CERTIFICATION OF APPROVAL

Palm Detection for Employee Attendance

by

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Approved by,

(Dr Baharum B Baharudin)

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

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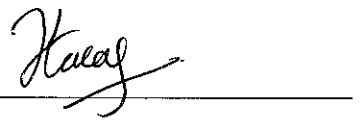
CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.



STACEY MIA ANAK NGIPA

ABSTRACT

Palm detection is one of biometrics products. The objectives of this topic which is about Palm Detection for Employee Attendance are such as: to protect against errors or employee fraud, to maintain necessary details about employees and to perform fast employee enrolment and instant identification. Some of previous what people had done in order to implement the devices for palm print can be seen in literature review part. Some methods or techniques had been found through research. The system is developed using software Microsoft Visual Basics 2010 to detect employee's palm image and pattern of the palm. Some details of the employees will be stored in database using Microsoft Access.

ACKNOWLEDGEMENT

Firstly, I heartedly to express my gratitude to thank Universiti Teknologi PETRONAS because give me an opportunity to take Final Year Project (FYP) course. By taking this course had giving me a chance to feel the challenges to develop individual project which it really tough yet it is really valuable as I gained and learned a lot in different kind of perspectives such as while doing researches about the project.

My precious and full of appreciation thanks to my Supervisor, Dr. Baharum Baharudin for all his guidance, advice, and help in completing my Final Year Project because it really honor to be your supervisee and gained as much as I could the knowledge that you shared to me.

Not forget to all my friends who had contributed in my project directly or indirectly especially in moral supports as well as in developing my systems. The coordinators from FYP 1 to FYP 2 and evaluators as well had contributed a lot and a huge thanks and appreciation to all the ideas, comments, and knowledge given to me. Finally, to my family members that who are always by my side to give supports and advises whenever I need them, a very thank you and feel so glad for that.

Sincerely,

stacey

TABLE OF CONTENTS

List of Figures — Pages

List of Table (s) — Pages

CHAPTER 1
INTRODUCTION

1. INTRODUCTION

Nowadays, Biometrics products are demanded by any big organizations in whole the world because of its technology which makes life much more safe, easier, and efficient. Biometrics has a few products such as card reader, fingerprints, face recognition, voice recognition, and palm recognition.

As mentioned earlier, palm recognition or palm detection is one of biometrics products. Palm detection means to capture and recognize the entire of individual's palm image from verification of veins pattern.

In our real life there is none who has similar palms veins as per research had made, palms have broad and complicated vascular patterns and thus it has high capability to recognize individual's identities without redundant data with others. In addition, it is one of very secured way to do authentication as palms veins lies under the skin and that makes people hardly to copy or read for cheating.

Therefore, palms detection is the best suggestion to be created as employee attendance. Palm detection for employee attendance is the safest, trustworthy technology that available for time and attendance and for entrance. Furthermore, there will be an LCD display, together with an audible signal, informs users whether they have logged in or out correctly.

1.1 Problem Statement

There are some problems that have been observed when company is not using this kind of system. Problems that are always occurred as following:

i. Previously and currently, worker is using card reader for time in or out. This kind of system is lead to cheating the system as the worker can ask another person to time in or out for them.
ii. Moreover, there are many cases illegal person who enter the workplaces with bad intentions such as doing vandalism, robbery, and misused of confidential documents for own goods.
iii. There are some cases had redundant data such as they have same bar code but still manage to escape from security entrance once the time in or out.

1.2 Scope Objectives

Objectives to implement Palm Detection for employee attendance are as following:

a) To protect against errors or employee fraud.

As per research, by using palm to detect someone's database is one of the ways to reduce errors or employee fraud. This is because palm veins for each of individual are totally different from each other and it is very low to get

error when capturing someone's palm which will authenticate them during time IN or OUT.

b) To maintain necessary details about employees.

Palm detection devices can maintain necessary details about employees as it is can store data of individual's palm veins accuracy, safe, and without redundancy.

c) To perform fast employee enrolment and instant identification

As per research, the palm detection is user friendly, creating a touch free, and hygienic solutions for public use [4]. In addition, it is high accurate as possibility to enrol the right person without false or error is very low.

1.3 Background of Study

Basically, palm detection is to recognize individual's palm vein and will be fused with the database that has been set for each of the registered individual. Moreover, palm detection used methods such as a scanner that can capture the palm images. For example, from a journal by *Kong, et al (2009) "A survey of palm print recognition" "Pattern Recognition" (42) (7), 1408-1418*, they developed CCD-based palm print scanner as it can capture a good quality of palm images. The journal also had mentioned about the identification in large database. As per research also [4], palm has unique features because each of everyone has different types of veins thus, the scanner and the database can store and capture millions of employee's database.

There are many advantages can be found when using this type of biometrics products for attendance because of its accuracy and capable to store and capture millions of different palm veins. As per research, there will be small chances for failure or wrong database which is connected with the registered palms.

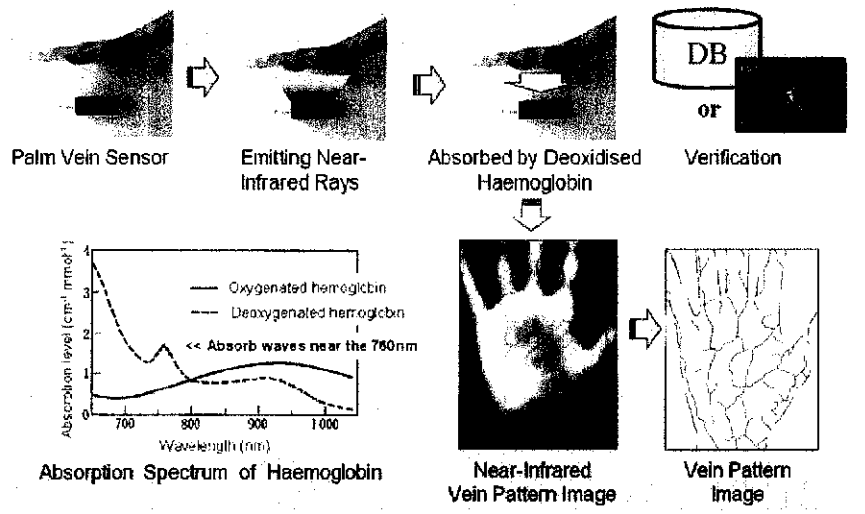
CHAPTER 2
LITERATURE REVIEW

2.0 Literature Review

Based on a website, palm images will be captured by using near-infrared rays where there is hemoglobin will absorbed these rays, thus, the reflection rate will be reducing and the veins are appear as a black pattern on the screen [4]. Then, it will identify the right person who owns the palm veins which this is good for security part.

Thus, others cannot cheat the system or device to use others palm which veins have huge and different internal features for each individual. This is because each individual has a unique hand's palm and even for left and right hands which the possibility to get wrong database of a person is very low. Moreover, palm detection is a user-friendly, creating a touch free and hygienic solution for public use [4].

Figure 1: Hand's palm detection using Near-infrared rays



According to one of website, palm detection or palm scanning is one of the best ways for employee's attendance because its scanner is capable to capture thousands different types of palm [5]. Other features about hand scanner are as following which according to [5]: in an organization it can be a time tracking not only for attendance but also to track their leaves, overtime, extended lunch, and lateness.

This website http://techbiometric.com also provided the advantages of the palm detection devices. The advantages that can be found are as following:

- The hand reader or hand scanner still can capture the best quality of palm image and recognize even the palm is dirty or the surface is oily.
- Can avoid employees fraud by using others to punch their attendance as the devices require individual's palm self.

- Benefits in terms of reducing cost because previously when the company was using card systems, they need to maintain employees' database.
- By having this device, reports like worked hours, lateness, leaves, and overtime, the manual preparation cost is reduced.
- "It is tested as a fast, accurate, and user friendly devices.

According to this journal, *Jian, et all (2008) "Person recognition by fusing palmprint and palm vein images based on "Laplacianpalm" representation" "Pattern Recognition" 41(5), 1514-1527*, unimodal is transferring to multimodal in order to get more accurate for palm recognition. Multimodal is created as it wants to improve previous modal which is unimodal. There are lots of problems occurred when using unimodal. The problems such as noisy-data, intra-class variations, restricted degrees of freedom, non-universality, spoof attacks, and unacceptable error rates.

Moreover, unimodal produced less quality of palm images. From the journal, they came out with a solution where multimodal personal identification system will combine these two, the palm print and palm vein images into a single image at the image level. For methodology, they are using image fusion and image registration. The images of the palm print and palm vein will be fused when the image is registered in the database. Below are figures for multimodal palm identification system and image fusion which represent methodology in this journal

Figure 2: The setup of our multimodal palm identification system.

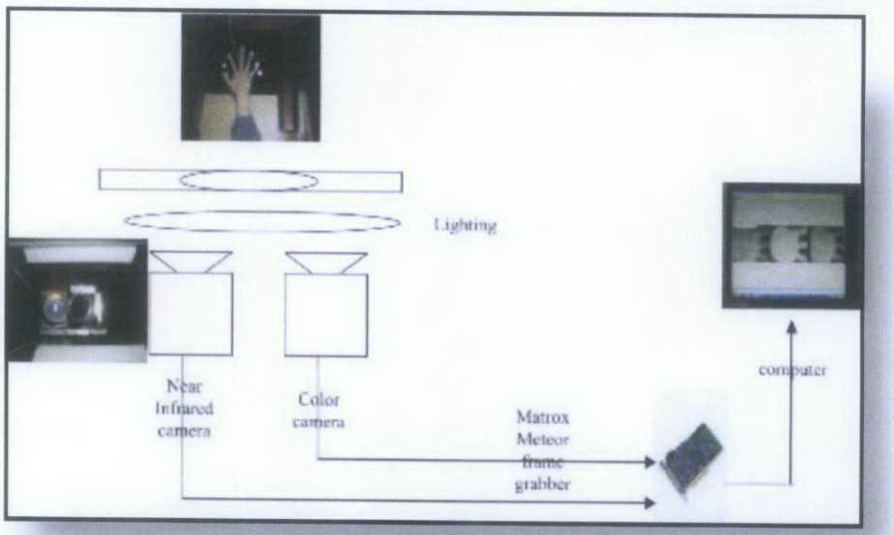
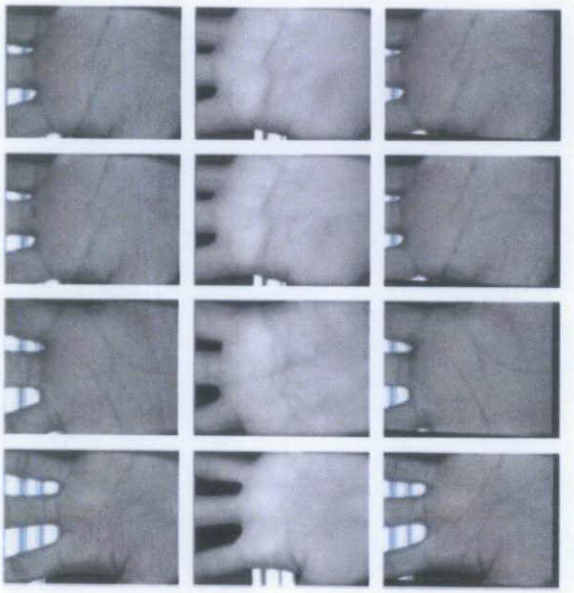


Figure 3: Image registration. First column: palmprint images (source); second column: palm vein images (target); third column: registered palmprint images.

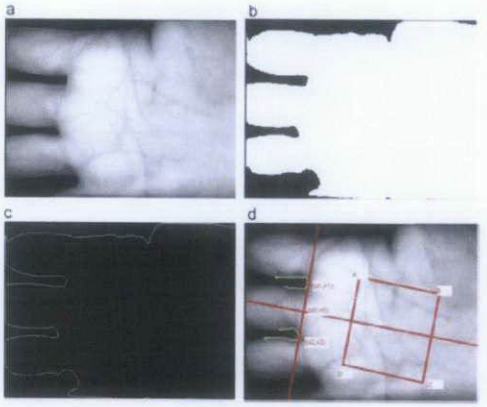


As per information from this journal, it stated that the principle of image fusion using wavelets is to merge the wavelet decompositions of the two original images using fusion methods applied to approximation coefficients and detail coefficients.

Then, they are using Region-of-interest (ROI) extraction after the two images have been fused for extraction stage.

The main crucial part in this journal is to present the novel palm representation, "called "Laplacianpalm". This type of novel representation as *Jian, et al* had stated, is extracted from the fused images by the locality preserving projections (LPP). The experimental results show that it provides a better representation and achieves lower error rates. *Jian, et al* did proposed and said Laplacianface which for face recognition had produced a better representation and achieves lower error rates in face recognition than other representations.

Figure 4: The region-of-interest extraction of a fused image: (a) original image; (b) the binaried Image of (a); (c) the contour of (b); and (d) the two webs and the region of interest.



According to this article *Kong, et al (2009) "A survey of palm print recognition" "Pattern Recognition" (42) (7), 1408-1418*, the authors, Kong et al mentioned about "a typical palm print recognition system consists of five parts such as palm print scanner, preprocessing, feature extraction, matcher and database." Furthermore, researchers mentioned about the four types of sensors they are using. The four sensors such as CCD-based palm print scanners, digital cameras, digital scanners and video cameras to collect palm print images. The Hong Kong Polytechnic University.Zhang et al. and Han which the first two research teams developing CCD-based palm print scanners. In the article, it did mentioned that the scanners capture high quality palm print images and align palms accurately because the scanners have pegs for guiding the placement of hands. Kong, et al wrote about preprocessing of the hand scanners which stated in the article, they used five common steps: 1) binarizing the palm images, (2) extracting the contour of hand and/or fingers, (3) detecting the key points, (4) establishing a coordination system and (5) extracting the central parts.

For recognition algorithm, Kong et al identified there are two types of recognition algorithm, verification and identification. Basically, in this journal said that verification algorithms must be accurate while identification algorithms must be accurate and fast (matching speed). Verification algorithms are line-, subspace- and statistic-based. Some algorithms in this section can support a certain scale of identification. However, most of the researchers do not report matching speed.

Another methodology that had been stated in the journal is identification in large database which it was using classical and hierarchical approaches and also coding approaches. Other discussion in the journal wrote by Kong et al is about the security and privacy where they mentioned about the issues that had happened when using this type of biometrics. One example of the issue that they mention is about a fake palm can be found as the researchers; *R.K Rowe et al* said they did not study into details yet about the detection.

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Other article named Identification of palm print using dermatoglyphics analysis and detection system by
Yiaohua Qiao[a], Zhen Li[a], Qing Wang[a], Yanjun Zeng[a], and Ke Liang[b], they stated that what are the characteristics of palm print and also the vital role for preprocessing in identifying the ridge characteristics of palm due to the complexity and poor quality of the images.

In the article, it stated that, there are methods had been tried to develop palm recognition or detection. One of the ways as stated in the article is to combine automatic recognition technology, digital image processing technology and dermatology analysis technique, where this study based on biology statistics investigated the biological characteristics of palm ridges for the early diagnosis of tumors.

In addition, article also stated that there is a template-based matching method was proposed and the parameters, including the triradius count, the number of ridges between two triradius points, the distance between two nodes, and the included angle of two lines, were quantitatively measured in the study.

The results of the method that had been mentioned in the article are the images of the palm print can be improved effectively and the identification of the palm characteristics also said that it can be conducted.

From the article, it can be concluded that the methods such as measurement system, template-based image preprocessing like, ridge detection and ridge skeletonization, and triradius location are for image improvement in terms of quality and increase the effectiveness of detection of the palms even though palm has larger and complex images.

From an article named, "A Palm print Recognition Algorithm Using Phase-Based Correspondence Matching," by Koichi Ito, Satoshi Iitsuka and Takafumi Aoki, they are proposing a palm print a recognition algorithm using phase-based correspondence matching. The proposed algorithm employs (i) sub-pixel correspondence search technique using POC and (ii) local block matching to deal with nonlinear distortion. Experimental evaluation using the PolyU Palm print Database [2] demonstrates efficient recognition performance of the proposed algorithm compared with conventional algorithms.

Furthermore, according to the article, the POC function defined as the inverse DFT of normalized cross-power spectrum. When two images are similar, their POC function gives a distinct sharp peak. When two images are not similar, the peak drops significantly. The height of the peak gives a good similarity

measure for image matching, and the location of the peak shows the translational displacement between the images.

From *Koichi Ito, et al* experimental, their observation shows that POC-based matching can estimate displacement between two images with 0.01-pixel accuracy when image size is about 100×100 pixels.

For the palm print recognition and algorithm, *Koichi Ito, et al* they are proposed two steps which are 1) Pre processing and 2) Matching. For pre processing, *Koichi Ito, et al* extract the palm print region from an input image. They applied methods that will be used to gap between fingers as a point to define the palm print region.

Step 1: Apply the Gaussian low-pass filter to the input image.

Step 2: Obtain the chain code from boundaries of the binary image using a boundary tracking algorithm and determine the landmarks based on the chain code.

Step 3: Obtain the perpendicular bisector of the line segment between two landmarks to determine the centroid of the palm print region.

Step 4: Extract the palm print region of fixed size, which is centered at the centroid obtained the previous step. In this paper, the size of palm print region is 128 X 128 pixels.

Final step: *Koichi Ito, et al* obtains the palm print regions which scaling factor and rotation angle are normalized.

In matching stages, it is to evaluate the similarity between two palm print regions. Two palm print region, f(n1, n2) and g(n1, n2).

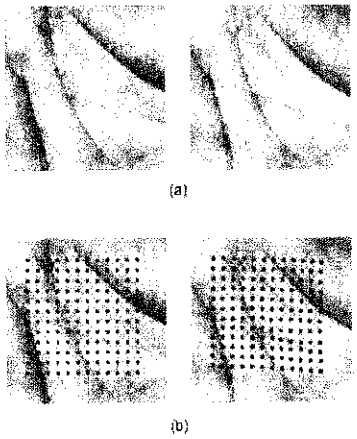

Figure 5: Example of correspondence matching: (a) palmprint regions f(n1, n2) and g(n1, n2) and (b) reference points on f(n1, n2) and their corresponding points on g(n1, n2).

From the abstract of the journal, *Koichi Ito, et al* proposed that they are using phase based correspondence matching for their palm print recognition algorithm. In order to handle nonlinear distortion, the proposed algorithm (i) finds corresponding points between two images using phase-based correspondence matching and (ii) evaluates a similarity between local image blocks around the corresponding points. Finally, during their experimental evaluation they stated in the journal that they are using a palm print image database demonstrates for an efficient recognition performance of the proposed algorithm compared with conventional algorithms.

From an article named, "On Hierarchical Palmprint Coding with Multiple Features for Personal Identification in Large Databases," by Jane You, MemberbIEEE, Wai-Kin Kong, Member, IEEE, David Zhang, Senior Member, IEEE, and King Hong Cheung, they are using four-level features: global geometry-based key point distance (Level-1 feature), global texture energy (Level-2 feature), fuzzy "interest" line (Level-3 feature), and local directional texture energy (Level-4 feature).

In this article, let focusing on their hierarchical palm print identification system. There are four components in the hierarchical: 1) palm print acquisition, 2) preprocessing, 3) feature extraction, and 4) hierarchical matching.

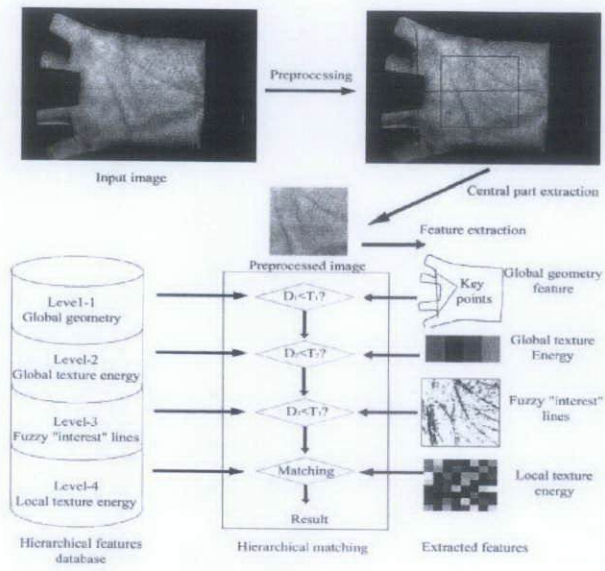

Figure 6: System diagram of hierarchical palm print system.

In hierarchical palm print coding, it stated that there are such boundary segments that can be obtained by a boundary tracking algorithm with the following major steps.

Step 1: Convert an original palmprint image to a binary image by convolving a lowpass filter with the original image and thresholding.

Step 2: Apply boundary tracing to obtain the boundaries between fingers.

Step 3: Compute the tangent of line segments.

Step 4: Identify the two key points and calculate their distance as the global geometry feature.

-1	-2	-4	-2	-1
0	0	0	0	0
2	4	8	4	2
0	0	0	0	0
-1	-2	-4	-2	-1

(a)

-1	0	2	0	-1
-2	0	4	0	-2
-4	0	8	0	-4
-2	0	4	0	-2
-1	0	2	0	-1

(b)

0	-1	-4	0	2
-1	-6	0	8	0
-4	0	12	0	-4
0	8	0	-6	-1
2	0	-4	-1	0

(c)

2	0	-4	-1	0
0	8	0	-6	-1
-4	0	12	0	-4
-1	-6	0	8	0
0	-1	-4	0	2

(d)

Figure 7: Four kinds of "tuned masks" for global palm print texture extraction. a) Horizontal line. b) Vertical line. c) 45°. d) -45°

In the article, the experiment stated that it carried two stages. In stage one, the global palm print features are extracted at the coarse level and candidate samples are selected for further processing. In stage two, the regional palm print features are detected and a hierarchical image matching is performed for the final retrieval.

As a conclusion, *Jane You et al* conclude that palm print feature extraction and matching are the two key issues in palm print identification and verification. Therefore, they are proposing that the traditional techniques they

propose a hierarchical palm print coding scheme to integrate multiple palm print features for guided palm print matching.

CHAPTER 3
RESEARCH METHODOLOGY

3.1Project activities

For Final Year Project 2 (FYP 2) progress report, it is to do some study how to develop the system and what kind of software, hardware or tools to be used. First of all, let focusing on the pre processing and extraction of the system.

3.1.1 Pre processing and Extraction

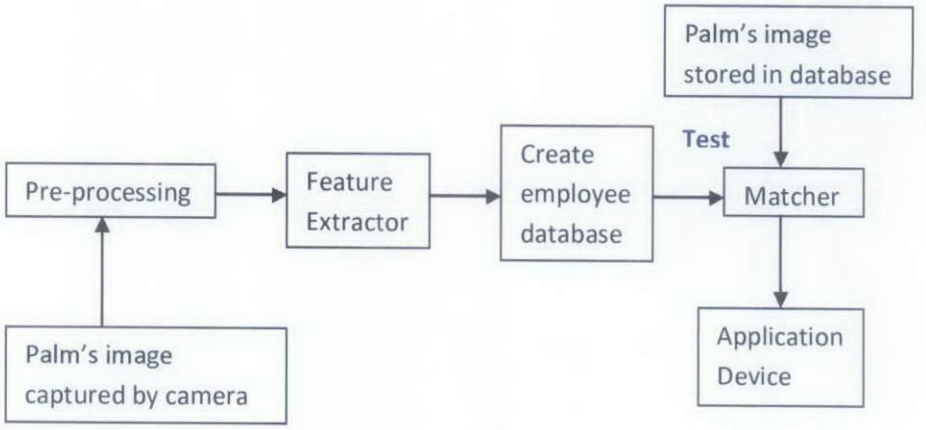

Figure 8: Diagram for Preprocessing & Feature Extraction

Palm means that it is an inner surface of the hand between the wrist and the fingers. Below is the example of palm image and the main region that will be detected by the systems.

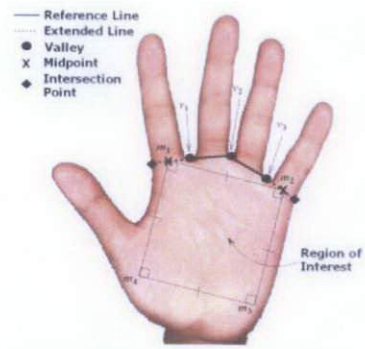

Figure 9: Outline of the region of interest (ROI) from the palm.

3.2Tool (e.g Equipment, hardware, etc) required

As because of time constraint and considering of high cost if using or buy palm detection for the pre processing, therefore, there is an alternative way to develop the systems. For extraction or getting the palm image, the tool that will be used is a camera as well as Internet for alternative way in order to get palm image and its pattern. Then for the database, Microsoft Visual Basic 2010 Express and Microsoft Access will be used to store all the details about employees. The camera features are as below:

Camera Features	
Lens Type	CMOS
Mega pixel	5.1
Max. Resolution	2560 x 1920
Digital Zoom	4x
Flash	Yes
Night Mode	Yes
Extra Features	Face detection, Smile detection, Geo-tagging, Auto-focus, Image stabiliser
video	Yes, 24fps, continuous autofocus
Photo Format	-
Video Format	720p HD recording

Table 1: Camera Features for image pre procession and extraction

Some interfaces that will be developed using Microsoft Visual Basics 2010 are as following:

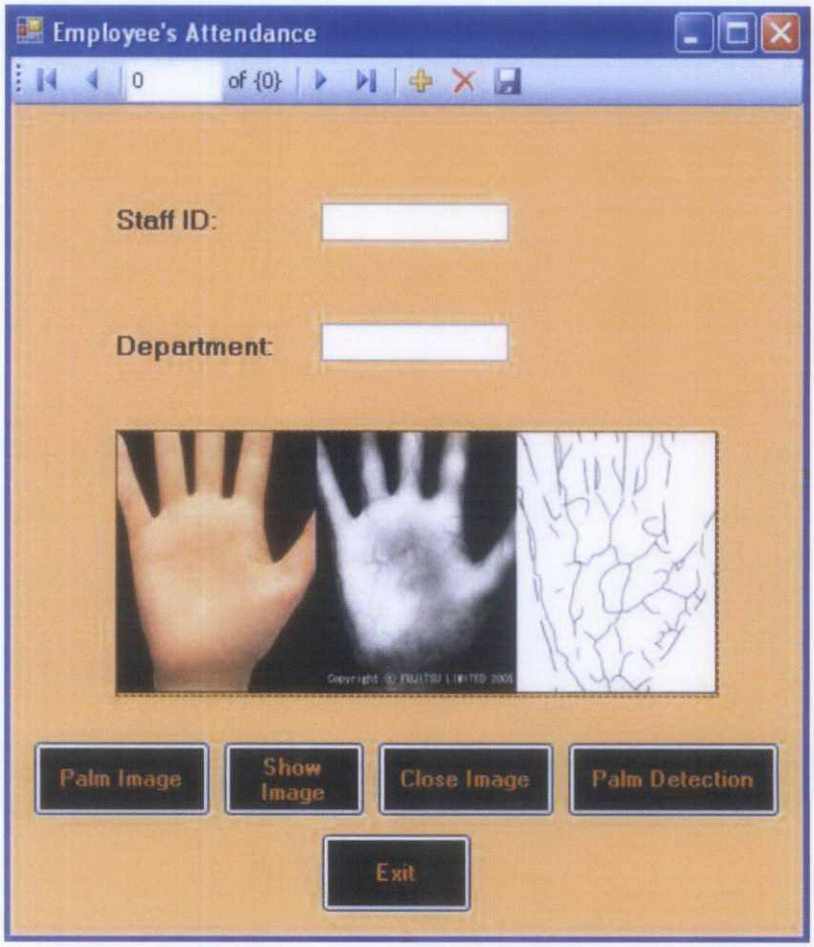

Figure 10: Registration / Employee Attendance

Figure 10 shows the system interfaces which using Microsoft Visual Basics 2010. All the employees' details will be stored in database which using Microsoft Access. This database will be merged to detect the employee's palm. When employee enters wrong details in the system, their palm will be not detected because it is not match the database. While, when the details filled in correctly, their palm will be detected. Thus, they cannot lie to the

system when time in or out. Even though, the palm is not appear in the system but the intention to develop this kind of system is to detect the palm not to see the palm physically.

CHAPTER 4
RESULTS AND DISCUSSION

As per research and based on journal that had been found, there are several ways of to verify and identify the techniques or algorithms that have been used for the palm print detection or recognition. The techniques and algorithms that I had found such as multimodal recognition, eigenpalms, wavelet, and correlation filter classifiers, hierarchical palm print, et cetera.

All that kind of techniques and algorithm has their own uniqueness and accuracy of palm detection or recognition. For this project, multimodal ways is chosen which it does not mean it will include all types of biometrics and combine them in one system, yet it is not only to detect the palm image but the pattern of the palm which as from researches, everyone has different pattern of palm.

As because of time constraint and did not have any knowledge of using MATLAB programming, Microsoft Visual Basics 2010 will be the software for the system and as mentioned before in progress report, camera will be used but nowadays, Internet also can be as an alternative to find any palm images for the system as it there will be lesser works and make life easier. Moreover, some details of the employees will be stored in database using Microsoft Access.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATION

As a conclusion, palm detection for employee attendance is very crucial for an organization security aspect. This is because there is no one in the world will has same palm veins. Thus, people cannot enter the place where required authorized person only by cheated.

An accurate and effective system for employee's attendance can avoid data redundancy where there were always happened when they have same identification number and bar code in the card reader. This is always happened when they tend to use previous workers identification number who already resigned or retired for new workers. The new workers will have high possibility recognized and having previous details which we can say that the database is not updated.

The device for palm detection is a user friendly as so far, there is no research found said that it brings harmful to individual's health. Therefore, an accurate and relevant technique of palm detection for attendance will be needed.

As for recommendation, it is recommend that during FYP 2 a training workshop for all specialization area that students will choose. For example, for Business Information System (BIS) students, they did not have any knowledge in MATLAB programming and many of them are developing system which using MATLAB. While for Information Technology (IT) students, they did not have knowledge in Visual Basics. Thus, it might be helped if there is a training workshop at least once in two weeks. Make it compulsory in terms of attendance.

Furthermore, for biometrics systems, it is recommended for University to provide one device to test how to use the system as it will at least more than 3 students will do biometrics topics.

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APPENDICES

1. Gantt Chart for FYP 2

	Week													
Project Activities	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14
Pre-processing and Extraction														
Research about algorithms														
Start to develop interface														
Submission of progress report														
Design and Development														
Continue to develop interface														
Development using Matlab														
Pre-EDK														
Technical Report and Viva														
Develop Prototypes														
Prepare for Viva and Technical Report														
Technical Report submission														