IMAGE ANALYSIS OF PALM (PALMISTRY) (HEALTH AND CHARACTERISTICS)

by

SAMSUL FITRI B ABD RAZAK

Dissertation submitted in partial fulfilment of
the requirements for the
Bachelor of Engineering (Hons)
(Electrical & Electronics Engineering)

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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the
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BACHELOR OF ENGINEERING (Hons)
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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.

SAMSUL FITRI B ABD. RAZAK

ABSTRACT

Palmistry is defined as the study of lines and signs of the hands. In modern palmistry there are three main aspects chiromancy, chirognomy and dermatoglyphics. With the aid of image processing this project is mainly proposed on developing software that can evaluate a palm and display the health and other characteristics of its owner. The methodology used in this project is to compare a person's palm data with the stored database. The features being evaluated in this report are the shape of the hands, the shape of the fingers and the lines of the palm. This report also explains the algorithm and the features of the software being developed. This system can be considered as a step forward in modern hand analysis to know person's health conditions and characteristics to some extent.

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First and foremost I would like to thank god for being with me through ups and downs of this project. Without his grace this project would be nothing more than just a title on writing pad.

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CHAPTER 1

INTRODUCTION

1.1 Palm Data

This project is a development of a system that will analyze a human's palm (palmistry) based on digital image processing. The research work has been conducted basically to determine the relationship between palm data and the person's characteristics and health conditions. The characteristics are determined based on the lines, shapes of the palms and fingers.

In this work the structure of the palm and its lines will be digitized and analyzed using feature extraction methods.

Set of palm images is extracted to perform a multi-resolution analysis that yield a good result in identification of the health and other characteristics. Digital Image Processing functions will be used to obtain the intended result. The input for this system is image of a person's palm taken by using a camera and the output will be the detection of the person's characteristics and health condition. The coding will consist of many steps, such as reading the test image and pre-processing, segmentation, feature extraction and recognition.

The image that has artifacts caused by the digitization process or by other causes (for example, bad lighting) are corrected using Image enhancement techniques. Then the image is segmented and the feature extraction operations will be performed to obtain

useful information from the image. Most important factor to perform the feature extraction is to ensure that the images taken are on similar environment.

1.1 Problem Statement

Palmistry is defined as the study of lines and signs of the hands. Throughout our lifetime, our bodies register change. For example, the lines on our hand that we acquire with age reflect our present conditions of living. Lines and signs on our hands, present at birth, change as we evolve, signifying the accumulated experience of our lives.

Our hands offer us an objective view of who we really are. Through the study of palmistry, we have the opportunity to see to what extent our thoughts and feelings influence our happiness and the harmony of those around us. As we exercise our will in choosing positive patterns of thinking to replace any negative ones, we see our lines begin to change, reflecting a shift in our consciousness.

The aim of this project is to develop a system that would perform the task of analyzing a person's palm and displaying his or her characteristics. This will be advancement in modern hand analysis *(The student's Gantt chart is given in Appendix I).*

CHAPTER 2

OBJECTIVES

This project aims to achieve the following objectives:

i. To develop a system, to analyze palm with a possible level of accuracy and reliability, which is robust and efficient

ii. To apply few levels of image processing and computer vision concepts, such as segmentation, pattern recognition, and feature extraction in the analysis of palmistry.

iii. To implement a palm analysis system that can analyze the texture and structure of the palm and will be able to identify on a person's characteristics and health conditions based on palmistry study.

CHAPTER 3

LITERATURE REVIEW

In order to obtain relevant and beneficial information regarding this project, the author carried out an extensive literature review, such as by referring to books, journals, magazines, websites, etc. The information is very important for the development of the system as it provides theories, concepts and as well as techniques that be utilized throughout this project.

3.1 Palm Reading History

There are various opinions on the origination of Palmistry and following the history is both captivating and frustrating. Many books chronicling the life of this telling art, and most agree on the famous practitioners who have ultimately brought it into popularity, but its actual discovery remains a mystery.

The roots of this ancient art have been traced by some as far back as the ancient cultures that have been credited with its origin. Many records indicate that the practice was popular in India, Greece, China, France, Ireland, and England.

One of the most famous and revered Palmists was, and still is, Cheiro[16]. He offered his real name as Count Louis Hamon, but researchers discovered his birth certificate in Ireland shows his name to be William John Warner. His first book on Palmistry was published in 1894 and he became the seer to the rich and famous. He wrote many books during his lifetime and some are still available today.

3.2 Medical Palmistry

For centuries now, medicine has recognized the link between Palmistry and health. Plato stressed the importance of the hand in the study of human beings, Aristotle furthered this application and Hippocrates, the Father of Medicine, practiced this art on all his patients. Modern medical researchers too have confirmed this link.

Dr Satish Tadwalkar [18], a Medical Palmist and BAMS, says, "Your palm could indicate the early warning symptoms to your health and serve as a guide for all your physical and mental ailments." A practicing Medical Palmist for 12 years now, Dr Tadwalkar had his first brush with the hidden science when an astrologer predicted, from the position of his mount of Saturn, that he would develop dental problems soon. And true to the astrologer's words, Dr Tadwalkar visited his dentist two years later.

"Many a time, doctors themselves send their patients over when it becomes difficult for them to pinpoint the actual problem. In such cases, studying the markings on the hand leads us to the actual problem", he reveals. "But you have to take all things into consideration before the diagnosis is confirmed," he cautions.

Medical Palmistry not only helps diagnosing diseases but also helps one to know about the patient's temperament, his/her constitution, and the subconscious mind. Besides, some factors such as love, libido, and the emotions that are beyond the pale of empirical sciences, can easily be recognized by the knowledge of Palmistry. Palmistry plays the role of computers for the body. The benefits of Medical Palmistry are as follows [18]:

- It provides an early warning for forthcoming diseases, and one can prevent them early.
- It provides information about hidden diseases which remain undiagnosed or misdiagnosed by doctors.
- It helps in the prognosis of diseases where doctors are unsure about it.

- Psychological ailments can be easily recognized by the study of the palm.
- Palmistry has a major role in prevention of diseases. With its help and knowledge, a doctor can easily recognize the weakness of the system and advise the patient all relevant nutritional changes to prevent the disease from becoming severe.
- Serious illnesses, accident and hospitalization can be avoided by guiding the person properly in the nascent stage.

3.3 Palm reading

Modern hand analysis has come a long way over recent years, leading to the extra study of chirognomy, which involves the study of various formations including the hand and finger shape, colour, consistency, texture, etc., and dermatoglyphics, which is the genetic study of skin ridge formations found both in the palms and the fingers. Over recent years, there has been a breakthrough in how certain skin ridge patterns can be related to various health and psychological conditions. There are three main aspects of Modern Palmistry [17]:

- Chiromancy: A study of the lines within the palms. From ancient times until the 19th century this was basically the only aspect of palmistry which existed
- Chirognomy: A study of genetic hand shape, finger shape, finger nails, texture, consistency, gesture, etc. Used by hand analysts in order to gain insight into aspects of the inner workings of the personality.
- Dermatoglyphics: A study of skin ridge patterns and formations found on the fingertips and within the palms themselves. Much research has and continues to be done with regard to how certain patterns may be indicative of genetic problems

3.4 Chirognomy

Chirognomy is the study of the size, shape and appearance of the hand, including analysis of the color, texture and resiliency of the skin. A good place to start the study of Chirognomy is by getting to know the basic hand shapes. Assessment of the shape of the hand provides insight into the essential character of the individual.

Throughout the history, palmists have developed various systems of categorization for hand types. One popular system classifies the hand into 7 types: Elementary, Square, Spatulate, Philosophic, Conic, Psychic and Mixed. In traditional Chinese Palmistry there are 5 hand types that correspond to the 5 elements of Water, Fire, Wood, Earth and Metal.

The simplest type of classification, and the one that I favor, reflects the 4 elemental categories used in western astrology: Earth, Air, Fire and Water [13].

3.4.1 Earth Hand

The Earth hand is square and solid. The fingers are short and the palm exhibits few lines. Those that do appear are strong and well defined. Subjects with Earth hands tend to be level-headed, no-nonsense people. Physical experience may be more important than intellectual pursuits. Practical in nature, the Earth type may be conservative and probably prefers spending time outdoors. It is an experience that the Earth type is the least likely to seek out a palmist for a reading. Figure 3.1 shows a sample of Earth hand.

Figure 3.1: Earth Hand [13]

3.4.2 Air Hand

The Air hand has long fingers and tends to have an abundance of clear lines in the palm. Air types spend their time in the intellectual realms. They are curious and full of ideas. They thrive on nervous energy and may be prone to worry and stress. Air types are communicators and are often good at working with the public. However they may tend to intellectualize their feelings and can have difficulty with close, personal relationships. Figure 3.2 shows a sample of Air hand.

Figure 3.2: Air Hand [13]

3.4.3 Fire Hand

A hand with an elongated palm and short fingers fits into the Fire classification. The lines in the palm are usually strong and well-defined and the hand may have a busy or vibrant feel to it. Fire types are energetic and action oriented. They have a need for variety and may lack patience. Then tend to be individualistic and often make good leaders. Figure 3.3 shows a sample of Fire hand.

Figure 3.3: Fire Hand [13]

3.4.4 Water Hand

Water hands have many fine, spidery lines and both the palm and the fingers are long. The Water hand is found on the sensitive, emotional type of individual. Water types are caring, receptive and artistic. They are primarily motivated by feelings. They may have trouble coping with stress and are often happiest in a peaceful environment. Figure 3.4 shows a sample of water hand.

Figure 3.4: Water Hand [13]

3.5 Chiromancy

The lines in the hand can be divided into 3 groups: the major lines, the minor lines and the personal lines. There are 3 major lines to be found in the hand. These are the Life Line, the Heart Line and the Head Line. The minor lines run vertically in the hand and each is named for the finger under which it terminates. Everything else is considered a personal line. The personal lines may have names and fit into categories though there may be some lines that are quite unique to the individual. It is through practice and experience that the palmist can learn how to interpret these lines.

Though most hands will have the three majors and at least one or two of the minors, every hand is unique and many of these lines will be absent from a number of the hands observed.

The lines in the hand change all during the life and reflect the changes in behavior, attitude, lifestyle and experience of the individual. Taking dated prints of the hands provides a record of what the hands reveal at a particular point in time.

3.5.1 The Major Lines

The Life Line: The Life Line begins at the edge of the hand between the thumb and forefinger and arcs downward around the thumb area. Contrary to popular belief, this line does not indicate length of life. It does identify vitality, robustness or weakness, enthusiasm for living and state of health.

The Head Line: The head line begins at or near the beginning of the Life Line and moves horizontally across the hand. It represents mental capacity and the intellectual style. The length of the line indicates amount of time spent in the realm of thoughts. A curvy Head Line is a sign of an intuitive thinker while the very straight line indicates a logical disposition.

The Heart Line: The Heart Line begins under the little finger (Mercury) and moves across the upper palm. The Heart Line reveals the style of relating, the degree of sensitivity of an individual and the emotional history. If the Heart Line sits low in the hand, it is an indication that the heart rules the head. If the line is very straight it shows a person who intellectualizes the emotions.

The Simian Line: Some hands have only 1 line moving horizontally across the upper hand, a combination of the usual 2 lines representing head and heart. This marking is known as the Simian Line. With the Head and Heart lines running together, the emotional and mental functions do not operate separately. Those who possess this line exhibit intensity of temperament.

3.5.2 The Minor Lines

The Line of Saturn: The Saturn Line begins just above the wrist and moves up the hand to the middle finger. It is commonly known as the Fate Line. This line represents the measure of personal success and the subject's attitude toward handling responsibility.

The Line of Apollo: This line is also known as the Line of the Sun. It appears under the finger of Apollo, the ring finger. The presence of the Line of Apollo indicates artistic talent. This line is often short, rising just above the Heart Line and may not appear on the hand at all.

The Line of Mercury: The Line of Mercury may sometimes be referred to as the Line of Health or the Line of Inner Dialogue. It may not appear on the hand but when it does it rises from the base of the hand and angles up to the Mound of Mercury under the little finger. When present this line will give information about the subject's nervous system. It is also an indication that the individual is seeking a path of self-improvement or spiritual growth.

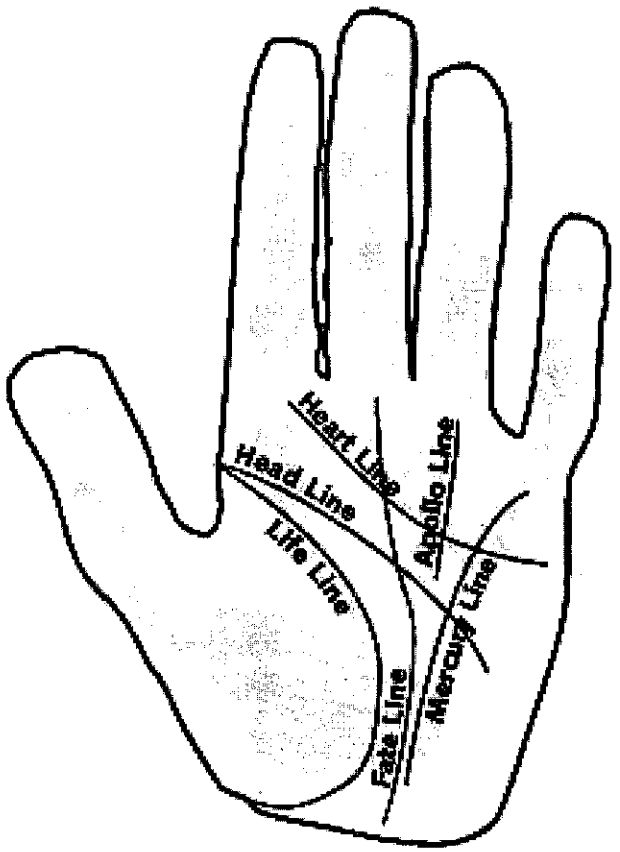


Figure 3.5: Palm's line [13]

3.6 Image Processing Function

Modern digital technology has made it possible to manipulate multi-dimensional signals with systems that range from simple digital circuits to advanced parallel computers. The goal of this manipulation can be divided into three categories [15]:

- Image Pre-Processing: image in -> image out
- Image Analysis: image in -> Region of interest out
- Image Understanding: image in -> high-level description out

The fundamental concepts of image processing will be focused. Further, it is restricted to two-dimensional (2D) image processing although most of the concepts and techniques that are to be described can be extended easily to three or more dimensions.

An image defined in the "real world" is considered to be a function of two real variables, for example, a(x,y) with a as the amplitude (e.g. brightness) of the image at the real coordinate position (x,y). An image may be considered to contain sub-images sometimes referred to as regions-of-interest, ROIs, or simply regions. This concept reflects the fact that images frequently contain collections of objects each of which can be the basis for a region. In a sophisticated image processing system it should be possible to apply specific image processing operations to selected regions. Thus one part of an image (region) might be processed to suppress motion blur while another part might be processed to improve color rendition.

The amplitudes of a given image will almost always be either real numbers or integer numbers. The latter is usually a result of a quantization process that converts a continuous range (say, between 0 and 100%) to a discrete number of levels. In certain image-forming processes, however, the signal may involve photon counting which implies that the amplitude would be inherently quantized. In other image forming procedures, such as magnetic resonance imaging, the direct physical measurement yields a complex number in the form of a real magnitude and a real phase.

3.7 Pattern Recognition and Classification

Pattern recognition deals with the recognition of objects in images, and is applicable to any other kind of data as well. The basic approach views an instance to be recognized as a vector of measurements. A recognition system must contain some memory of the objects that it is to recognize. Recognition and learning of patterns are subjects of considerable depth and interest to cognitive psychology, pattern recognition and computer vision.

Classification is the process of grouping objects together into classes according to their perceived likeness or similarities [5]. Pattern classification involves taking the feature extracted from the image and using them to classify image objects automatically. This is done by developing classification algorithms that use the feature information. The distance or similarity measures are used for comparing different objects and their feature vectors.

3.8 **Digit Ratio**[7]

The digit ratio is the ratio of the lengths of different digits, fingers or toes, typically as measured from the bottom crease where the finger joins the hand to the tip of the finger. It has been suggested by some scientists that the ratio of two digits in particular, the 2nd (index finger) and 4th (ring finger) is affected by exposure to androgens such as testosterone while in the womb and that this 2D:4D ratio can be used as a crude measure for prenatal androgen exposure.

Ratio 2D:4D is sexually dimorphic, in men, the second digit tends to be shorter than the fourth, and in females the second tends to be the same size or slightly longer than the fourth. Some would prefer to say that this trait is 'sexually differentiated' rather than 'sexually dimorphic' in recognition of the fact that the effect size is fairly small (2D:4D distributions of the two sexes overlap to a great degree), especially as compared to other sexually dimorphic traits such as height.

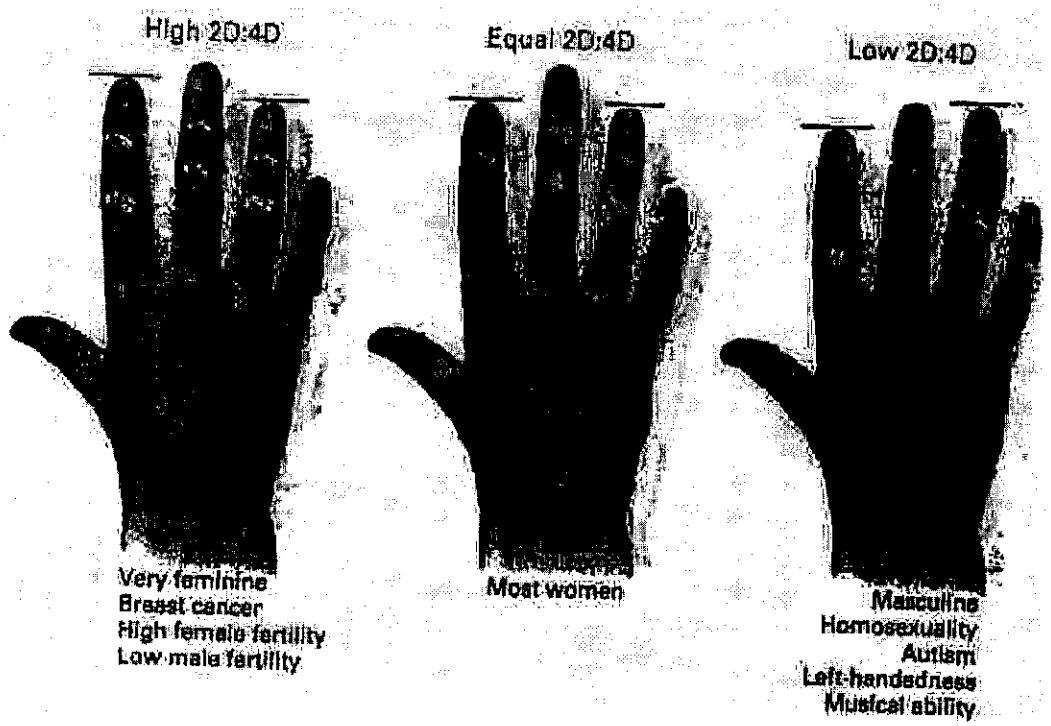


Figure 3.6: Digit Ratio Theory [7]

Digit ratio research often meets with a considerable degree of skepticism due to the obvious parallels to palmistry, phrenology and other discredited traditions within the field of anthropometry.

A greater proportion of men have shorter index fingers than ring fingers than do women has been noted in the scientific literature several times through the 1800s. In 1975 Wilson published a study examining the correlation between assertiveness in women and their digit ratio. This was the first study to examine the correlation between digit ratio and a psychological trait within members of the same sex. Digit ratio research has exploded since John Manning proposed that digit ratio reflects prenatal androgen exposure, launching a very active and on going area of research. In 2002 Manning published a book summarizing all such research on the topic to that point.

It is not clear why digit ratio ought to be influenced by prenatal hormones. There is evidence of other similar traits e.g. otoacoustic emissions, arm to trunk length ratio, which show similar effects. Hox genes responsible for both digit and gonad growth have

been implicated in this pleiotropy. Alternatively, direct effects of sex hormones on bone growth might be responsible.

There is some evidence that testosterone facilitates the differentiation of the brain at prenatally and postnatally. There have been many extensions of this, such as the Geschwind-Galaburda Hypothesis, that immune disease [9] and autism [10] is related to prenatal testosterone, this also explaining why more men are left-handed, autistic, etc. than women. Prenatal exposure to testosterone is thought to promote the development of the right-hemisphere and increase the incidence of sanitarily. As such low 2D:4D was found to be associated with improved left-hand performance [11].

3.9 Medical Assessment on the Basis of Nails

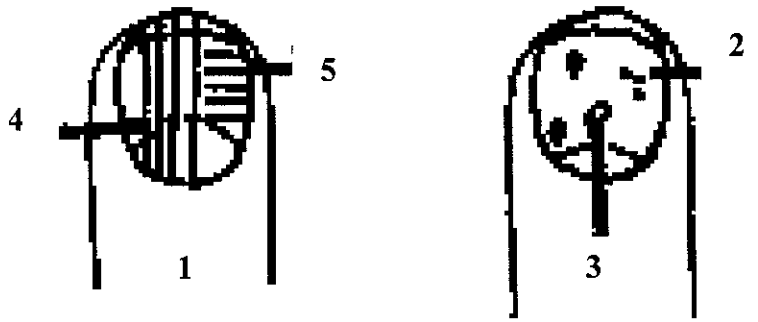
From the early 80's various works have been published which describe the clinical relevance of the nails [12]. In the past years various new books have been presented within this discipline.

However, only a few years ago medical students were hardly informed about the clinical value of the nails. In order to fill this space several dermatologists have united their knowledge and created in 1997 'Nail-Tutor^{TM}': a visual personal computer program including 150 photos which describe the anatomy and pathology of the nails - afterwards the user can test the understanding of the material in the program [8].

In general one can say that only some diseases are frequently accompanied with nail abnormalities. Table 3.1 shows the nails abnormalities and health indications associated with it. Figure 3.7 shows the abnormalities on a finger nail.

Table 3.1: Nail Abnormalities and Health Indications [12]

Nail Abnormalities	**Health Indications**
Large moons	excess protein
Small red dots	pin worms
White spots	excess sugars, zinc deficiency
Vertical lines	possible bacteria or worms in intestines
Horizontal lines	chaotic eating or big environmental change



Legend:
1: Large moons
2: Small red dots
3: White spots
4: Vertical lines
5: Horizontal lines

Figure 3.7: Nail Abnormalities [8]

CHAPTER 4

METHODOLOGY / PROJECT WORK

The early stage of this project is concentrated on the literature review of subjects and topics related to this project. It is intended to give the author a depth understanding on the basis of this project mainly on the area of digital image processing and palmistry. Research is done through various sources such as books, journals, magazines and websites. The system development procedure is shown in Figure 4.1.

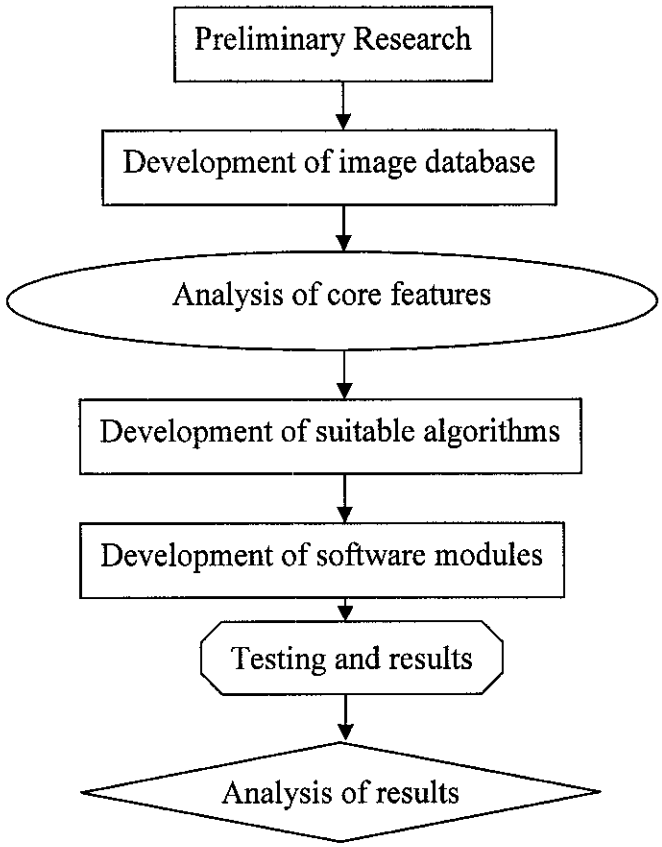


Figure 4.1: Block Diagram of system development procedure

MATLAB has been identified as the main driver for his project as the entire algorithm developed is processed by MATLAB. MATLAB software is a very powerful tool for mathematical calculation, visualization and programming. In addition there are several *toolboxes* available to expand the capabilities of MATLAB. The Image Processing Toolbox is one of these toolboxes. The toolbox consists of a set of functions and structures that handle image processing. This helps to ease the programming part of this project as it is not necessary to write code for all activation functions, training algorithms, etc.

The first step in developing algorithm is the acquisition of image. All the images were taken online using a web camera. The length and lighting conditions are fixed so that orientation and the lighting condition of the image captured can be controlled. Palm images taken are stored for pre-processing. Specification of the web camera that has been used is:

Model	: Logitech QuickCam Express
Video Capture	: 640x480 pixels
Still Image Capture	: 640x480 pixels
Frame-Rate	: 30 fps

The next step after acquisition of image is the development of database based on palms of several persons with different and distinctive characteristics. All the pictures was taken with the same background and lighting conditions to ensure a better analysis of the palms. Preprocessing was done to crop parts of the images that is unnecessary and to classify the region of interest for processing. Apart from that, the images are filtered in order to remove noise and blur and to enhance contrast in order to produce a good result. Digital images are prone to a variety of noise. There are several ways that noise can be introduced into an image, depending on how the image is created. The noise might be produced due various reasons:

i. When the image is acquired directly in digital format, the mechanism for gathering the data (such as CCD detector) can introduce noise

ii. Electronic transmission of image data can introduce noise. Pre-processing using enhancement image methods are applied for removal of noises.

Segmentation is the partitioning of a digital image into multiple regions (sets of pixels), according to a given criterion. The goal of segmentation is typically to locate objects of interest and is sometimes considered a computer vision problem. In this project, the original image or input image is segmented into various regions of interest such as palm region, finger region and nail region. The segmentation method is model based segmentation which uses a pre-defined template to detect the region of interest.

The next stage is the edge detection. Edge detection of an image reduces significantly the amount of data and filters out information that may be regarded as less relevant, preserving the important structural properties of an image. The edge detection method used in this project is Canny operator. It is the most commonly used edge detection method simply because it introduced the notion of non-maximum suppression, which means that edges are defined as points where the gradient magnitude assumes a maximum in the gradient direction [4]. This stage is necessary to calculate the shape of palm, shape of fingers and shape of nails.

Feature extraction is an important stage in the development of the coding. At this stage, feature extraction is utilized to process the segmented area of the input image. The input image will be then classified to fall in which class by matching the segmented area with the database throughout this project, the author has developed methods for the system to identify and matches all the features using image processing and concepts and techniques available in MATLAB software. Feature extraction procedure is employed to extract the Region of Interest (ROI) and texture information of the input image. Figure 4.2, Figure 4.3 and Figure 4.4 shows the steps taken in this software.

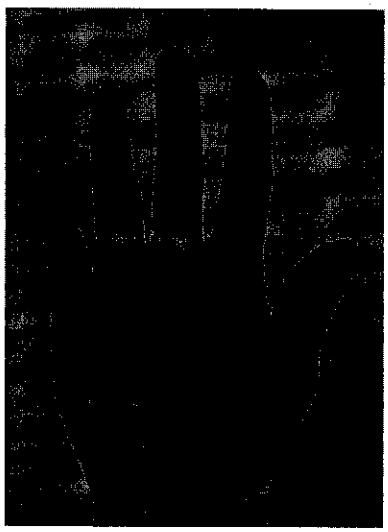


Figure 4.2: Original image

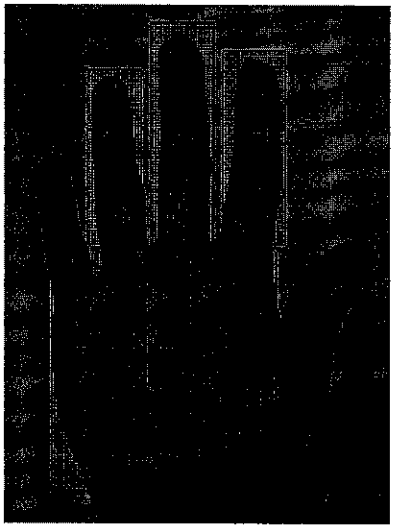


Figure 4.3: Segmented image

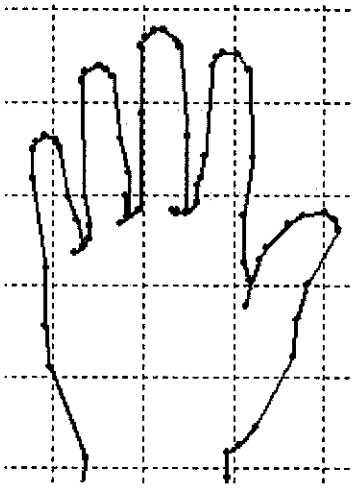


Figure 4.4: Edge detected image

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1 Proposed Palm Analysis System

The first stage of the work involved the acquisition and pre-processing of a dataset using a digital camera. In this project the author is using a measurement method for palm print classification system that identifies the characteristics of the palm's owner.

Palm classification can be considered as palm print recognition in a loose sense and it is done by comparing input image against a database. The palm images must be taken under controlled environment parameters such as constant lighting levels, background and the model must be static. The width and height used for all images must be standard and the system proposed employs a 400 x 300 pixel size format. The system is only able to read jpeg file format images. Therefore, all the images must be in JPG format only. All the images that are used in the software are captured using a standard web cam with a controlled environment. The output will be pop-up in a window, easier for the user to understand and read the result.

5.1.1 Software module: Hand shape recognition

The process flow of hand shape software developed is shown in Figure 5.1.

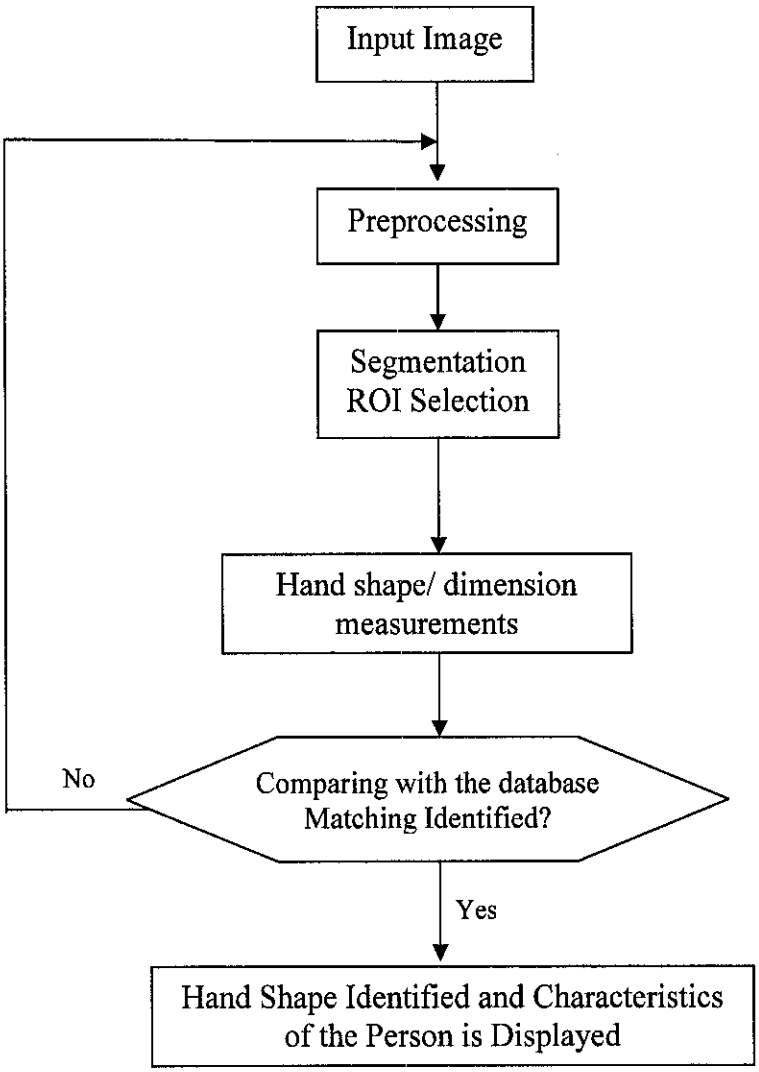


Figure 5.1: Hand Shape Software Module Process Flow

The criterion that is interested to look at is from the aspect of length of the palm, width of the palm and length of the finger. For example, for an Earth Hand, the shape of the palm is square so the width and length of the palm should be almost the same with short fingers, which will be determined by comparing the length of the finger with the length of the palm. All the other shapes are differed by the ratio of the measured characteristics. Hand type and related measurements a re shown in Table 5.1.

Table 5.1: Hand Type and Measurements [13]

Hand Type	**Palm**	**Palm measurements**	**Fingers**	**Fingers measurements**
Earth Hand	square	PW=PL	short	FL<PL
Air Hand	square	PW=PL	long	FL>PL
Fire Hand	oblong	PW<PL	short	FL<PL
Water Hand	oblong	PW<PL	long	FL>PL

Legend: PW= Palm Width
PL= Palm Length
FL= Finger Length

Hand types and related characteristics are shown in Table 5.2.

Table 5.2: Hand Type and Characteristics [13] [1]

Hand Type	**Physical Characteristics**	**Health Characteristics**
Earth Hand	Practical and down to earth attitude.	Prone to physical fatigue, joint problems, skin disorders, bowel and intestinal problems, worry.
Air Hand	Intellectual person with a strong mind.	Prone to mental fatigue, colds, headaches, delicate nervous system, ear, nose and throat complaints
Fire Hand	A person with a lot of enthusiasm and energy.	Prone to physical and mental burn out, backache, cardiovascular problems, accidents and injuries.
Water Hand	Signifies a very emotional, intuitive and sensitive person.	Prone to addiction, low physical resources, rheumatic problems, delicate skin and skin disorders, depression and psychological disorders, allergies, problems with the reproductive system.

Figure 5.1 shows that the software will extract input image and perform the hand shape classification based on comparing the input image with the database, in the terms of changing in angle at intercept point of the boundary lines determined in the coding. Firstly the software needs to acquire an input image from the user. Image acquisition is done through a web camera. The web camera is fixed to a certain position and lighting condition, so that the orientation and lighting condition can be controlled. The acquired image is saved in jpeg format. After that, the image will be preprocessed, such as denoising, brightness and contrast control, and zoom in zoom out.

When the image is read by the system, a series of processing task will be applied to the input image. The software will determine the region of interest (ROI) determined in the coding, which is the area of the palm and the fingers. When the ROI is determined, the algorithm will determine the length hand shape and then comparing and matching the input image with the database, and the output window will be pop-up to classify the input image fall within which class of hand shape in the database. The database contained the hand shape ratio of each of the hand type. The hand shape group in which the data falls will be identified as the hand shape of the input image, and its owner characteristics will be displayed. The coding of this software is given in Appendix II.

5.1.2 Software module: Finger recognition (Digit Ratio)

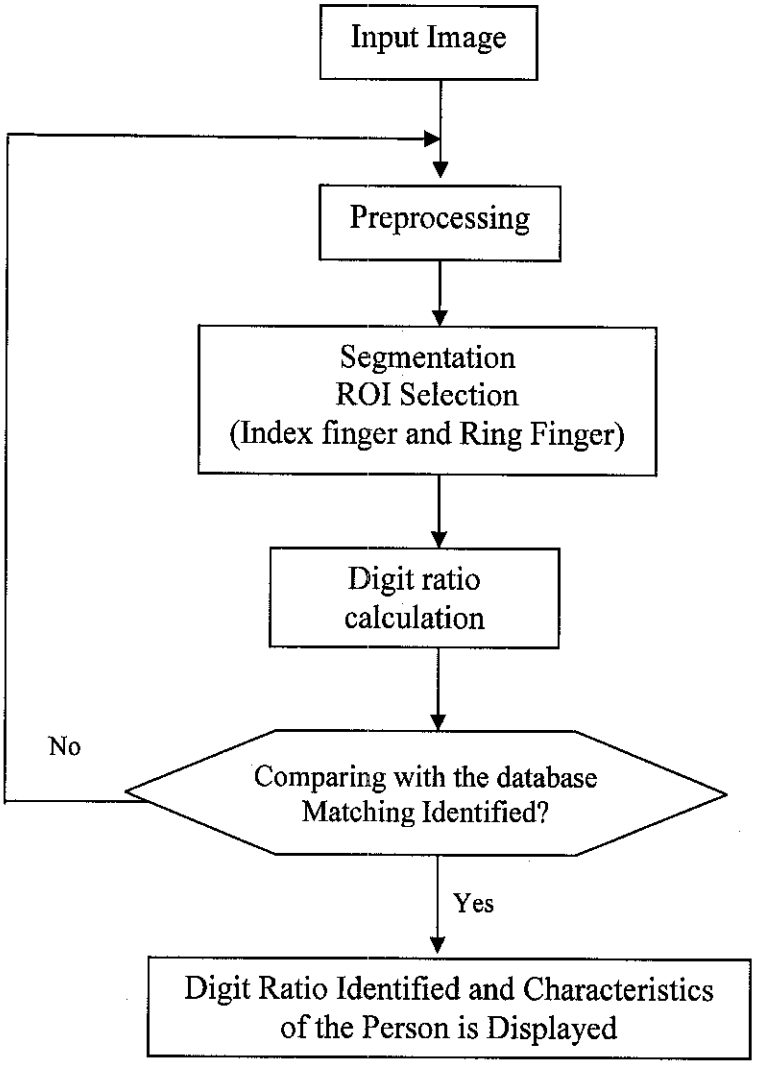


Figure 5.2: Finger Recognition (Digit Ratio) Software Module Process Flow

Figure 5.2 shows the finger recognition software module process flow. Firstly, the input figure is acquired using the web camera, with fixed distance and lighting condition, so that the orientation and lighting can be controlled. After that the image will be preprocessed, such as denoising, brightness and contrast control and zoom in zoom out. Both fingers will be measured and compared to determine the ratio.

For the segmentation stage, the ROI will be the index finger (2D) and the ring finger (4D). Both fingers are extracted from the input image using a predefined

template. After that edge detection will be applied to the ROI to determine the length of each finger. Both fingers are compared in term of length and the ratio is calculated. The difference in ratio will show the amount of estrogen and testosterone exposure during the first trimester of fetal development [11]. Once compared to the database, which contained the data of each digit ratio possibilities, the health and general characteristics will be determined. The characteristics will be different according to the gender of the user. The full coding for this software is given in Appendix III. The criterion of the measuring and displayed characteristics is shown in Table 5.3 and Table 5.4:

Table 5.3: Digit Ratio Measurement [7]

Digit Ratio	**Index Finger(2D)**	**Ring Finger(4D)**	**Calculations**
Low 2D:4D ratio	Short	Long	2D<4D
High 2D:4D ratio	Long	Short	2D≥4D

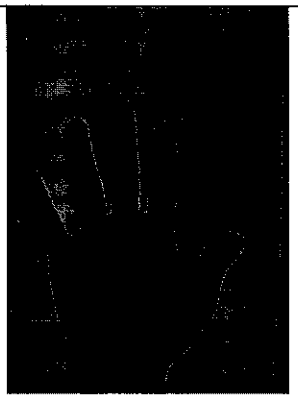
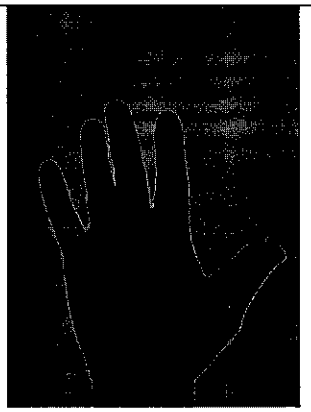
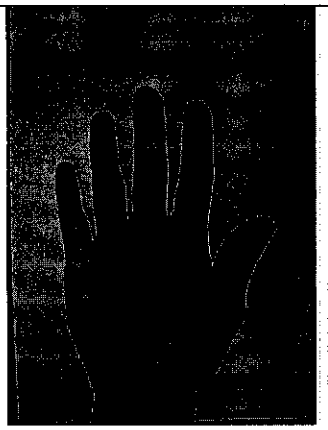
Table 5.4: Digit Ratio Characteristics [7] [10]

Displayed Characteristics	**Low 2D:4D ratio**	**High 2D:4D ratio**
Males	• More fertile • Higher lifetime reproductive success • More aggressive and assertive • Greater proclivity toward homosexuality/bisexuality • Higher musical and sports aptitude	• Higher risk of early heart disease
Females	• Greater proclivity toward homosexuality/bisexuality • More aggressive and assertive	• More fertile • Higher lifetime reproductive success • Higher risk of breast cancer

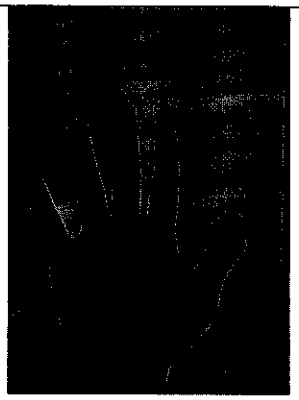
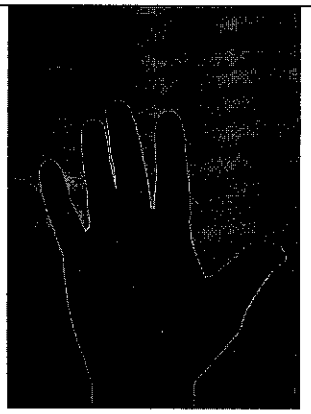
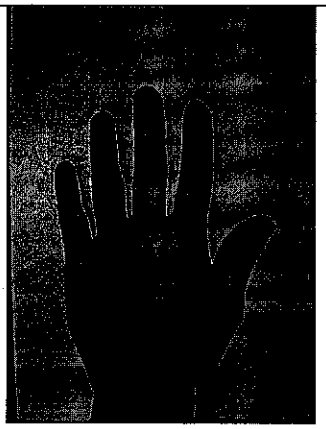
5.2 Testing

All the modules of recognition system have been tested by using palm images taken from 30 individuals. All the images used have a standard size, lighting level and standard frontal poses. The images utilized were of 400 x 300 pixels size on jpeg format. All the images are taken in standard lighting level to avoid inaccuracy and uncertainty. The results of the test from three cases chosen were shown in the next page:

5.2.1 Hand Shape Recognition

Palm Image	Palm's Characteristics	Person's Characteristics
	Finger length: 266 Palm length: 254 Palm width: 218-273 Square palm: PL=PW Long fingers : FL>PL - Air Hand	Intellectual person with a strong mind. Prone to mental fatigue, colds, headaches, delicate nervous system, ear, nose and throat complaints
	Finger length: 239 Palm length: 278 Palm width: 216-270 Oblong palm : PL>PW Short fingers : FL<PL - Fire Hand	A person with a lot of enthusiasm and energy. Prone to physical and mental burn out, backache, cardiovascular problems, accidents and injuries.
	Finger length: 280 Palm length: 278 Palm width: 229-286 Square palm: PL=PW Long fingers : FL>PL - Air Hand	Intellectual person with a strong mind. Prone to mental fatigue, colds, headaches, delicate nervous system, ear, nose and throat complaints

5.2.2 Finger Recognition (Digit Ratio)

Palm Image	Digit Ratio	Person's Characteristics
	Index Finger : 254 Ring Finger : 258 2D<4D - Low 2D:4D Gender : Male	More fertile Higher lifetime reproductive success More aggressive and assertive Greater proclivity toward homosexuality/bisexuality Higher musical and sports aptitude
	Index Finger : 230 Ring Finger : 228 2D>4D - High 2D:4D Gender : Male	Higher risk of early heart disease
	Index Finger : 275 Ring Finger : 270 2D>4D - High 2D:4D Gender : Male	Higher risk of early heart disease

5.3 Limitations

Currently, the proposed palmistry recognition system still has a number of limitations that has to overcome. Limitations of the system are as below:

i. The system is able to recognize images of palm from a fix orientation only. The inability of the system to recognize other orientation of palm is due to the fact that the author has yet to develop the algorithms perform such operation.

ii. System is unable to handle variable parameters of the camera and the surrounding environment. Currently, the test images must be taken under very similar lighting conditions and similar background with no extra details.

CHAPTER 6

CONCLUSIONS

This program is created based on information gained and studied through numerous of books written about palmistry. However, there are a few uncertainties encountered due to the origin of the palmistry studies. Therefore the accuracy of the interpretation of lines and shape might differ from an author to another. Thus more studies need to be conducted to enhance our interpretation of palmistry.

The analysis can be further enhanced on different palm lines to increase the accuracy of the measurements, diagnosis of health conditions and prediction of personal characteristics. It is also suggested that the database can be further enhanced with including large number of palm details.

The image processing technique used in developing this software can be said as the most up-to-date technique. However, there are certain areas that can be improved such as including an object tracking technique, to detect the user palm rather than fixing the position of the palm. This software can be considered as a step forward in modern hand analysis.

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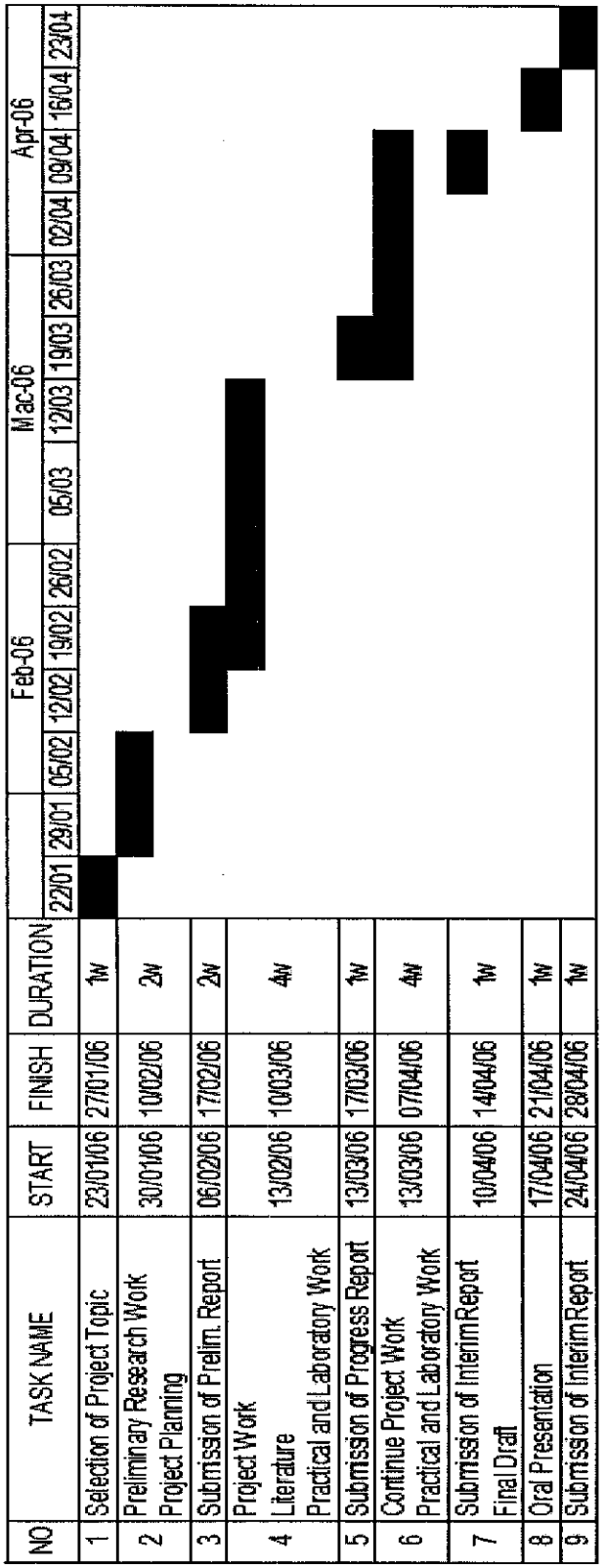
APENDICES

Appendix I : Gantt chart for FYP I and FYP II

Appendix II : Full MATLAB Code Hand Shape Recognition

Appendix III : Full MATLAB Code for Finger Recognition (Digit Ratio)

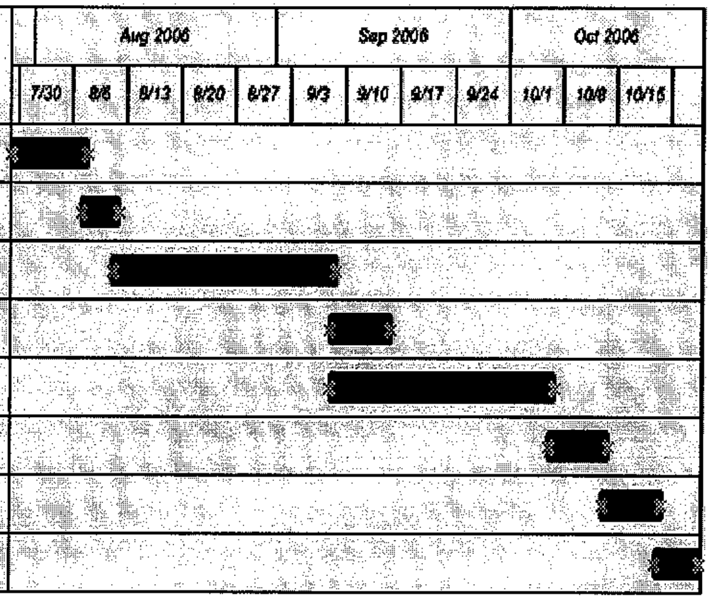
APPENDIX I



NO	TASK NAME	START	FINISH	DURATION
1	Selection of Project Topic	23/01/06	27/01/06	1w
2	Preliminary Research Work Project Planning	30/01/06	10/02/06	2w
3	Submission of Prelim. Report	06/02/06	17/02/06	2w
4	Project Work Literature Practical and Laboratory Work	13/02/06	10/03/06	4w
5	Submission of Progress Report	13/03/06	17/03/06	1w
6	Continue Project Work Practical and Laboratory Work	13/03/06	07/04/06	4w
7	Submission of InterimReport Final Draft	10/04/06	14/04/06	1w
8	Oral Presentation	17/04/06	21/04/06	1w
9	Submission of InterimReport	24/04/06	28/04/06	1w

FYP I Gantt Chart

ID	Task Name	Start	Finish	Duration
1	Project Work Continue	7/28/2006	8/7/2006	7d
2	Submission of Progress Report 1	8/7/2006	8/11/2006	5d
3	Project Work Continue	8/11/2006	9/8/2006	21d
4	Submission of Progress Report 2	9/8/2006	9/15/2006	6d
5	Project Work Continue	9/8/2006	10/6/2006	21d
6	Submission of Dissertation Final Draft	10/6/2006	10/13/2006	6d
7	Oral Presentation	10/13/2006	10/20/2006	6d
8	Submission of Project Dissertation	10/20/2006	10/27/2006	6d



FYP II Gantt Chart

APPENDIX II

```
a=vcapg;
figure(1);imshow(a);text(150,300,'input image');
imwrite(a,'image.jpg');
clear all;
im = imread('image.jpg');
work = rgb2gray(im);
figure(2),imshow(work);
edgeim = edge(work,'canny', [0.1 0.2], 1);
start_row = 25;
start_col = 150;
cropRGB1 = edgeim(start_row:400, start_col:425, :);
figure(3),imshow(cropRGB1);
start_row = 25;
start_col = 250;
cropRGB = edgeim(start_row:400, start_col:450, :);

[y,x]=size(cropRGB);
for y3=1:1:y
    for x3=1:1:x
        if cropRGB(y3,x3)==1
            break
        end
    end
    if cropRGB(y3,x3)==1
        break
    end;
end;
fprintf('\n y3= %d',y3)
for y4=y:-1:1
    for x4=x:-1:1
        if cropRGB(y4,x4)==1
            break
        end
    end
    if cropRGB(y4,x4)==1
        break
    end;
end;
fprintf('\n y4= %d',y4)
```

```
start_row = 250;
start_col = 250;
cropRGB2 = edgeim(start_row:251, start_col:400, :);
[y5,x5]=size(cropRGB2);
for x1=1:1:x5
    for y1=1:1:y5
        if cropRGB2(y1,x1)==1
            break
        end
    end
    if cropRGB2(y1,x1)==1
        break
    end;
end;
fprintf('\n x1= %d',x1)
for x2=x5:-1:1
    for y2=y5:-1:1
        if cropRGB2(y2,x2)==1
            break
        end
    end
    if cropRGB2(y2,x2)==1
        break
    end;
end;
fprintf('\n x2= %d',x2)
start_row = 25;
start_col = 325;
cropRGB3 = edgeim(start_row:225, start_col:375, :);

[y6,x6]=size(cropRGB3);
for b2=1:1:y6
    for a2=1:1:x6
        if cropRGB3(b2,a2)==1
            break
        end
    end
    if cropRGB3(b2,a2)==1
        break
    end;
end;
fprintf('\n b2= %d',b2)
for b1=y6:-1:1
```

```
    for a1=x6:-1:1
        if cropRGB3(b1,a1)==1
            break
        end
    end
    if cropRGB3(b1,a1)==1
        break
    end;
end;
fprintf('\n b1= %d',b1)

c=x2-x1;
f=0.25*c+c;
g=b1-b2;
h=y4-y3;
d=h-g;


fprintf('\n finger length %d',g)
fprintf('\n palm length %d',d)
fprintf('\n palm width %d',c)


if ((d==c||d>c&&d<f)&&(g<d))
msgbox('You have Earth Hand shape. Prone to physical fatigue, joint
problems, skin disorders, bowel and intestinal problems,
worry.Practical and down to earth attitude. ',...
'RESULTS');
else if ((d==c||d>c&&d<f)&&(g>d))
msgbox('You have Air Hand shape.Prone to mental fatigue, colds,
headaches, delicate nervous system, ear, nose and throat
complaints.Intellectual person with a strong mind.',....
'RESULTS');
else if ((d>c)&&(g<d))
msgbox('You have Fire Hand shape.Prone to physical and mental burn out,
backache, cardiovascular problems, accidents and injuries.A person
with a lot of enthusiasm and energy.',...
'RESULTS');
else ((d>c)&&(g>d))
msgbox('You have Water Hand shape.Prone to addiction, low physical
resources, rheumatic problems, delicate skin and skin disorders,
depression and psychological disorders, allergies, problems with the
```

```
reproductive system.Signifies a very emotional, intuitive and
sensitive person.',...
'RESULTS');
end
end
end
```

APPENDIX III

```
b=vcapg;
figure(1);imshow(b);text(250,350,'input image');
imwrite(b,'imageout.jpg');
clear all;
im = imread('imageout.jpg');
work = rgb2gray(im);
figure(2),imshow(work);
edgeim = edge(work,'canny', [0.1 0.2], 1);

start_row = 1;
start_col = 375;
cropRGB1 = edgeim(start_row:400, start_col:425, :);

[y1,x1]=size(cropRGB1);
for y2=1:1:y1
    for x2=1:1:x1
        if cropRGB1(y2,x2)==1
            break
        end
    end
    if cropRGB1(y2,x2)==1
        break
    end;
end;
fprintf('\2D height is %d',y2)


start_row = 1;
start_col = 200;
cropRGB2 = edgeim(start_row:400, start_col:280, :);

[y3,x3]=size(cropRGB2);
for y4=1:1:y3
    for x4=1:1:x3
        if cropRGB2(y4,x4)==1
            break
        end
    end
    if cropRGB2(y4,x4)==1
        break
```

```
    end;
end;
fprintf('\4D height is %d',y4)

if (y2<y4)
msgbox('You have low 2D:4D ratio. For male, you have, higher musical
and sports aptitude, higher lifetime reproductive success, and more
fertile.  For  female,  you  have  greater  proclivity  toward
homosexuality/bisexuality and more aggressive and assertive.',...
'RESULTS');
else if (y2==y4||y2>y4)
msgbox('You have high 2D:4D ratio. For male,you have higher risk of
early heart disease. For female, you have higher lifetime reproductive
success, more fertile and higher risk of breast cancer.',....
'RESULTS');

    end
end
```