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3'S Biometric Fingerprint Lock System of a Briefcase

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ABSTRACT

Nowadays, the term wireless communication technology has developed rapidly in our country, as it becomes the most important mediums of transmission of any information through the air without requiring any cable or other electronic conductor wires from one device to other devices. A biometric fingerprint is a high technology that applies identity of a person. A transducer that change a biometric treat of a person into an electric signal. During traveling or working, people often use a padlock to lock their luggage or briefcase. They can accidentally break the padlock, forget the password from padlock or their belongings might easily steal by thieves without being noticed. There are less security and lack of safety while using a manual padlock. This project was studied to figure out these problems using smart, simple and secure biometric fingerprint lock system. The first objective of study is ensuring a safety to users personal belonging. The second objective is promoting the smart fingerprint system at affordable price and lastly to create a simple but friendly smart fingerprint system. An arduino set is setup to make it works with a sensor of fingerprint scanner is connected together and coding is arranged inside a briefcase. The government parties, civilians' group and managers in banking sectors are the main target of our commercial potentials having this product. These groups carry their briefcase to keep the confidential documents, personal belonging or money plate inside it securely. In conclusion, to enhance this biometric lock better a GPS tracker with high heat resistance and auto lock system will be developed in future. Nevertheless, the creativity skill in dealing with a new approaching in innovation can be enhanced and also develop the critical thinking skill to solve problem in science, technology, engineering and math (STEM) learning as guided by Malaysia Education Ministry.

Keywords: Biometric; fingerprint; GPS tracker; auto lock system; arduino

1. INTRODUCTION

Nowadays, the term wireless communication technology has developed rapidly in our country, as it becomes the most important mediums of transmission any information through the air without requiring any cable or other electronic conductor wires from one device to other devices. This technology becomes famous and competes days by days in many devices such as smartphones, printers, cordless telephone, GPS, WIFI, satellite television and wireless computers. A biometric fingerprint is a high technology that applies identity of a person. A transducer is a device that changes a biometric treat of a person into an

electric signal. Currently, it becomes a high technology that applies the global positioning system (GPS) tracker when using it.

In general, a biometric fingerprint lock is a locking system with fingerprints biometric verification. Technology of biometrics implements the unique patterns of physical or behavioral traits of users for authentication or identification [1]. Basically, four systems or modules works with the biometric system such as the sensor module, feature extraction module, template database and matching module. With biometric scanners on smartphones and other devices becoming more prevalent, as well as a growing number of services calling for high security and good customer experience, traditional methods of authentication (e.g., passwords and PINs) are increasingly being replaced by biometric technology [1,2]. People who use passwords or PINs have some flaws such as are easily forget, lost or could be stolen their password. As a second solution, biometric fingerprints technology offers a system for an individual or single user to identify his authentication or identification based on biometric traits. The system is difficult to lost or forgot by the user. Biometric traits can trace the individual through his body by using the fingerprint, finger-vein, iris, voice, face, and so on [1,3]. In common biometric system produce authentication via the enrolment stage and verification stage [4,5].

The system of biometric widely used for the civilian and military parties [6–9] because of their specific properties possessed by biometrics in a few areas such as compliance with the law, frontier restriction, homes user in biometrics, and economic sector. Furthermore, the biggest country liked United States, United Kingdom, Australia and China utilized the biometric recognition systems in the law enforcement [1]. The Department of Defense and the FBI started using Next Generation Identification (NGI) in 2011 on the United States' generation of biometric system to perform and apply fingerprint, face, iris, palm data, and their facial recognition program became fully functioning in the end of year 2014 [10].

The fast technology in smart phones industry globally helps the biometrics technology to widely utilize in the market [11]. During business traveling or daily working, a person usually uses a padlock to lock their luggage or briefcase. He or she can accidently break the padlock, forget the password from padlock or their belongings might easily steal by the thieves without being noticed. Less security and lacks safety while using a manual padlock are the main problems might be faced out during handle it. This project was studied to figure out these problems using smart, simple and secure biometric fingerprint lock system. The fingerprint lock is invented to replace a simple padlock to help people in taking care their belonging or briefcase. The first objective of study is ensuring safety of users personal belonging. The second objective is promoting the smart fingerprint system at the affordable price and lastly is creating a simple device but friendly smart fingerprint system. This study is invented a biometric fingerprint lock system on a briefcase application. In addition, a low price is offered to public and simple mechanism compared to the other security devices as a main novelty of this project. The projects also use an inductive magnet to lock the briefcase and can be applied to other many devices too such as locker, door, luggage and traveling bag.

2. INNOVATION DEVELOPMENT

It is designed to be use by all people to keep their personal belonging or confidential document in this briefcase. As for example, the bank managers can use this briefcase in the extraction of money plates. The students or teachers for example can carry the briefcase at work or school to keep their books and laptops safely. The design of briefcase and its size are most attract to users to use and carry this briefcase. The product can reduce the backpain of the teachers when they carry the bag. The briefcase can be designed in the trolley bag to easily push or pull the bag as a briefcase bag. The application of this briefcase can be widely used by the people in general as for work, travel, shopping and business trip. This thing can increase the secure of the document because only certain people can open this briefcase because of biometric fingerprint lock system. Next, how the component of this system is function? Firstly, this system uses Arduino uno board that act as the brain of this system. Then, we use electromagnet as the lock of this system. This electromagnet will be functional if we connect it to a power supply. Thirdly, we use relay to break the circuit as our finger is put on the fingerprint sensor. In addition, we also use a fingerprint scanner to detect and notify personal identification or fingerprint and deliver the input to the Arduino system in order to access this briefcase.

3. COMMERCIAL POTENTIAL

We are creating a low-cost budget biometric lock system using these materials (refer Table 1). This product is design to all people that need a tool that can secure their confidential document or things that are valuable in affordable price. Firstly, we need to buy a suitable briefcase with a reasonable price so that we can save the money. The size of the bag is not too big and too heavy when we want to carry it. The space inside the briefcase can be used to keep the books, money, clothes and others personal items. Next, the magnet that is placed in the system is an electromagnetic lock. It is placed as a key or lock to access and open the briefcase. We try to use one magnet to be set up together with an Arduino system. Later, we also have a single battery of 12 V to generate the function of this briefcase. An Arduino Uno Board is bought at the cheap price through online shopping market because we try to keep the product in a low-cost budget. The function of this board is very important to make sure the fingerprint identification can be traced and utilized by the user. Therefore, we studied and did some research on how to run the Arduino Uno Board from the internet. We agreed to run the board by using the original of Adafruit_Fingerprint by Limor Fried/Ladyada from the research we done. Then, we attempted about 10 times the system Arduino by changing and refer the coding given by Adafruit Fingerprint in the way to make it success accessing the briefcase. The purpose of this coding is very important to keep our fingerprints information into the Arduino uno board. Our project produces the sensor from fingerprint to lock, open and run the system in the briefcase. The fingerprint can trace and identify the person information to access and open the briefcase. If the wrong information taken during opening the briefcase, it cannot be opened. The system of Arduino is not complete without the fingerprint scanner. We got the scanner from the shop which sold the scanner from the punch card box system. We tried first test whether it is function or not. The scanner size is small and can fit in the board. Besides that, a relay is used as a switch to run the whole circuit consists of the wires, battery, magnet, scanner and uno board. The circuit is on when the switch is completely off or touch all the elements and otherwise the circuit is off when the switch is on. It means

that the switch is break of disconnected to the other elements in the board. The switch works with both electric and electromagnet from the magnet. The wires are used to connect the point of elements in the circuit inside the briefcase. Figure 1 shows the price comparison between the ordinary biometric lock system briefcase in the market and our product itself. From this comparison, we can say that the range of price getting bigger gap around RM2000 range because may be due to the different materials of items and types of briefcase. Even though, we used a low-cost budget for materials and briefcase, the product from this study still can apply the fingerprint system in a good way and condition.

Table 1: Estimation of costing biometric fingerprint lock system

No.	Item	Quantity (Set)	Price per unit (RM)	Total price (RM)
1.	Briefcase	1	120.00	120.00
2.	Magnet	1	80.00	80.00
3.	Battery 12V	1	5.00	5.00
4.	Arduino Uno Board	1	30.00	30.00
5.	Fingerprint Scanner	1	80.00	80.00
6.	Relay	1	5.00	5.00
7.	Wire	7	3.00	21.00
			TOTAL	341.00

Figure 1: Innovation prototype

Table 2: The real market price of fingerprint briefcase

Market Price	Market Price
RM 2336.80	RM 341

4. CONCLUSION

In conclusion, our product offers a system that is user-friendly, affordable and top-notch safety protection. At lower price, the users now can rest easy as their various devices from briefcases to safe are well protected with our system and their valuables are secured for safekeeping. The system's functionality that is coded according to the owner's biometric precognitive part, which is in this project, is the owner's fingerprints. The mechanism of this system firstly detects the fingerprint using the biometric sensor and if it is matched with the coded fingerprint, it will then unlock the briefcase. As for future recommendation and improvement, we are planning to add GPS tracker to our products. This enable our clients to track the movement of their briefcase in perhaps extraction of money plates or even in to detect the location of the briefcase after theft case. Thus, our client able to plan the route of extraction in detail and also retrieve backs their stolen briefcase. If they unable to do so, they can leave it to police's hand along with the tracker to locate the briefcase. Next recommendation and improvement that we are planning to do is to implement the system on other various types of gadgets or other places that require safety protection. As an example, we can implement this system to doors, drawers and suitable things that require safety protection. Then we can widen the diversity of biometric sensors from fingerprint sensors to other, maybe retinal scanners or facial recognition sensors. The purpose we change the fingerprint sensors is because if our clients involved in an accident that somehow affects their fingerprints, the briefcase will stay locked although we will provide a spare key for each of our products. The spare key will be useful in times that if our fingerprint sensors unable to detect our clients' fingerprint. We believe that with our product recommendation and improvement, our product will breach through international markets and somehow compete fairly with other innovation ideas.

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