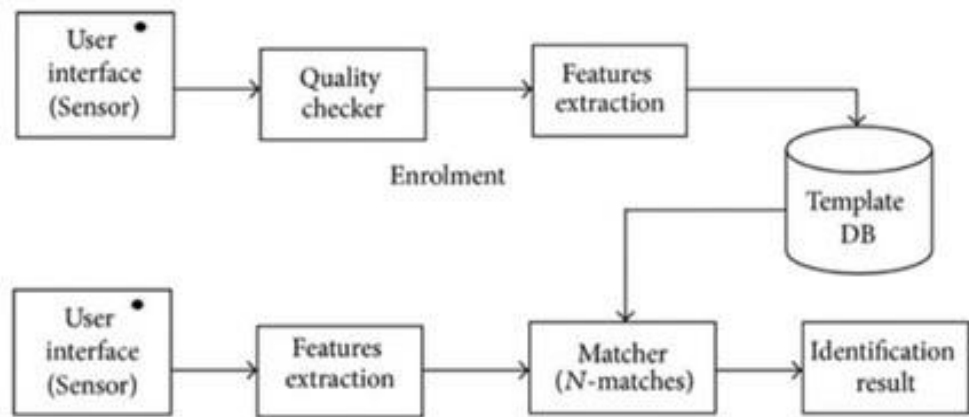


Figure 2.1: Figure generic block diagram for enrolment and identification of biometric authentication system

