# MOBILE SIGN TO VOICE (MS2V)

**By**

**Muhamad Firdaus Bin Hassan**

**8357**

Dissertation submitted in partial fulfilment of
the requirement for the
Bachelor of Technology (Hons)
Information & Communication
Technology

**JANUARY 2008**

**Unversiti Teknologi Petronas**

**Bandar Seri Iskandar**

**31750 Tronoh**

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# CERTIFICATION OF APPROVAL

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**Approved by:**

_____

**(Mr. Low Tan Jung)**

**Unversiti Teknologi Petronas**

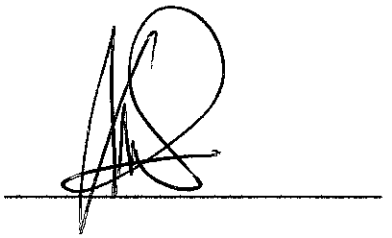
**Bandar Seri Iskandar**

**31750 Tronoh**

**Perak Darul Ridzuan**

## CERTIFICATE 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.



Student Name : **MUHAMAD FIRDAUS BIN HASSAN**

Student ID : **8357**

Date : **11th April, 2008**

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Thank You,

**Muhamad Firdaus Bin Hassan**
**8357**
**INFORMATION & COMMUNICATION**
**TECHNOLOGY**
**09th April 2008**

# -ABSTRACT-

## 'Mobile Sign To Voice'

**MUHAMAD FIRDAUS BIN HASSAN**
Unversiti Teknologi PETRONAS
Bandar Seri Iskandar, 31750 Tronoh
Perak Darul Ridzuan
epi312@gmail.com

This documentation is a feature of design system for a special people where they have problem with hearing or speech problems and thus need to use sign language for communication. It is the best way to whom that want to learn in the short period because as we all realized, nowadays everybody have it own mobile phone with the Bluetooth capability and this will make the process become easier in distributing the product and introduce the product to the community. The product a Mobile Sign-to-Voice (MS2V) designed to help normal people to communicate with deaf or mute people in the short duration and more effectively. Within this report, it should able to answer some of the questions the might in the mind about this system:-

- Is this system able to help people learn the sign language effectively?
- Is this system able to special people easier to socialize with other people?
- Is this system able to reduce the cost to learn sign language for everyone?

In this report and within this system shall answer the questions with the affirmation and the stated of the objective of this system for example help the normal people to communicate with special people using mobile and it also could be cost saving fir those who wants to learn sign-language. The scope of this project is giving away the ideas in utilizing the mobility product and enhancement to help special people that need the technology to help them to socialize with other peoples and suggest the enhancement for the future use.

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## LIST OF ABBREVIATION

| | |
|---|---|
| mS2V | Mobile Sign to Voice |
| J2ME | Java Micro Edition |
| PDA | Personal Data Assistant |
| PC | Personal Computer |

## -EXECUTIVE SUMMARY-

This preliminary report consist several chapter that will explain the overall ideas on the Mobile Sign to Voice (MS2V). Therefore, this system will help to translate the sign that being shown into voice using the hand phone, by using hand phone as a medium to execute this program and using its camera to capture the image and process this image, lastly translate this image into the voice in the database.

In chapter 1, will be discuss about the introduction and describe about the background of the product being in this project. Beside that, in this chapter also there is a statement that will explain on the problem statement that brought the project on the line. In addition, in this chapter also will be discussing about the objective and also the scope of studies about this project. It will help to understanding the fundamental of the project.

In chapter 2, there is literature review on the study for the project, the reference that been made in order to make this project success in the development. This review also helps to guide and make a reference in certain area that not being covered in the education fields.

In chapter 3, methodology and the project work will be discussing about the model that being used in the project development and to know the relationship between model that being choose and the progress of the project, so this will help to guide the progress while doing the project instead of referring to the timeline because this will show the detail of the work and relate to the progress.

In Chapter 4, is result and discussion that will be projected the findings within this project which it will determine whether the project successfully done or not successfully and can be used as theory only. The results that being discuss in this project will be determine when the prototype or the application can be used. In the

discussion part, there a part where the result being analyze and recommendation for future development can be made.

In chapter 5, in this chapter where the conclusion for overall project being discuss and to summarize the project based on objective that being stated in the first chapter. So this will see the overview of the project and how it going to be implemented and what the future improvement that can be made based on the conclusion on the overall project overview.

# -CHAPTER 1-
# INTRODUCTION

## 1.1 Background

This Mobile Sign to Voice System (mS2V) is enhancement from previous final year project. The previous project implemented it on the PC using the MatLab tools as a to detect the sign and try to recognize the sign and translate it into voice that match with the image sample in the database that stored.

This project will be implemented in the mobile phone or Personal Data Assistant (PDA). For this project, the device that will be used in this project is "Nokia 6680", so the idea of this application will do the same functions and very different from implementation aspect such as coding device being used with the previous project. In the previous application using the MATLAB, where in the MATLAB there is a built in image processing tool whereas in this project the image processing is created by own perspective by using object oriented approached in J2ME. In this Mobile Sign to Voice (mS2V) project is using the J2ME (Java 2 micro edition) as image processing and image recognition process and using mobile phone as medium to implement this application.

Mobile Sign to Voice (mS2V) developed to help people to learn the sign language. Even though we all know that, the sign language is a combination variety of sign and produces the meaning. This project will try to utilize the function of the mobile phone, which have low power consumption processor and try to make image processing from the captured image and match the images with recognition process.

The feature of this project is to expose the capability of the recognition techniques and to see whether it can cope with the low power-processing unit and can generate the result that needed. This project can be as stepping-stone to other projects

that using the mobile or small device especially from recognition systems and image processing aspect and give some important ideas to implement the recognition process.

## 1.2 Problem Statement

### 1.2.1 Portability problem

This problem arise because of previous system are made in the PC, so to carry to the other place is quite difficult, to encounter this problem is using the smaller device, portable and easy to use. By looking to these criteria, the potential of mobile phone and other mobile device is a solving factor. If we can see, the mobile phone is an embedded system that can carries many task at one time, so it can easily to solve the portable problem. In addition, nowadays a lot of mobile phone with multi function and have great camera resolution. So this will make this application is much easier to implement compare to the past mobile phone is quite big and the function are limited.

### 1.2.2 Sign language.

By using this mobile, it easily assist able to understand the sign language that being shown and can be understand for those that learn the sign language, but we all know that the sign language consist of several sign and make the meaning. Therefore, the combination of sign language is not applicable in this application. This application is just to determine whether the concept can be applied or not.

### 1.2.3 Communication

Within this mobile sign to voice, it is to allow normal people to communicate with hearing handicapped person practically anywhere and anytime more effectively. by using this method able to reduce discriminations with those handicapped person.

## 1.3 Objectives and Scope of Study

The objective of this project is to help the normal person to understand the sign that shown by the handicap person. By help of this application can easily solve the problem because it translates the sign and make the output in a voice form. Beside that, the fundamental of this project is to see whether the application efficient to use or not, because in this project use true sign language but not combination sign. In this project the simple sign are used to be act as sample.

Instead of the main objective to help the handicap person it also can be used to see whether this features of recognition can be applied and use in the mobile phone. The recognition process is consist of many element such as Artificial Intelligent, Neural network learning, Java 2 Micro Edition and Image Processing Technique. By doing this study, it will help on the development of the project.

### 1.3.1 Scope of study

The application that will be developed will be concentrate on several areas:-

**a) Artificial Intelligent**

This area will recognize the image and try to compare with the database and produce the output in a voice form. Artificial intelligent is the terms to explain on how the system learns generate the result.

**b) Neural network learning**

A neural network-learning algorithm called Backpropagation is among the most effective approaches to machine learning when the data includes complex sensory input such as images. So this approach is used to detect the image and process the image.

**c) Java 2 Micro Edition**

In this Java 2 Micro Edition is the main engine to run the program that needed to be develop, for example for this Mobile sign to voice application, it need to be develop in the J2ME environment because it's supported the criteria that need to be used in this project. In addition, this programming language is frequently use by mobile because it being design to support the small embedded system such as mobile phone.

**d) Image Processing Technique.**

The Image processing technique that being applied in this project is the images indexing technique. In this technique, what the important element that needed to be know is how to differentiate the pixel in the images every pixel in the image have it's own value in the pixel so the by differentiate the value between the pixels, it will able to determine the shape and compare it in the database system and generate the result.

# -CHAPTER 2-

# LITERATURE REVIEW AND/OR THEORY

## 2.1 J2ME (Java 2 Micro Edition)

Java-enabled devices are rapidly evolving into full-fledged multimedia platforms. Features once available on separate devices such as cameras, radios, and audio processing are now being combined. Currently the developer must program too many different operating systems and APIs to take advantage of these advanced multimedia features—but that is about to change.

The midlet or the programming for the hand phone created by J2ME this is because the midlet does not support to be created in the ordinary java programming so J2ME being used instead of others supported programming system for mobile application such as Symbian application using C++, because Java is lighter in term of processing compare to others programming language. It also created installer *.JAR with small size, and suitable for limited storage in mobile.

In J2ME, there are many features in this programming language especially programming for small device such as mobile phone and others gadget. If this programming language can be explored, it able to make economic value and can be used as own application.

### Related Work with J2ME

In the general, J2ME in this programming is act as compiler and coding the program. In these programming language it help to determine and debugging process in the mobile Sign to Voice (mS2V). This process is including coding, compile, debug, and run the program. Beside that, in this program also provide the simulation to view the result after the coding process and if there is the problem or the view id not same as expected, it can be change and build and compile it.

Beside J2ME, there is other one programming language which use the C++ as programming language called as Symbian programming also dedicated for mobile devices programming. J2ME used JAVA language as a medium programming language, both of this programming language is based on the object oriented programming language which the floe of this program easier because every object place in its own class and just invoke the class and used it.

This the examples of mobile Sign to Voice (mS2V) interface running in the Sun Java (TM) Wireless Toolkit 2.5.2 for CLDC. This toolkit consist building and running the application, like the other programming but the limitation of this program it does not contain the a space to build or editing the coding. For mobile Sign to Voice application are used 2 compiler, which the other one is NetBeans IDE 6.0 for mobile application. This NetBeans IDE will done the coding part and save it as *.java and compile it because of some limitation of this NetBeans such as heavily used in RAM or memory in the computer so the decided result will be compiled with wireless toolkit compiler. Both of this compiler is freeware and can be download from it respective websites.

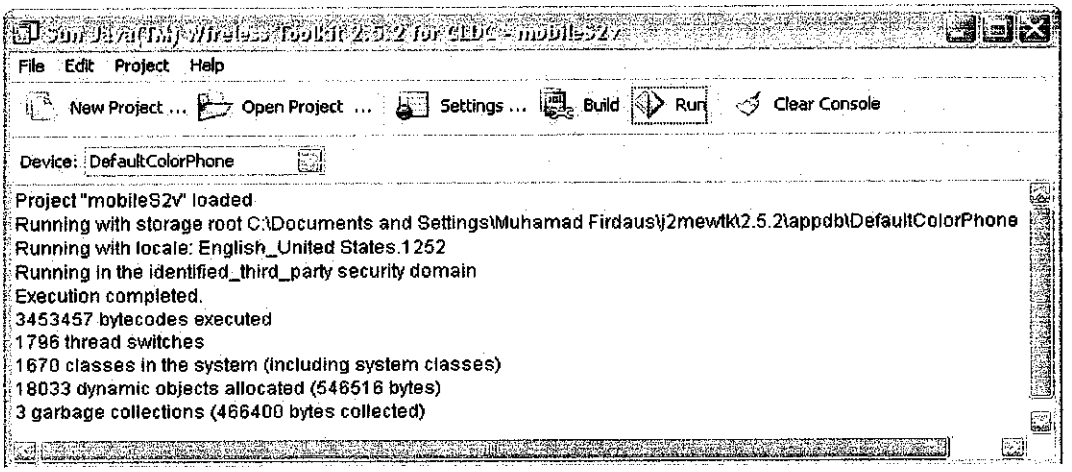



**Figure 2.1: Sun JAVA Wireless Toolkit**

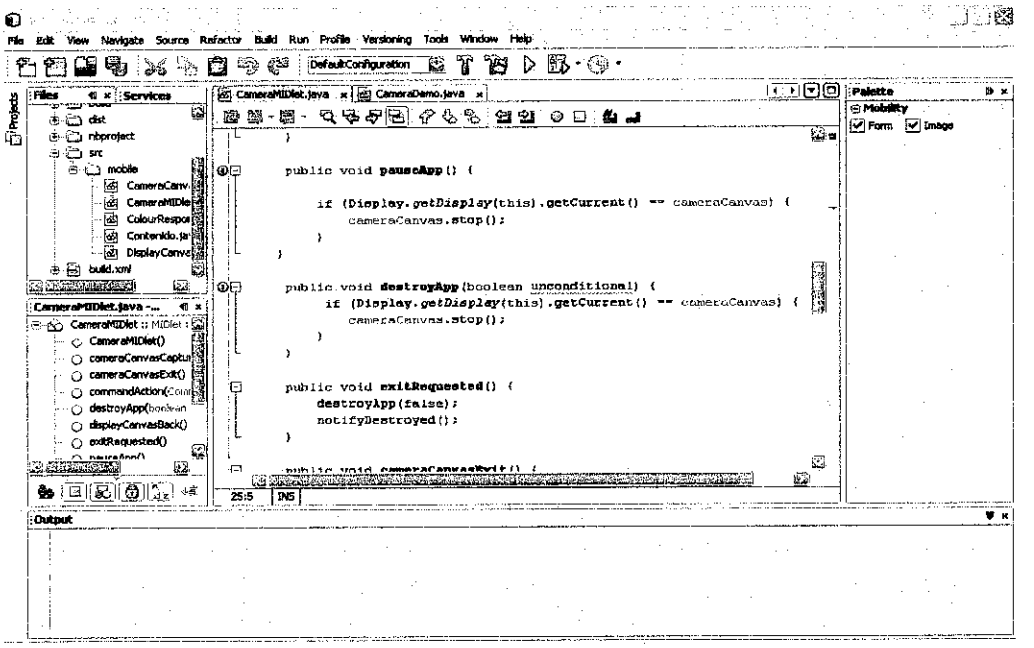



**Figure 2.2: NetBeans IDE 6.0 for mobile application.**

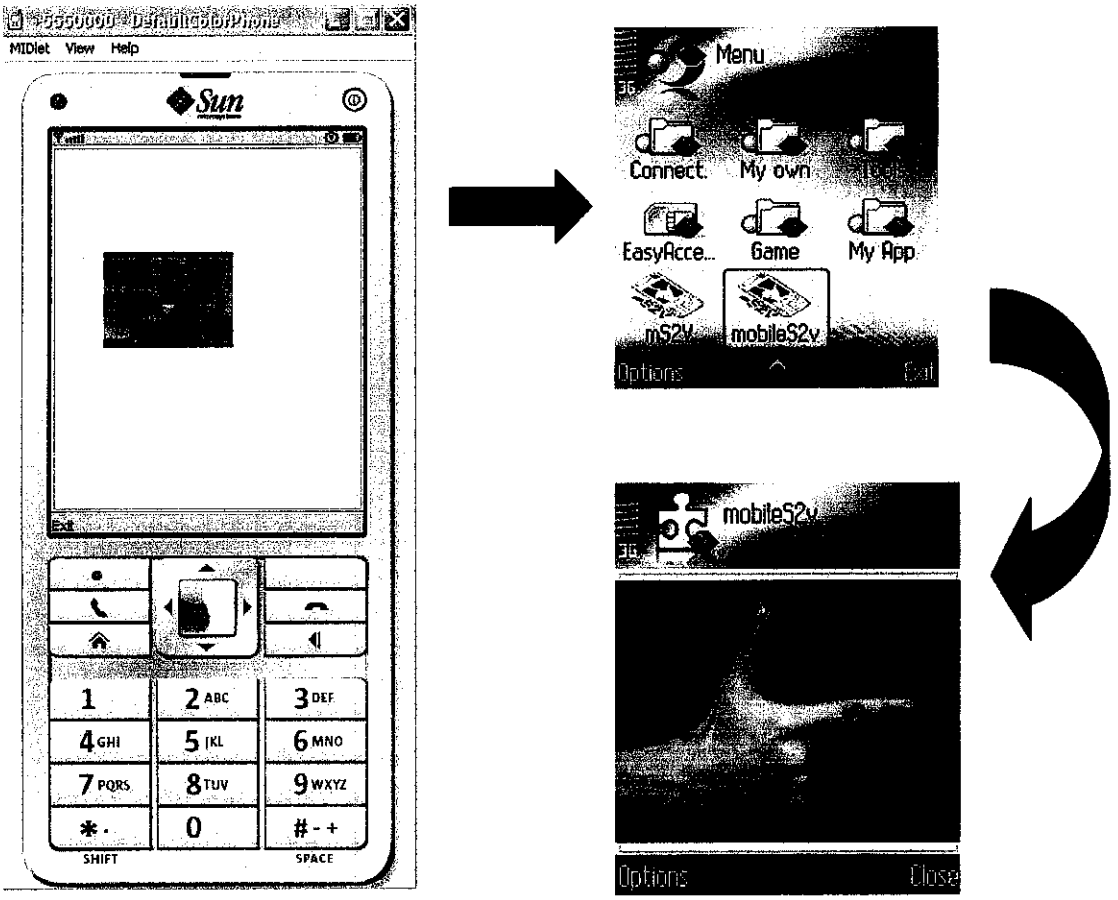



**Figure 2.3 : From simulator to real interface in mobile.**

## 2.2 Pattern/Sign Recognition

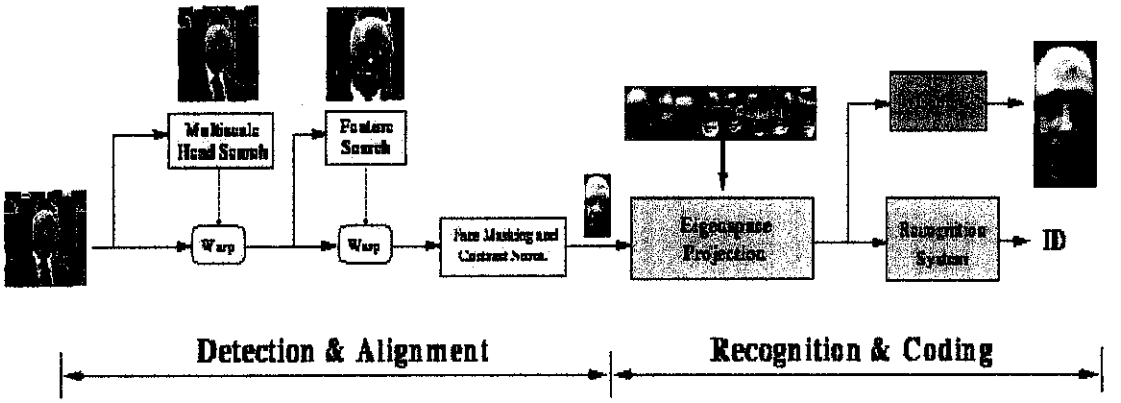



**Figure 2.4 : Recognition process**

The diagram above is face recognition process that have been taken as a literature review for face recognition. The system diagram above shows a fully automatic system for detection, recognition and model-based coding of faces for potential applications such as video telephony, database image compression, and automatic face recognition. The system consists of a two-stage object detection and alignment stage, a contrast normalization stage, and a Karhunen-Loeve (*eigenspace*) based feature extraction stage whose output is used for both recognition and coding. This leads to a compact representation of the face that can be used for both recognitions as well as image compression [14].

The process of face detection and alignment consists of two-stage object detection and alignment stage, a contrast normalization stage, and a feature extraction stage whose output is used for both recognition and coding. Pictures below illustrate the operation of the detection and alignment stage on a natural test image containing a human face.

**Phase 1: Detection and Alignment**

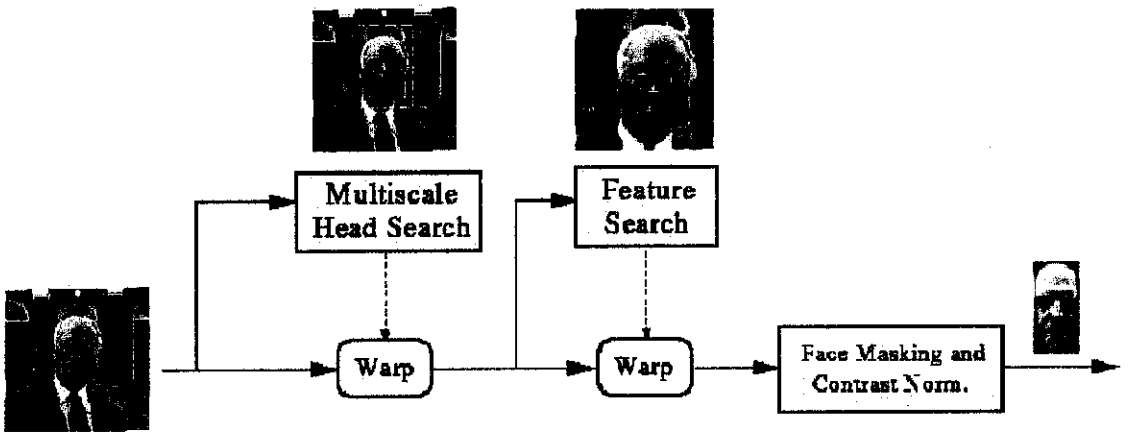



**Figure 2.5 : Detection and Alignment**

The first step in this process is illustrated in "Estimated Head Position and Scale" where the ML estimate of the position and scale of the face are indicated by the cross-hairs and bounding box. Once these regions have been identified, the estimated scale and position are used to normalize for translation and scale, yielding a standard ``head-in-the-box" format image. A second feature detection stage operates at this fixed scale to estimate the position of 4 facial features: the left and right eyes, the tip of the nose and the center of the mouth. Once the facial features have been detected, the face image is warped to align the geometry and shape of the face with that of a canonical model. Then the facial region is extracted (by applying a fixed mask) and subsequently normalized for contrast. [14]

**Phase 2: Recognition and Coding**

**Figure 2.6 : Eigenfaces**

Once the image is suitably normalized with respect to individual geometry and contrast, it is projected onto a set of normalized eigenfaces. The figure above shows the first few eigenfaces obtained from a KL (Karhunen-Loeve) expansion on an ensemble of 500 normalized faces. The projection coefficients are used to index through a database to perform identity verification and recognition using a nearest-neighbor search.

### 2.3 Neural Network

A neural network learning algorithm called Backpropagation is among the most effective approaches to machine learning when the data includes complex sensory input such as images.

Neural network is used to create the face database and recognize the face and build a separate network for each person. The input face is projected onto the eigenface space first and gets a new descriptor. The new descriptor is used as network input and applied to each person's network. The one with maximum output is selected and reported as the host if it passes predefined recognition threshold.

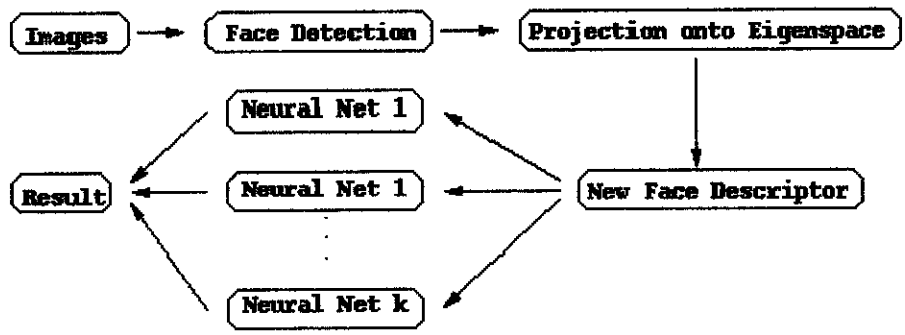



**Figure 2.7 : Neural network**

The face detection codes search the face by exhaustively scanning the image at all possible scales. Kah-Kay Sun started the face pattern size from 20x20 pixels and increased it by a scalar (0.1). In this situation, the application search a specific portion of the image (usually from 40% to 80% ) for the face. It will help to speed the face

detection procedure. If the actual face size is big, linear increase of the face pattern size will lead to coarse face location. So it increases the face pattern size arithmetically by 4 pixels at each step to locate the face more accurately [14].

For each window pattern, a series of 3 templates is applied sequentially to determine whether the input image is a face. If the output of any test fails to pass the predefined threshold (usually 0.5), it is rejected immediately. A face is reported only after the window pattern passes all the tests and the minimum of the 3 test results will be selected as the final output. In our environment, we can assume that there is no more than one face in the image. We set the threshold dynamically by replacing it with the maximum output up to the searching point. This greatly reduces the time cost on searching by avoiding unnecessary template tests.

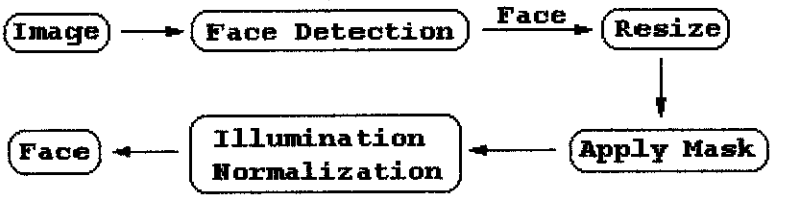



**Figure 2.8 : Masking process**

If the image contains more than one person, we have to set a predefined threshold for face finding. For each face inside the image, most of the times the code will find multiple face templates for it with small location shift and size change. Finally all the face templates are packed to give only one face for each person in the image [14].

In the tests, most of the time the face detection code can find the face. It gives higher outputs on upright face images than those from images with orientation change. But the objective of the face detection code is to find faces inside images. Its aim is not to cut faces from images for recognition purpose. We have found that sometimes the face templates located by the code are smaller than their actual size or not central to the actual faces.

# -CHAPTER 3-

# METHODOLOGY/PROJECT PROGRESS

## 3.1 Methodology Point of View

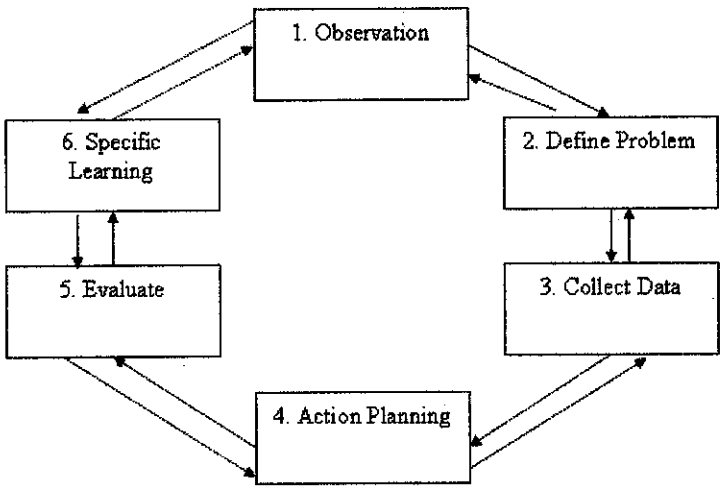



**Figure 3.1 : Methodology diagram**

The methodology of this project uses the circulation approach and can be turn either clockwise or anti-clockwise until it finished all the phases in this project. By using this methodology, it can be more specific for collecting the details needed and if the error occurs in the middle of the implementation, it can be turn back to the previous state. After correction was done, it can proceed to the next stage of implementation.

- **Observation**

  In the observation process, the process of determination of the problem statement, and the research will conduct to overview the problem and how it will effects the community if this application being implement. In this stage, the statement such as "What?", "Why?", "Where?", and "How?" Therefore, in the next stage the statement previously used able to define the problem occurs.

- **Define Problem**

  In this phase, after observing the problem the statement that previously used such as "what", "when" ,"why", "how" will help to determine the and define the problem more accurate. The question such as "what is the objective of this project?" will guide the developer to narrow down their objective and try to achieve the objective.

- **Collect Data**

  In this phase, collect the data is the important phase where this will determined what kind of data that need to be collect and at this stage the developer able to see the solution to the current problem. For example in this project, the data that can be collect such the drawback or limitation of previous project, which this project is developed to enhance the system created in the computer into small device such as mobile phone.

- **Action Planning**

  In this phase, action planning is to implement the application such as making the plan on this project needs to counter the problem faced and determined what kind of the programming language suitable for the mobile device, and validate the problem that will rise if the programming language not supported by the mobile phone currently used.

- **Evaluate**

  The evaluating process is to see whether the system is useful or not. In this phase also, the evaluation process is to determine the successful of the application either it can solve the problem or not. if in the evaluate phase found the system does not help much on solving the problem, maybe it will revised the previous stage and made some modification and make sure it fit and follow the objective of the project.

- **Specific Learning**

  This specific learning is the last phase to see either the system manage to help and archive the main objective and if the application able to cope with the objective the future recommendation will consider to be implement in the current application..

### 3.2 System Overview

In this project, it consists several process that need to be consider when running the application. All the phases in this project show how the application process and gives the overview on how does this project works. In addition, this project is running under the J2ME environment that it runs in the computer so maybe because of the computer have bigger processing power that can support the entire operation of the application different from when we run it from mobile phone itself the processing might be different.

**Development process**

| | Requirement | Specification |
|---|---|---|
| 1 | Wireless toolkit 2.5.2 for CLDC | To run the program on the MIDP midlet. |
| 2 | Netbeans IDE for mobile | To write the code on j2me |

**Testing Purpose**

| | Requirement | Specification |
|---|---|---|
| 1. | Nokia S60 Series 6680 | To test the working application |
| 2 | Java MIDP 2.0 | To runs specification application. |

Instead of methodology that being followed, the project divided in to 3 segments, which is first stage, second stage and third stage. In every stages it has own task to be done, such as plan, progress and development.

In the this project, there are several processes included in this process such as planning, search the research paper, understanding the concept of this project and get the requirement of the product. So the study in this plan stage is very crucial because in

this stage if the requirements are wrongly picked it might cause a problem while the development still in progress.

In the second stage is the development segment which to develop the application and figure out the algorithm to make sure the application is working. In this second stage, also the tough part is the artificial intelligent part that needs to be use to detect the picture and do the converting image into black and white then it will extract and normalize the image, and recognition process.

In the third stage is the testing and final consideration, in this stage there are several aspect considered to make the testing and evaluation success in the final before application deliver to the assessor. The aspect that going to be considered is on how representative set of snapshots and evaluate the correctness of the image this will be determined by weight and the binary score.

### 3.3 Mobile Phone Specification

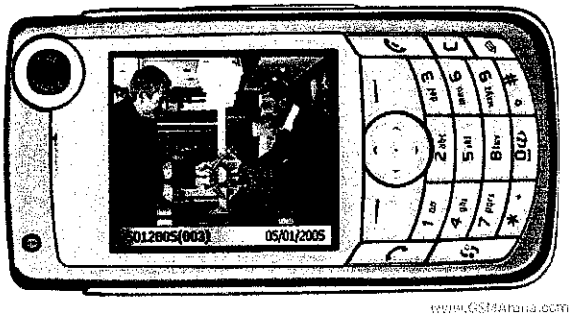


**Figure 3.2: Mobile Phone**

| | | |
|---|---|---|
| Display | Type | TFT, 256K colours |
| | Size | 176 x 208 pixels, 35 x 41 mm |
| | | - 5-way navy key |
| Memory | Card slot | RS-DV-MMC, 64 MB card included, Hot swap, |
| | | - 10 MB shared memory for storage |
| Data | GPRS | Class 10 (4+1/3+2 slots), 32 - 48 kbps |
| | EDGE | Yes |
| | Bluetooth | Yes, v1.2 |
| | USB | Yes, Pop-Port |
| Features | OS | Symbian OS 8.0a , Series 60 UI |
| | Camera | 1.3 MP, 1280x960 pixels, video (QCIF), flash; secondary video call VGA camera<br>- Push to talk<br>- Java MIDP 2.0<br>- MP3/AAC/MPEG4 player<br>- Voice command/memo |

### 3.4 System Architecture

This mobile sign to voice (MS2V) system architecture shown in the figure below it has one way of flow direction and the output will be voice.

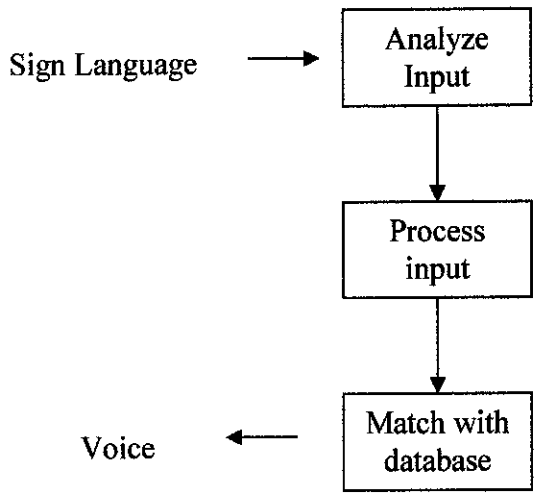



**Figure 3.3: System general process flow**

These flow shown that the system will capture the image as an input from the sign. This image then will be process, as the image being recognized it will generate the result and search for the sound that match and produced it. In the flow below is the step that involved in the system, which from it starts until it finish the process. This flow divided into 3 segments, which is:

1. Initials segment;
2. Process segment;
3. Result segment.

This initial segment includes the initial process, where the application will execute camera view canvas and allow the user view the video form in the screen. From this view video form canvas, user able views the target the object using camera that needed to capture. In the process segment, is the most important part where the recognition and the matching process with the images in the database will occur. In this part, the captured image will be converted into byte code, and byte code will be saved

into buffer. The matching process will compare the byte code with the sample images in the database, and then it will produce the result. In the last segment is the result segment, where the result from the process segment will produce. The result that will be produce is in the form of voice in the *.WAV format and the user can able to listen to the voice and understand what meaning of the sign is.

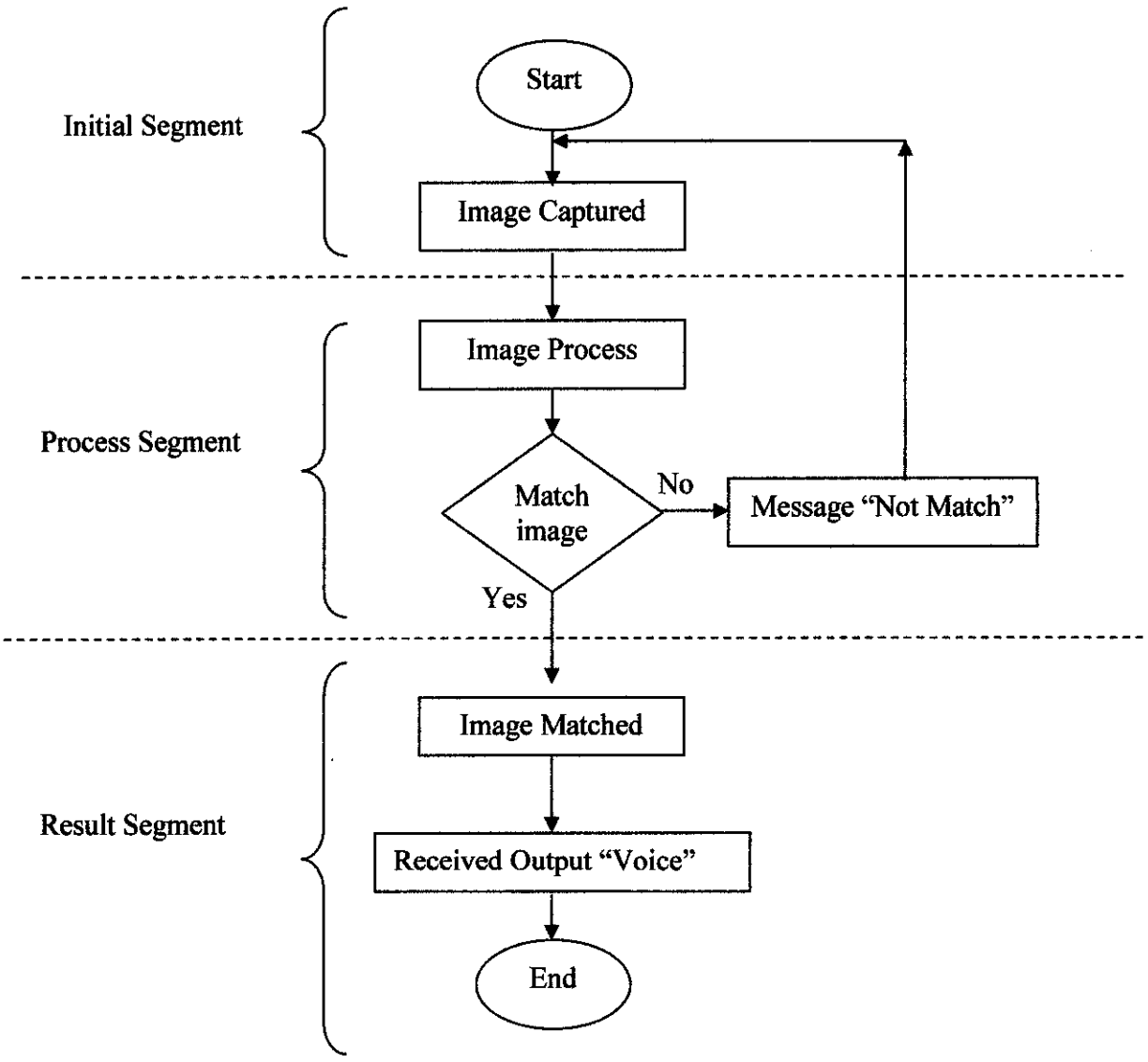



**Figure 3.4: System flow process**

### 3.4.1 Initial Segment

**Camera Overview**

This segment is the important element in this application, because this will determine whether the recognition process can be successful or not, because in this cases every pixel have it own value. Therefore, this value will be converted into binary value and both of the value in the database will be compared and if it matches with one of the images so it will produce the result in the voice form. Below is the example of the images taken it have it own resolution which the default resolution is 640 x 480 pixels but in this application it downsized the resolution to 100 x 75 pixel.

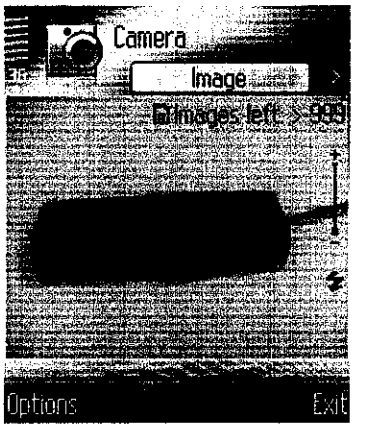



**Figure 3.5: Default image resolution 640 X 480 pixels**

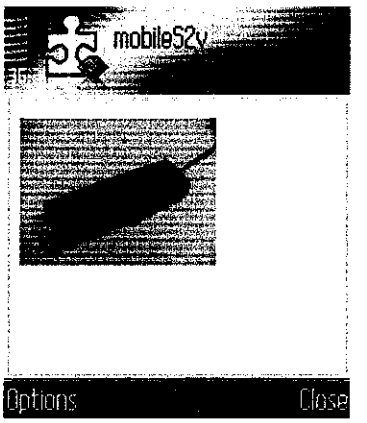



**Figure 3.6: Image resolution 100 X 75 pixels**

### 3.4.2 Process Segment

**Image Segmentation/ Indexing**

The image captured by handphone camera using, and the image will change to black and white where the value of black is equal to (0) and the white is equal to (1). Then calculate the edge of each object with background image. Operators that calculate the gradient of an image in contrast can detect changes. Refer to figure below:

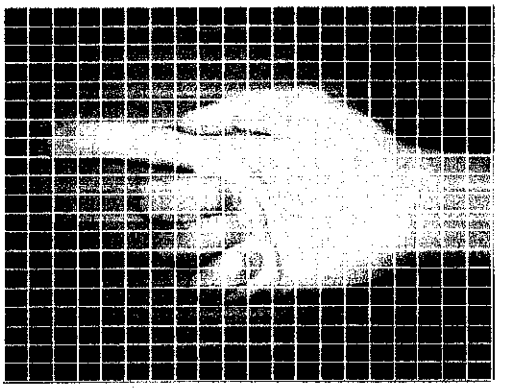


**Figure 3.7: Indexing the image**

This Image show on how it done the indexing and differentiate the value according to the colour of the image. This image is (100 X 75) and it has it own value in every box. Refer to image below:

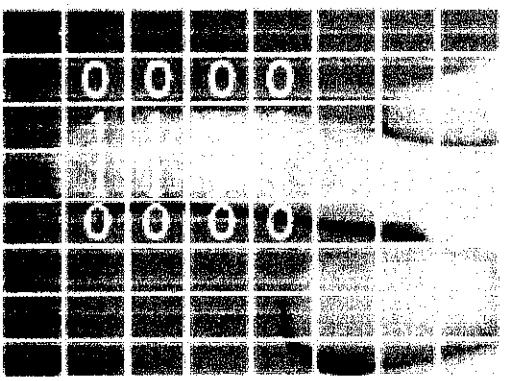



**Figure 3.8: Value of the image**

This image shows the value of each box that will determine the shape and it will choose the shape according to the coordinate that in the coding, this approached call detection of image edge, the next step is to create the skeleton and structural analysis.

**Image matching/ images compare**

In this application, it will have the process to match the images and comparing the images, for a purpose it will need to something to compare. In this case, comparing the byte is more efficient than others option which used shape recognition and involve complicated algorithm, this can be done if this program using MatLab or others engineering software because it have its own built-in tool that can be invoked. The process shown below:

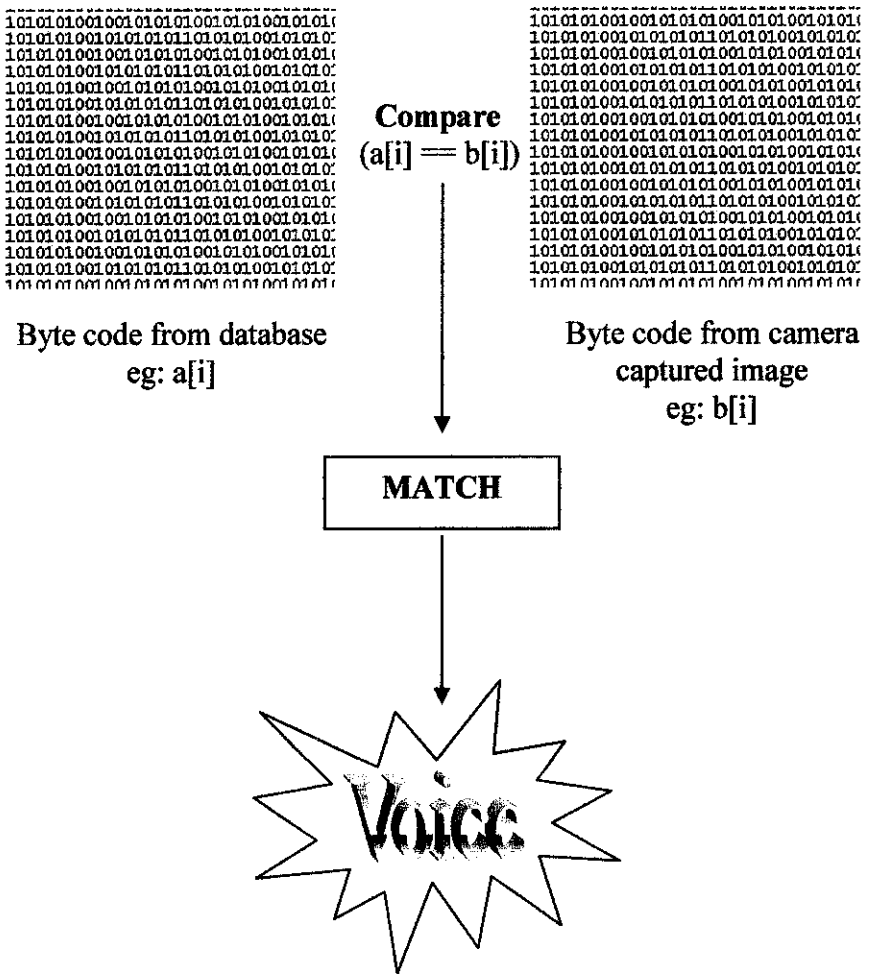



**Figure 3.9: Comparing and Matching Process.**

### 3.4.3 Result Segment

**Invoking the Result Process**

In this process invoking process, occur when the images match or not both will invoke the (voice) sound format. This application written in J2ME will able to invoke the *.WAV, *.MP3, *.ASF format. This also depends on the format that accepted by mobile phone itself. Below shows the java coding that invoke the *.WAV

```
try {
   InputStream is = getClass().getResourceAsStream(
   Player player = Manager.createPlayer(is,
   p.start();
}
catch(MediaException me) {
}
```

**Figure 3.10 : Invokes wave file.**

This JAVA coding shows how this coding invoke the "left.wav" file in the phone memory, this coding also provide the error handling if over flow process occur.

## 3.5 Use Case Diagram

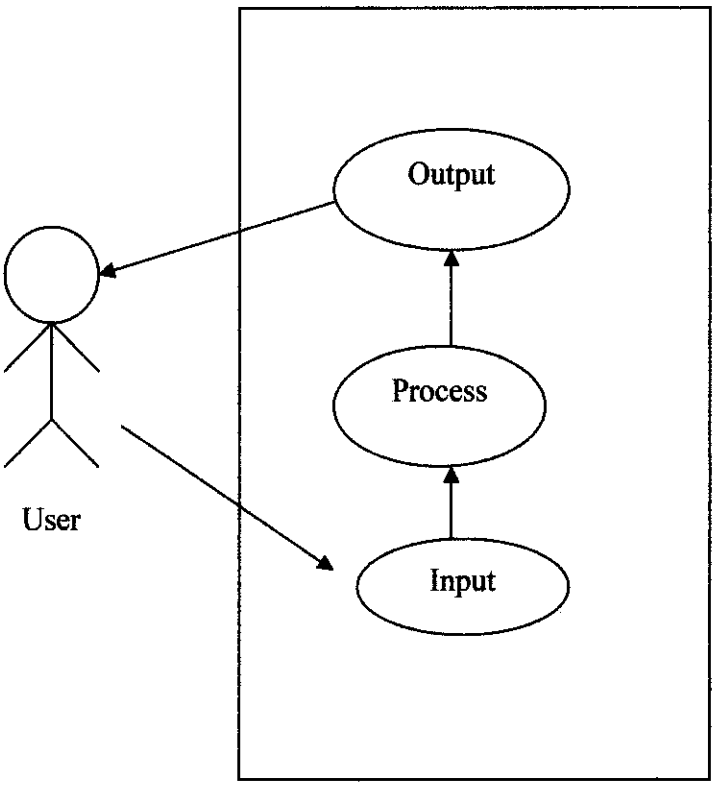



**Figure 3.11: Use case**

## 3.6 Class Diagram

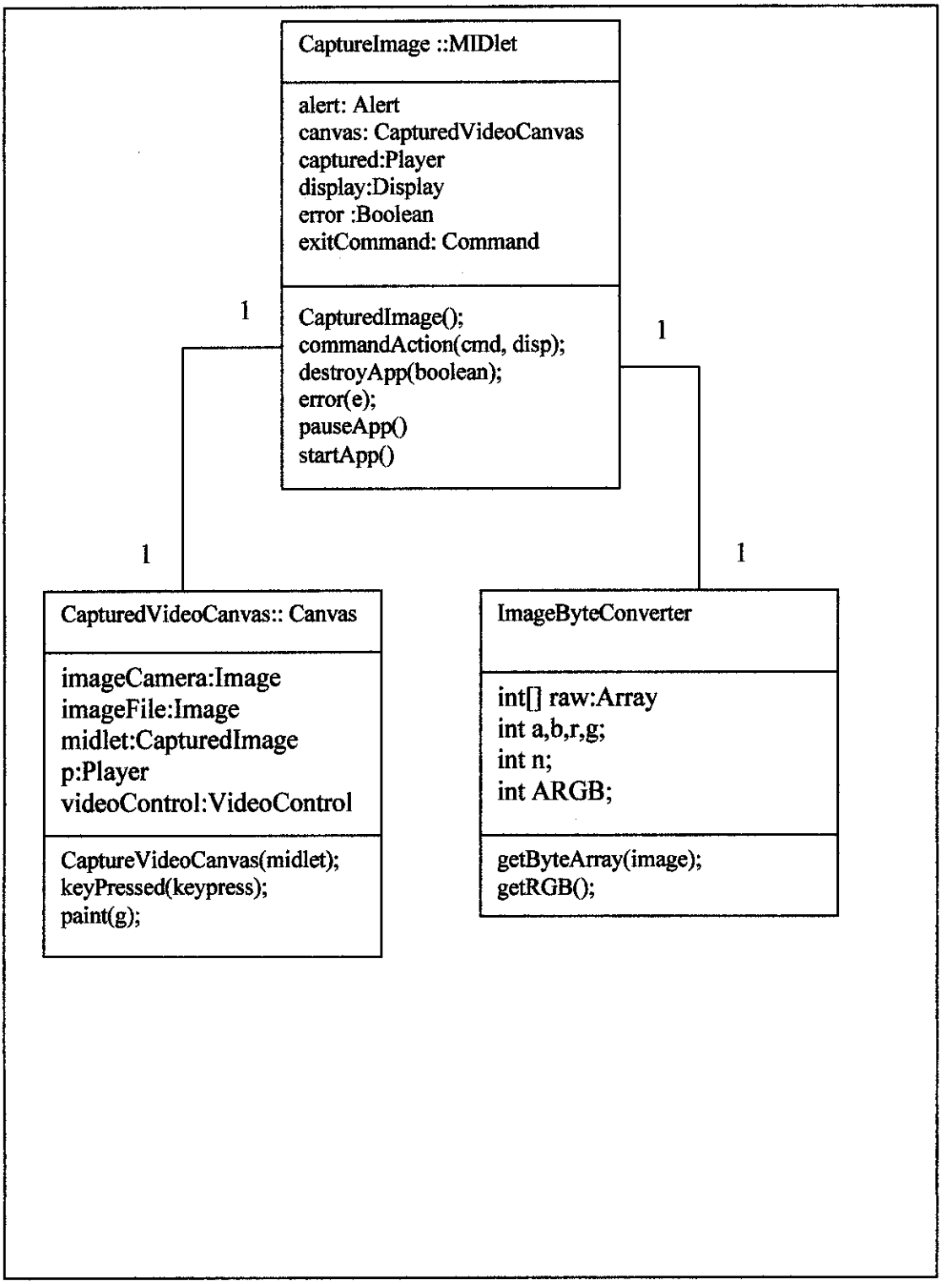



**Figure 3.12: Class Diagram**

### 3.7 System Progress Design

In the beginning of the process developing the application, the application just stand as one standalone system and working in the mobile phone. This will help to use the program and show flow on how it works.

#### 3.7.1 Mobile Sign to Voice interface Design

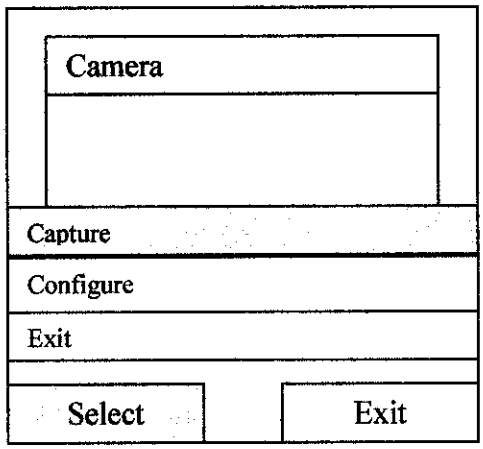



**Figure 3.13: Captured View**

In the interface above shows the capture menu selection with allowed user to choose the menu and execute it. This process is in the initial segment and can be found in the video canvas form. This "capture" option allowed user to capture the image.

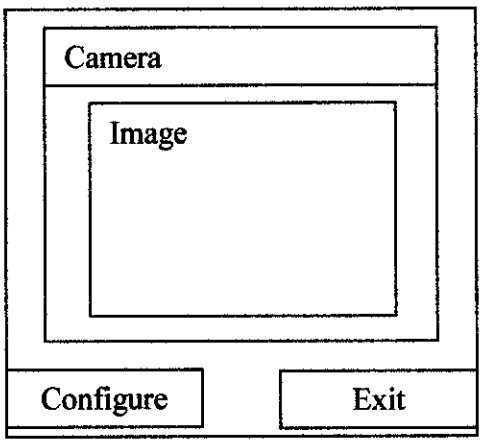



**Figure 3.14 : Image Canvas view**

The second interface is the interface where the captured image will be displayed and allow user to view the captured images and proceed to the process segment, where the recognition the image happen.

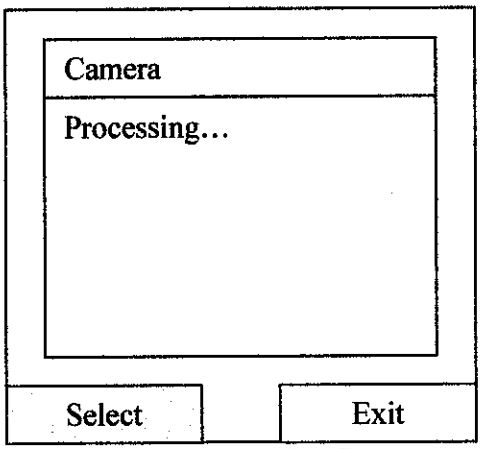



**Figure 3.15: Processing Image**

In the third interface, show the processing the image occur and matching with database in the mobile phone. This maybe took some of the time to processing it depends on the images in the database.

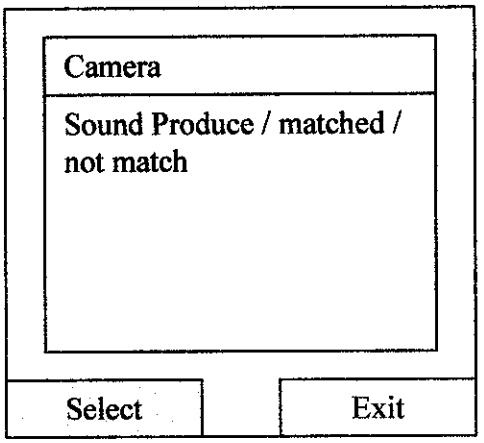



**Figure 3.16 : Result Produce**

# -CHAPTER 4 –
# RESULT AND DISCUSSION

## 4.1 Introduction

This chapter will conclude on all the findings and research that has been done for past ten weeks. Most of the findings were gathered through internet, journal and books, which have given great inputs and outputs to further with the project.

## 4.2 Result Analysis

Based on the result that being gather while doing coding and conducting testing, the result is based on the some limitation that might affect on the result produced.

### 4.2.1 External Factor

1. Light (Brightness)
2. Hand Position
3. Hand Shape
4. Skew of the Camera Position

**Findings**

1. Storage Limitation
2. Camera Resolution

**External Factors**

**1. Light Factor**

This factor might affect the result while comparing the process because the light will determine the value of the pixels based on the Red, Blue, and Green (RGB) value so if anything different from the actual value will affect the result and comparing process cannot match with the sample in the database. Example show below:

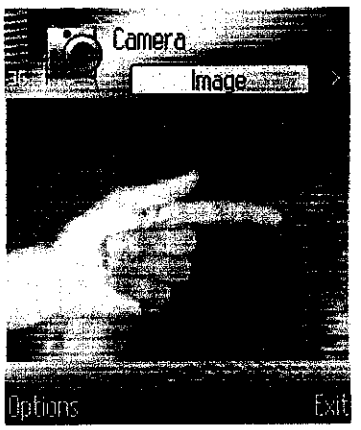



**Figure 4.1: Enough Light Exposure**

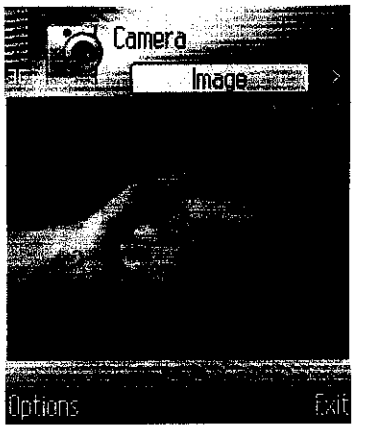
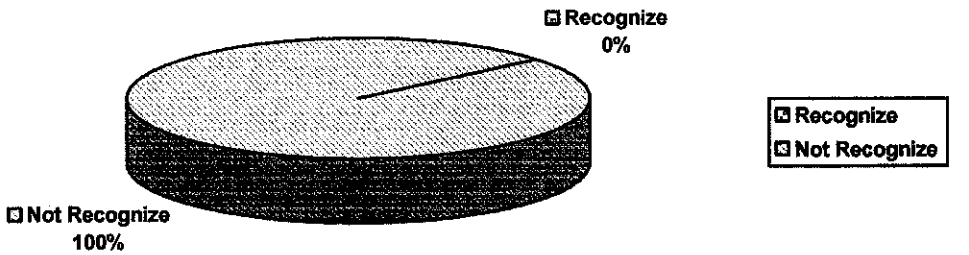



**Figure 4.2: Not Enough Light Exposure**

The captured image shows above is consider enough light exposure and the percentage to be equal as sample image is determined by byte coding which have probability of (100 x 75 pixels = 7500 pixels), its mean probability is (1/ 7500 = 0.000133 ) or in percentage is * 0.0133 % (*This result if the sample of image is 1 image). The probability also depends on the number of images in the database.




(* This result for 1 sample image in database)

**Chart 4.1: Probability image to be equal as Sample in database**

## 2. Hand Position

The hand position also one of the factors that will affect the result, which the position of the hand must be same as the sample image. The possibility of getting same result is depends on the sample images stored in the database. For example, the result shows below:

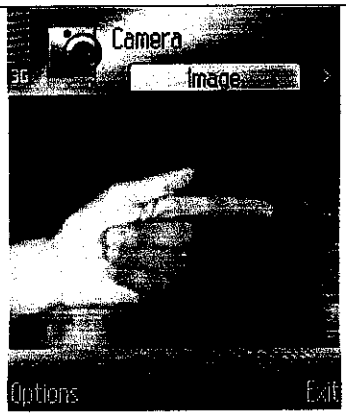
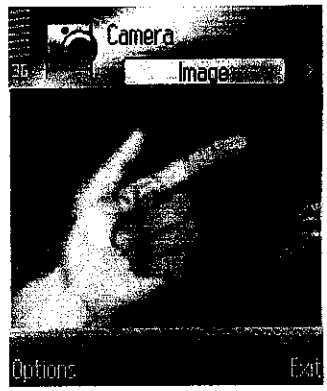
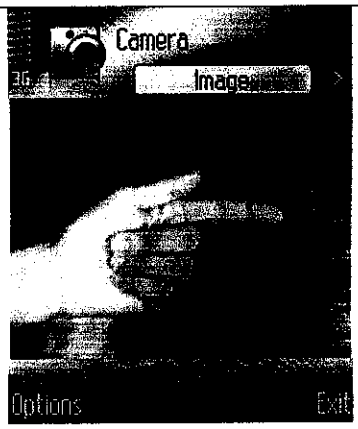
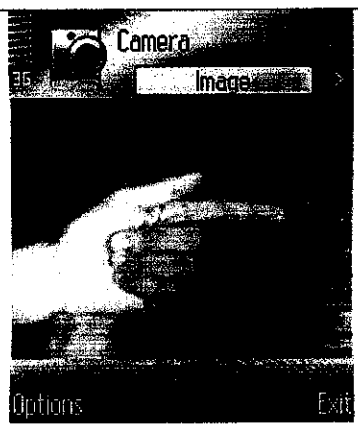
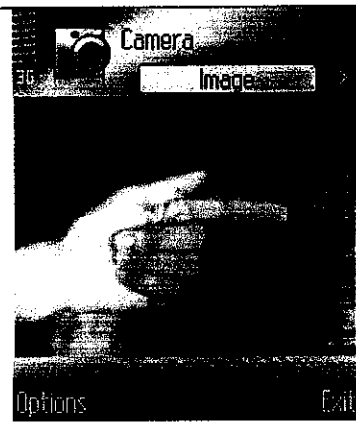
| Sample Image | Result | Captured Images |
|---|---|---|
|  | ≠ |  |
|  | ≠ |  |
|  | = |  |

**Table 3.1: Comparison of Hand Position**

### 3. Hand Shape

Hand shape also might affected the result because different people have different hand size and have its own shape, the worst case scenario which the shape of individual might vary because of some unwanted condition and incident such as accident and physical deficiency, this factor as well might affect the result.

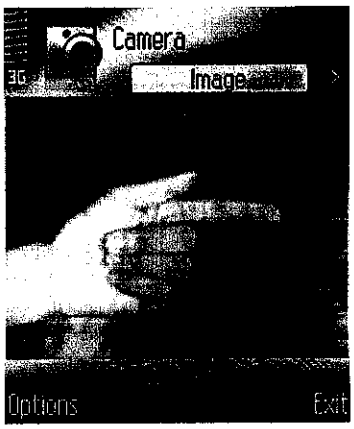
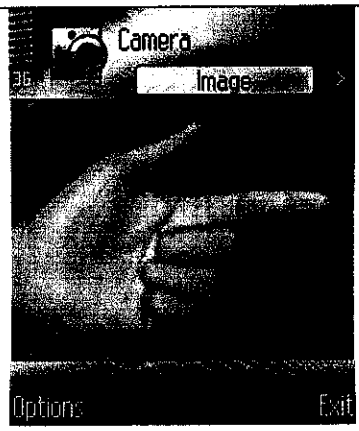
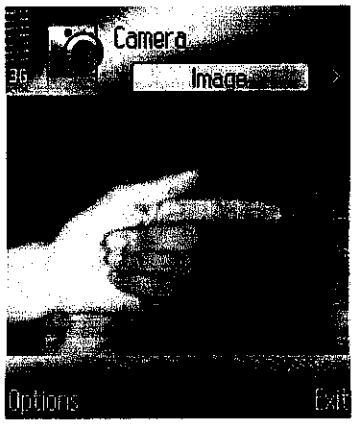
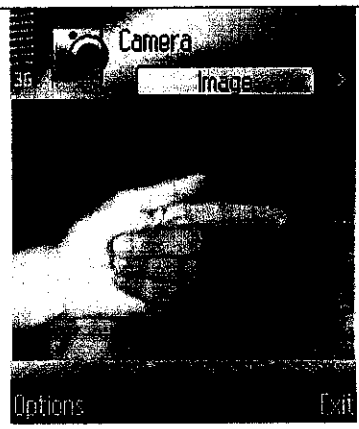
| Sample Image | Result | Captured Images |
|---|---|---|
|  | ≠ |  Hand size bigger than sample image |
|  | = |  Accurate size |

**Table 3.2: Comparison of Hand Shape**

**4. Skew of Camera Position**

Skew position also must count as the factor to determine whether the result can be accurate as the sample image in the database. This skew might slightly affected because of the different angle will interrupt the matching and comparing process.

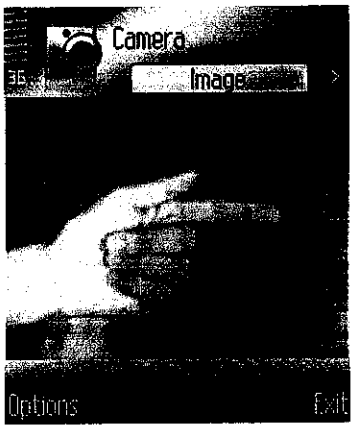
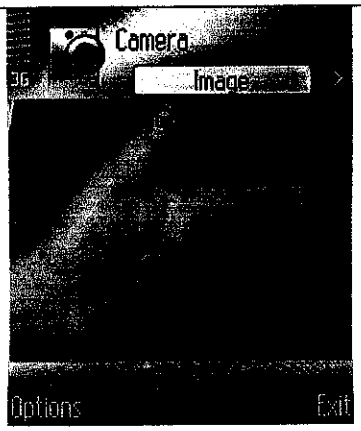
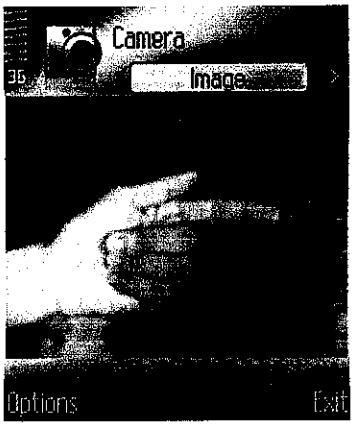
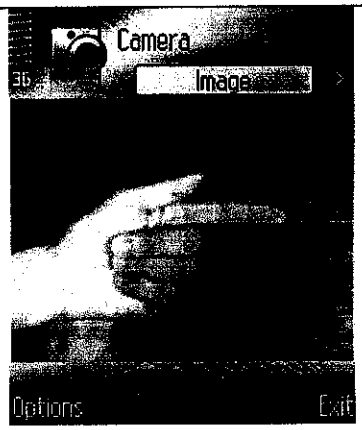
| Sample Image | Result | Captured Images |
|---|---|---|
|  | ≠ |  Image taken from skew of 45° |
|  | = |  Accurate angle |

**Table 3.3 : Comparison of Skew Position**

**Internal Factors**

**1. Storage limitation**

This factor is one of the limitations for smart phone and small devices. The bigger size of storage needed because of external factors, which needed more space to store the sample images for comparing and matching purpose. Nowadays, the bigger storage size is around 8 Gigabytes. The important to have bigger storage size is to enable the application to counter the limitation from external factors.

**2. Camera Resolution**

The resolution factors can be solved if the mobile phone has 1.3 Mega Pixels. Because if the mobile phone has better resolution, the image will have, more images that are accurate produced and the probability to match with the sample images is high.

# -CHAPTER 5-

# CONCLUSION AND RECOMMENDATION

## 5.1 Conclusion

This system can be consider as enrich life of a special group of people. This system also definitely can help people to learn a sign language. Improving this system in term of recognition aspect maybe can make this system more successful and can do more task rather than sign language only.

The successful development this system also can help to reduce discrimination against the hearing / speech impaired community because this application is able to teach people to learn sign language. This product also has an economy value and moral benefit for physically challenge people.

## 5.2 Recommendation

Future enhancement and expansion:

- This application may be enhanced for collision or obstacle detection, using its capability to detect near object and produce alerting sound.
- Current application is able to recognize static sign, in the future it is to improve for combination of signs and translate it into words.
- This application also may be modify for security system in recognizing the user face without having to push any button

# -REFERENCE-


1. Stephen Potts, Alex Pestrikov, and Mike Kopack, Sams Publishing. Java 2 Unleashed(2004).
2. Jafar Ajdari, Java 2 Mobile Information Device Profile(MIDP).Helsinki University of Technology(2001).
3. Downs, Sharon.Make A Difference. University of Arkansas at Little Rock.(2005)
4. Tennant, Richard.*The American Sign Language Handshape Dictionary*. (1998).
5. Sun Microsystems 2001. Java 2 Micro Edition. http://java.sun.com/products/Mobile Information Device Profile (MIDP)/index.html
6. Sing Li and Jonathan Knudsen, Beginning J2ME: From Novice to Professional. Apress(2008)
7. Terrence Lawai Wan, Translator System ( English to sign Language).(2007)
8. Canlas, Loida ,Laurent Clerc: Apostle to the Deaf People of the New World. Laurent Clerc National Deaf Education Center at Gallaudet University(2006).
9. Garner Group, Research on PDA and mobile phone sales by 2005,(online at)http://info-edge/com(2004).
10. Paul Tremblett, Instant Wireless Java with J2ME. McGraw Hill(2002)

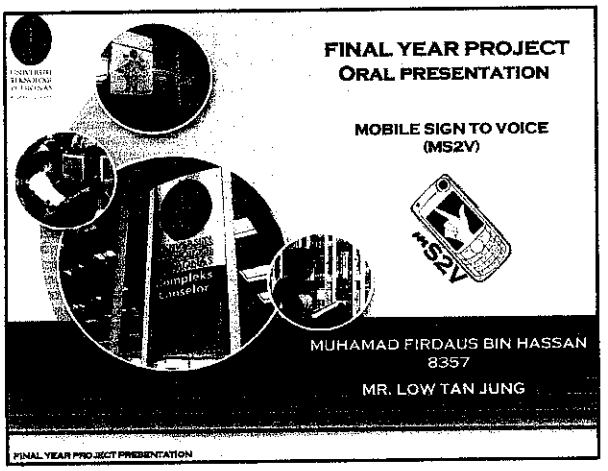
Internet Reference

11. [Available Online-] http://www.e-zest.net/j2me.html
12. [Available Online-]http://www.javaworld.com/javaworld/jw-08-2004/jw-0823-multimedia.html?page=2
13. [Available Online-]http://www.vs.inf.ethz.ch/res/papers/rohs2004-visualcodes.pdf
14. [Available Online-] http://vismod.media.mit.edu/vismod/demos/facerec/system.html

# APPENDICES

| *TASK* | DAYS | JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER | JANUARY | FEBRUARY | MARCH | APRIL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***1. System Planning/Analysis*** | **48** | | | | | | | | | | |
| Collecting information for project | 20 | | | | | | | | | | |
| Study of gathered information | 18 | | | | | | | | | | |
| Feasibility study | 10 | | | | | | | | | | |
| | | | | | | | | | | | |
| ***2.System Design*** | 55 | | | | | | | | | | |
| Gathered information to produce system flow | 30 | | | | | | | | | | |
| Generate system requirement | 10 | | | | | | | | | | |
| Generate system specifications | 15 | | | | | | | | | | |
| | | | | | | | | | | | |
| ***3.System Development*** | 110 | | | | | | | | | | |
| Development of system interface | 50 | | | | | | | | | | |
| Development of system logic | 20 | | | | | | | | | | |
| Interaction between the interface and the system logic | 40 | | | | | | | | | | |
| | | | | | | | | | | | |
| ***4.System testing*** | 30 | | | | | | | | | | |
| unit testing | 15 | | | | | | | | | | |
| system test | 15 | | | | | | | | | | |
| | | | | | | | | | | | |
| ***5 Implementation*** | 2 | | | | | | | | | | |
| final presentation of the project | 1 | | | | | | | | | | |
| Project Submission | 1 | | | | | | | | | | |

Figure 3.1: Project timeline



# FINAL YEAR PROJECT ORAL PRESENTATION

MOBILE SIGN TO VOICE (MS2V)

MUHAMAD FIRDAUS BIN HASSAN
8357
MR. LOW TAN JUNG



## OVERVIEW

- CHAPTER 1 : INTRODUCTION
- CHAPTER 2 : LITERATURE REVIEW
- CHAPTER 3 : METHODOLOGY
- CHAPTER 4 : RESULT AND DISCUSSION
- CHAPTER 5 : CONCLUSION AND RECOMMENDATION.



## BACKGROUND OF STUDY

- THIS MOBILE SIGN TO VOICE SYSTEM (MS2V) IS ENHANCEMENT FROM PREVIOUS FINAL YEAR PROJECT.
- THIS APPLICATION IS TO RECOGNIZE SIGN AND MATCH THE VOICE STORED IN THE DATABASE.
- THE PREVIOUS PROJECT IMPLEMENTED IT ON THE PC USING THE MATLAB TOOLS.
- NOW IMPLEMENTED IN MOBILE (MOBILE PHONE).



## PROBLEM STATEMENTS

- ***PORTABILITY PROBLEM***
  - THIS PORTABILITY PROBLEM ARISE BECAUSE PREVIOUS S2V PROGRAM IMPLEMENTED ON THE COMPUTER, THIS APPLICATION ABLE TO SOLVE THE PORTABILITY PROBLEM.
- ***LEARNING SIGN LANGUAGE***
  - TO LET PEOPLE LEARNING SIGN LANGUAGE IN A EASIER WAY TO PICK UP SIGN LANGUAGE FASTER.
- ***COMMUNICATION***
  - TO ALLOW NORMAL PEOPLE TO COMMUNICATE WITH HEARING HANDICAPPED PERSON PRACTICALLY ANYWHERE & ANYTIME MORE EFFECTIVELY.



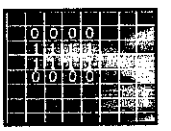
## OBJECTIVES

- THIS APPLICATION INTENDS TO HELP THE NORMAL PERSON TO UNDERSTAND THE SIGN LANGUAGE BETTER AND WITH EASE.
- MAKE THIS APPLICATION MORE PRACTICAL AND MOBILE.
- HELP NORMAL PEOPLE COMMUNICATE WITH HANDICAP PERSON WITH EASE.



## SCOPE OF STUDY

- TO EXPLORE THE ABILITY OF SMALL DEVICE TO HELP DISABLED PEOPLE. THESE INCLUDE:-
  - SIGN RECOGNITION
    - DETECTION AND MATCHING
  - ARTIFICIAL INTELLIGENT
    - SEARCHING AND COMPARING



## LITERATURE REVIEW

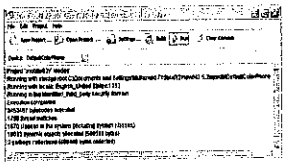
- ***J2ME***
  - PROGRAMMING LANGUAGE.

    THESE REFERENCES ARE ABOUT DEVELOPING THE APPLICATION. SUCH AS ALGORITHM, OPERATING AND OTHERS.
    - REFERENCE

      ( http://java.sun.com/javame/index.jsp )

      ( http://developers.sun.com/mobility/j2me/ )

      ( http://www.j2meforums.com/ )





## LITERATURE REVIEW

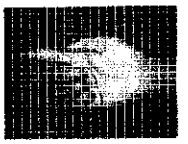
- ***PATTERN RECOGNITION/SIGN RECOGNITION***
  - HOW THIS CONCEPT WORKS.

    TO SEARCH FOR EXAMPLE ALGORITHMS TO APPLIED IN THE APPLICATION.
    - REFERENCE

      ( http://www.cs.ucsb.edu/~mturk/Papers/mturk-CVPR91.pdf )

      ( http://vismod.media.mit.edu/vismod/demos/facerec/system.html )

      ( http://people.inf.ethz.ch/adelmann/batool )





## LITERATURE REVIEW

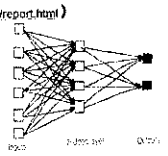
- ***NEURAL NETWORK***
  - HOW NEURAL NETWORK CAN BE APPLIED IN PATTERN MATCHING PROCESS.

    NEURAL NETWORK IS ONE OF THE PART IN THE ARTIFICIAL INTELLIGENT. TO LEARN ON HOW NEURAL NETWORK FUNCTION THAT MIGHT BE ABLE TO APPLIED IN THE SYSTEM.
    - REFERENCE

      (http://www.doc.ic.ac.uk/~nd/surprise_96/journal/vol4/cs11/report.html )

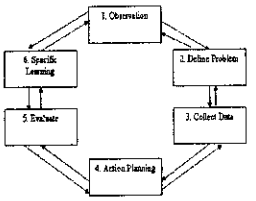
      ( http://www.mathworks.com/products/neuralnet/ )

      ( http://www.cs.stir.ac.uk/~lss/NNIntro/InvSlides.html )





## METHODOLOGY




1. **OBSERVATION**
   - WHAT IS THE PROBLEM?
2. **DEFINE PROBLEM**
   - NARROW DOWN THE PROBLEM
3. **COLLECT DATA**
   - IDENTIFY THE DATA NEEDED.
4. **ACTION PLANNING**
   - DEVELOPMENT PROCESS
5. **EVALUATE**
   - EVALUATE THE PROCESS
6. **SPECIFIC LEARNING**



## PROJECT TIMELINE

| TASK | DAYS | JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER | JANUARY | FEBRUARY | MARCH | APRIL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. System Planning Activities | 48 | | | | | | | | | | |
| Collecting information for project | 20 | | | | | | | | | | |
| Study of gathered information | 18 | | | | | | | | | | |
| Feasibility study | 10 | | | | | | | | | | |
| 2.System Design | 55 | | | | | | | | | | |
| Gathered information to produce system flow | 20 | | | | | | | | | | |
| Generate system requirement | 10 | | | | | | | | | | |
| Generate system specifications | 15 | | | | | | | | | | |
| 3.System Development | 110 | | | | | | | | | | |
| Development of system interface | 30 | | | | | | | | | | |
| Development of system logic | 20 | | | | | | | | | | |
| Interaction between the interface and the system logic | 40 | | | | | | | | | | |
| 4.System testing | 30 | | | | | | | | | | |
| unit testing | 15 | | | | | | | | | | |
| system test | 15 | | | | | | | | | | |
| 5.Implementation | 2 | | | | | | | | | | |
| final presentation of the project | 1 | | | | | | | | | | |
| Project Submission | 1 | | | | | | | | | | |



## TOOLS

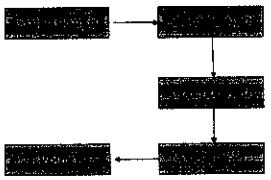
**Development process**

| | REQUIREMENT | SPECIFICATION |
|---|---|---|
| 1 | WIRELESS TOOLKIT 2.5.2 FOR CLDC | TO RUN THE PROGRAM ON THE MIDP MIDLET. |
| 2 | NETBEANS IDE FOR MOBILE | TO WRITE THE CODE ON J2ME |

**TESTING PURPOSE**

| | REQUIREMENT | SPECIFICATION |
|---|---|---|
| 1. | NOKIA S60 SERIES 6680 | TO TEST THE WORKING APPLICATION |
| 2 | JAVA MIDP 2.0 | TO RUNS SPECIFICATION APPLICATION. |

## SYSTEM ARCHITECTURE



1. SIGN LANGUAGE
2. PROCESS INPUT
3. ANALYZE INPUT
4. MATCH WITH DATABASE
5. VOICE



## PROCESS FLOW

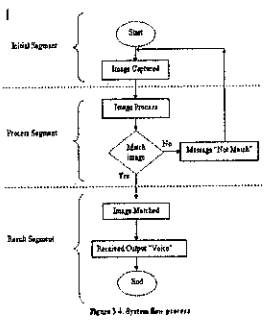



Figure 3.4. System flow process

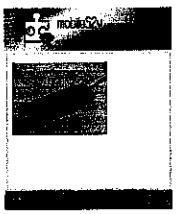
- DIVIDED INTO 3 SEGMENT
  - INITIALS SEGMENT;
  - PROCESS SEGMENT;
  - RESULT SEGMENT.



## INITIAL SEGMENT

**CAMERA OVERVIEW**

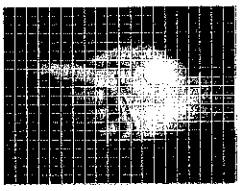

Default view 640x480



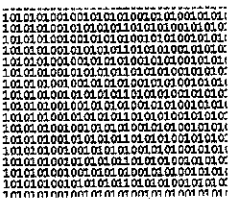

Alternate View 100x75



## PROCESS SEGMENT



Convert into byte array



Arrays of bytes



## RESULT SEGMENT

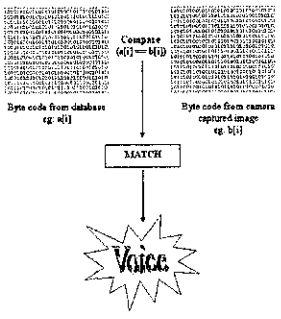



Figure 3.9. Comparing and Matching Process.



## RESULT AND DISCUSSION

- **CONSTRAINS:**
  - BASED ON THE RESULTS FROM SYSTEM TESTING. SEVERAL FACTORS AFFECTING THE RESULT:
    - LIGHT (BRIGHTNESS)
    - HAND POSITION
    - HAND SHAPE
    - SKEW OF THE CAMERA POSITION

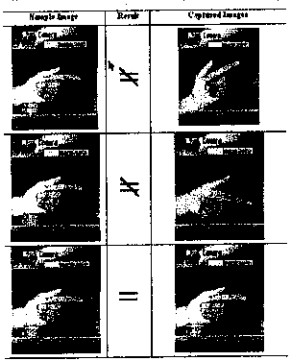
## LIGHT FACTOR

Enough Light

Not Enough Light

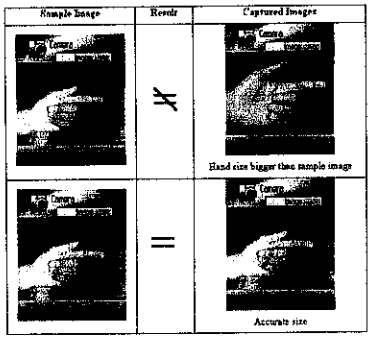


## HAND POSITION



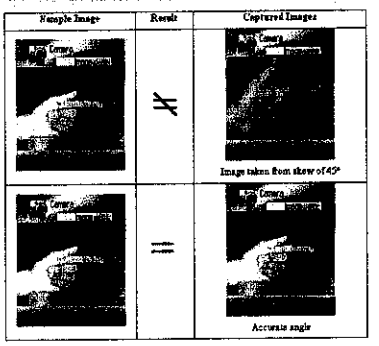



## HAND SHAPE






## POSITION SKEW






## RESULT GRAPH


(* This result for 1 sample image in database)

Chart 4.1: Probability image to be equal as Sample in database



## FINDINGS

- ***STORAGE LIMITATION***
  - STORAGE LIMITATION IS ONE OF THE FACTOR THAT MIGHT AFFECT THE RESULT WHILE DOING THE COMPARING AND MATCHING WITH THE SAMPLES IN THE DATABASE.
  - EXAMPLE: MOBILE PHONE HAVE LIMIT CAPACITY OF STORAGE; 512 MB, THE HIGHEST IS 8GB.
- ***CAMERA RESOLUTION***
  - CAMERA WITH THE HIGH RESOLUTION MORE ACCURATE IN COMPARING AND MATCHING WITH THE SAMPLE.
  - REDUCING THE RESOLUTION, LESS ACCURACY IN MATCHING OF IMAGES.

## CONCLUSION

- THIS APPLICATION ABLE TO EASE NORMAL PEOPLE TO COMMUNICATE WITH THE HEARING HANDICAPPED PEOPLE.
- THE SUCCESSFUL OF THIS PROJECT ABLE TO REDUCE DISCRIMINATION TO THE HANDICAPPED PEOPLE, AND CAN BE ENHANCED INTO MORE APPLICABLE USAGE.



## RECOMMENDATION

- THIS APPLICATION MAY BE ENHANCED FOR COLLISION OR OBSTACLE DETECTION, USING ITS CAPABILITY TO DETECT NEAR OBJECT AND PRODUCE ALERTING SOUND.
- CURRENT APPLICATION IS ABLE TO RECOGNIZE STATIC SIGN, IN THE FUTURE IT IS TO IMPROVE FOR COMBINATION OF SIGNS AND TRANSLATE IT INTO WORDS.
- THIS APPLICATION ALSO MAY BE MODIFY FOR SECURITY SYSTEM IN RECOGNIZING THE USER FACE WITHOUT HAVING TO PUSH ANY BUTTON



## QUESTION AND ANSWER

# THANK YOU