ALPHABET BRAILLE TRANSLATOR USING AN OPTICAL CHARACTER RECOGNITION AND SUPPORT VECTOR MACHINE

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2017

DECLARATION

I hereby declare that this project report entitled

BRAILLE TRANSLATOR USING OPTICAL CHARACTER RECOGNITION AND SUPPORT VECTOR MACHINE

is written by me and is my own effort and that no part has been plagiarized without citations

STUDENT : _____ Date: 22/8/2018

(MOHAMMAD ROZWAN BIN MOHD ZULKUPLI)

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I hereby declare that I have read this project report and found this project report is sufficient in term of the scope and quality for the award of Bachelor of Computer Science (Artificial Intelligence) With Honours

SUPERVISOR : _____ Date: 22/8/2017

(EN AHMAD FADZLI NIZAM BIN ABDUL RAHMAN)

DEDICATION

We dedication this project to the lecturers, friend and family who have been giving are helping for make this final year project is completely finished. Especially a thousand thanks to the instructor in the SMK Padang Temu, Melaka for their cooperation when conducting the interview session in there. For their helping by giving a knowledge and guide to make sure my project is follow the condition and term to accomplish the goal for my project. We indebted them as a divine source of inspiration.

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ACKNOWLEDMENT

I would like to praise to the Almighty god for giving me the might to complete this project. My special thanks of gratitude to my supervisor, Ahmad Fadzli Nizam bin Abdul Rahman for his support and encourage me to giving a full dedication towards this project. His advice and help give me strength for make this project and report fully completed during the timeline.

I also want grab the change to express my gratitude to beloved parent for their support in moral and mental to accomplished the objective of the project. I really appreciate their assistance contribution.

Last but not least, my thanks are dedicated to the friend for their opinion and idea to provide me a better solution for this project. Lastly, thank you for your support to all parties or person that I have not mentioned.

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ABSTRACT

The system that will be built for this project is called Braille translator using optical character recognition (OCR). A braille is a system that used for the impaired vision person to read the word. The braille consist of 6 dot in 2x3 matrix. Each braille have its own characteristic and meanings .By applying an OCR it can make the system read the braille to translate it an alphabet itself. Project involves development a software to make braille that can translate it to alphabet. The purpose of developing the software is to make the process of learning and recognition of the braille by the instructor is ease and consume the time. The instructor just capture the paper that contain the braille character then upload it to this software, then by OCR it will match the braille character with the right alphabet. This project is develop because for the normal person it hard to translate the braille itself if he want to discover it and the proses to translating the braille is take time and slowly if do manually. Then the objective of this project is to convert the braille dot to Roman alphabet, develop the system that robust to detect any braille character and to make the process of the learning of the braille easy for the normal person. The contribution of the project is help the process of learning interactions between the student and the instructor in the school and make the instructor easily translate the braille character by using the application

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ABSTRAK

Sistem ini yang dibangunkan pada projek kali ini ialah perterjemah braille kepada huruf dengan menggunakan pengecaman karakter optik. Braille adalah sistem yang diguna pakai oleh orang kurang upaya cacat penglihatan untuk membaca. Braille terbahagi kepada enam titk dalam matrik 2 x 3. Setiap Braille mempunyai huruf dan karekternya yang tersendiri. Dengan menggunakan teknik pengecaman karakter optik sistem yang akan dibangunkan nanti boleh mengenalpasti braille untuk terjemahkan kepada huruf yang betul.Pembangunan sistem ini memerlukan software untuk memastikan Braille dapat diterjemahkan keada huruf yang betul. Pembagunan sistem ini bertujuan untuk memastikan proses pembelajaran dan pengecaman Braille oleh tenaga pengajar adalah mudah dan menjimatkan masa untuk proses tersebut. Pengajar hanya mengambil gambar yang mempunyai braille dan memuat naik ke dalam sistem ini, seterusnya menggunakan pengecaman karakter optik dan teknik k nearest neighbour dapat memastikan sistem daat memadankan Braille dengan huruf yang tepat. Pembangunan projek ini dibina disebabkan pengguna yang normal susah untuk menterjemahakan Braille dan proses tersebut memakan masa dan perlahan tana mengunakan teknologi yang sedia ada. Objektif untuk projek ini untuk memastikan Braille dapat diterjemahkan kepada huruf dan membangunkan sistem yang dapat mengenalpasti apa jua saiz Braille. Pembangunan projek ini dapat menyumbangkan beberapa perkara seperti membantu proses interaksi diantara pelajar dan pengajar di sekolah dan memudahkan pengajar untuk untuk menterjemahkan Braille menggunakan sistem ini.

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CHAPTER I

INTRODUCTION

1.1 Introduction

The normal people use alphabet character or their own language as a medium to read or write. The character that they write can easily detectable by their eyes then translate it by their brain to understanding the character. However the blind people cannot recognize it as they cannot see since their eye is malfunction. Then the Braille character has been introduced by the Louis Braille in 1824 to ease the blind community to gain the ability to write and read. The invention that he made have become rapidly popular among blind community itself until this modern day.

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1.2 Problem statement

Blind community can track the Braille character easily as they have practice it since they small but for the normal people that have use their eye as a medium to see what they write or read maybe is hard to learn it. For the new instructor maybe it is hard to read the braille character by detecting it by using their finger tip. As an instructor the process of learning and understanding may be in dilemma for them because they it is hard to learn it by detect it by their fingertip and using their eye to translate the mean of the braille text to the readable form. As an instructor they also must translate the braille character before being check by the other people this is implemented in school. This will take time to translate the braille own and the process maybe will some time do mistaking as human error always probability happen.

1.3 Objective (s) of the Project

Develop and offer an application in assistive technology that are useful for both party. To provide the process of learning for the normal people with the opportunity to make interaction for communication by using artificial intelligence technique

1.4 Project Scope

The target users for this project are the instructor that teaching the blind people itself. Recently this application maybe will widely use in school that categorized as “Pendidikan Khas” or community itself. The blind people using a braille as a medium to read or write since they cannot see the image with their eyes. Since in the school , the instructor are teaching them with the voice as they can hear but to do the exercise by their instructor they will use braille character to write the answer.

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1.5 Project Significance

The system that will be built for this project is called Braille translator using optical character recognition. Project involves development a software to make braille that can translate it to alphabet. The purpose of developing the software is to make the process of learning and recognition of the braille by the instructor is ease and consume the time. The instructor just capture the paper that contain the braille character then upload it to this software, then by using optical character recognition it match with the real alphabet.

1.6 Expected Output

The system are capable to detect any braille that have standard size according the international braille society. If the braille size do not have this specification the possibility braille cannot detected is high. It is important to select the only braille that have the requirement before proses of translating happen.

1.7 Conclusion

In conclusion this chapter can discuss what the reason to build the system application are. It also overview about the system. The problem can be solved by objective and scope of this project which is determined that make the system capability to proses the output result.

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Chapter II

Literature Review

2.1 Introduction

This chapter tells the reader in details about Literature Review and Project Methodologies. Literature review describes the background of the project proposed which is Alphabet Braille Translator using an OCR. Besides that, this chapter provides summary and evaluation of the previous research or work that is the same or related to the project which can be developed. The purposed of the literature review is to justify the exact choices of research or a project.

Moreover, it exposes the important of the topic or the system to be developed. Furthermore, in order to understand the project, literature review can assist to gather the background information needed. It function as the key to show readers that the developer of the system is familiar with significant and the latest research that is relevant with the topic. Literature review provides chance to discover what has been investigated and what has not and also to discover how the project is related to the work of others.

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2.2 Fact and finding

Braille is a system of raised dots that can be read with the fingers by people who are blind or who have low vision. A braille character is composed of a combination of dots from a matrix of three rows and two columns, known as a cell. Braille is not a language but consider as a medium to convert the language readable to the system that can use by the impaired vision to read.

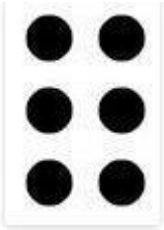

Figure 2.1: A braille cell

$$= \sum_{k=0}^{6} C \binom{6}{k}$$

Figure 2.2 possible number of braille cell

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When one Braille cell corresponds to 1 Character, it is referred to as Grade 1Braille. However in Grade 2 Braille system, individual cell or a combination of cells forms a variety of contractions or whole words. For example, in grade 1 Braille, the sentence “I love you” requires twelve cells as it has ten characters of braille including space. It is represented as follows.

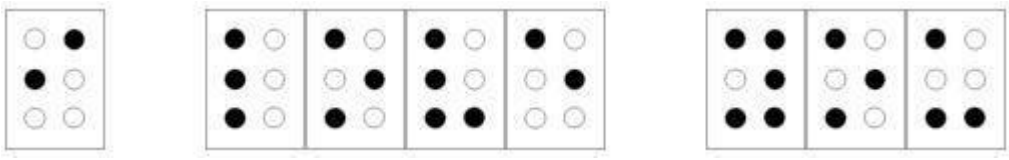

Figure 2.3: Grade 1 braille system

The same sentence in grade 2 Braille, takes only eight cells space. This because the letters y are used to represent whole words, you. Similarly, the word you is created by combining the letters o and u. The sentence I love you in grade 2 system, looks like this

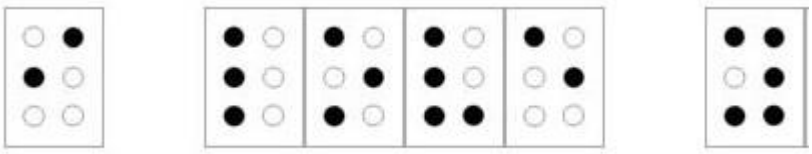

Figure 2.4: Grade 2 braille system

2.2.1 Domain

The alphabet braille translator using optical character recognition is a system that translate the braille cell to the Roman alphabet. This system is built to make it recognize the braille cell then matching it with correct alphabet. Moreover this system can make the user consume the time to read and without use their finger to sense the braille. This system use an artificial intelligence technique to make the system have ability to recognize the braille cell by pre-processing an image and translate it with the correct alphabet by matching with the dots that have in the database of the system.

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2.2.2 Existing System

There are few existing system that have identified with the framework that going to be created. Keeping in mind the end goal to pick up the better indicate that utilized building up this framework, those the current framework can give be great use for directing and coming up the better thoughts to enhancing the recently made framework which is Alphabet braille translator using an OCR. There are two examples s framework which is Imprinted Braille-Character Pattern Recognition using Image Processing Techniques and Odia Braille: Text Transcription via Image Processing.

2.2.2.1 Odia Braille: Text Transcription via Image Processing

This system is built by the K.Parvathi, Bijet Maynoher Sama and Jitendra Kumar Das in 2015. The purposed this system is for make braille character to translate to Odia language. Odia language is a widely spoken in India especially in the east of the nation. It take the braille image as an input than will process it with binary image or greyscale conversation, segmentation , pattern recognition then translate it into Odia letter. The system will run by using command window then will produce the output using the display figure from Matlab.

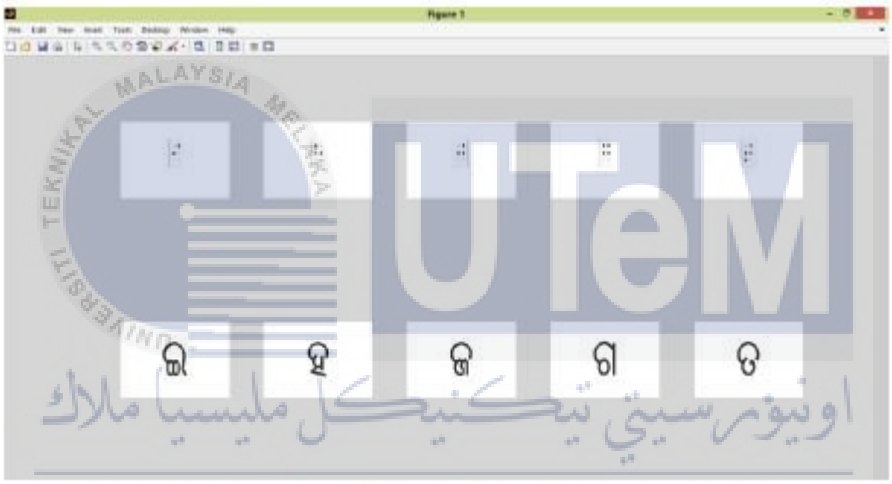

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Figure 2.5: Odia Braille: Text Transcription via Image Processing

2.2.2.2 Scale Invariant Braille Translator

Scale Invariant Braille Translator is built by the Yaniv Tocker. The purposed this system build to make the translation of braille more effective. A braille with the standard size can be detected as the radius of the dot braille is follow the specification. The system also have a clearly braille to be detected as the system will do the segmentation to differentiate each of the braille cell. Hence, make the translation or matching the braille with the right Roman alphabet is easier and ease to do it with using graphical user interphase.

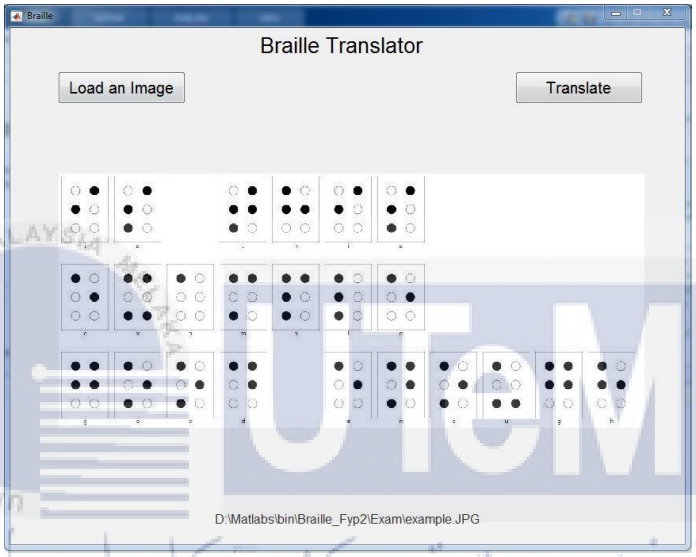

Figure 2.6: Scale Invariant Braille Translator before translating proses

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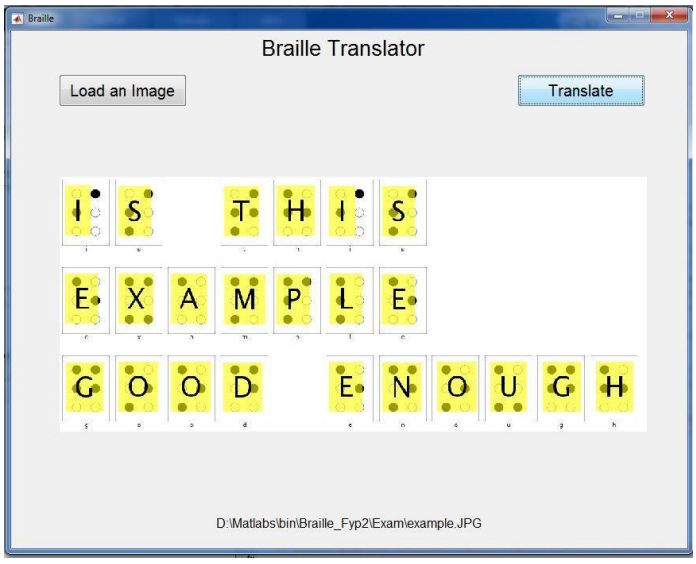

Figure 2.7: Scale Invariant Braille Translator after translating process

2.2.3 Existing System vs Proposed system

Table 2.1: Existing System vs Proposed system

	Scale Invariant Braille Translator	Odia Braille: Text Transcription via Image Processing	Proposed System
GUI and features	Have GUI and features is limited	No having GUI	Have GUI and features is more interesting
Image Pre-processing	Use but limited usability	Use certain image pre – processing that compatible to the system	Use various of type of image pre-processing
Output result	Show Alphabet / word	Show different braille and word	Have both braille and alphabet result

2.2.4 Technique

2.2.4.1 Image pre-processing

Image pre-processing is a proses to make the image contain is transform to the output of image is better before proses it to the next step. It includes primitive operations to reduce noise, contrast enhancement, image smoothing and sharpening (A Sagar and M Mayank, 2016). The image pre-processing is fundamental step in image processing and computer vision.

2.2.4.2 Reduce noise

The type of noise is came from the digital image. The noise of the image is resource from result of the error in pixel value which do not represent the original intensities of the real image before taken. Utmost care is taken to insure that unwanted noise or redundant information is not introduced at the time of scanning and that the obtained scanned image is completely aligned (M. Wajid and M. Waris Abdullah and O. Farooq, 2011).

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2.2.4.3 Conversion of RGB image to binary image

The original image of braille usually contain a type of RGB image. RGB is refer to the red, green and blue is a color representing on image display in the computer visual. It also mean as a coloured image. The binary image is an image which contain only two value such as 1 and 0. 1 is represented as black while 0 is represented as white. The binary image has far lesser requirement for memory space than RGB image, hence it has the inherent advantage of lesser computation time and lesser complexity (M. Wajid and M. Waris Abdullah and O. Farooq, 2011).

2.2.4.4 Enhancement of the image

Enhancement proses make the image is look smoothening. It make image is visually in the high resolution before the image is testing to load for the next proses. Any disturbing and noise will reduce the quality of the image to proses for the output. Image enhancement algorithm is very important to obtain the useful information of digital image. It can be a distorted process in order to improve the visual effects of the given image (H. Song and Y. Shang and X. Hou and B. Han, 2011).

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2.2.4.5 Pattern recognition

Pattern recognition is the process of classifying input data into objects or classes based on key features. Every image have it is own features and characters. Make the image easily to differentiate or to do the comparison. The image also can be classified according the class that we made based on the features that will save time to do if doing in the large scale of data.

2.2.4.6 Support Vector Machine

The support vector machines are supervised learning models with its associated learning algorithms that analyse data and recognize the patterns. (P. Pravallika and K. Satya Prasad, 2016). The technique are used to make the program of the system recognition the image of braille with the right output.

2.2.4.7 K-Mean Clustering

The clustering is a method of Unsupervised Machine Learning methods, where it collects words with other have similar characteristics in the clusters based on Similarity Function to calculate the distance between those words (D. S. Al-Azzawy and F. M. L. Al-Rufaye, 2017).

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2.3 Project Methodology

The first step building a system is define the type of the methodology. There are several type of methodology that can apply in the computer engineering and industry today. The best solution to do the methodology for this project is spiral method.

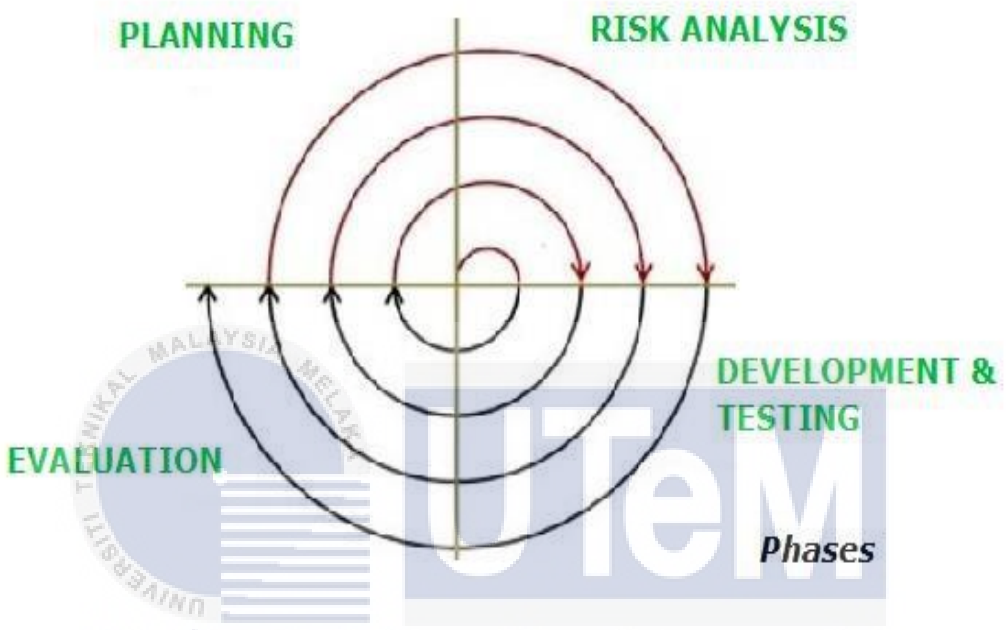

Figure 2.8: Spiral Methodology

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Phase 1: Planning

This phase starts with planning to get the requirements in the baseline spiral. In the subsequent spirals as the identification of unit requirements, subsystem requirements and system requirements all done in this phase.

This phase also includes understanding the system requirements by continuous communication between the user and the system analyst. At the end of the spiral, the product is deployed in the identified market

Phase 2: Risk Analysis

From the previous phases, gathering the information to identify includes estimating, monitoring the management risks and technical feasibility, such as schedule slippage and cost overrun. The further identify the risk is better to avoid any problem and error that make the proses of development became slow and not fluent as expected.

Phase 3: Development and testing

This phase are discussed about development and testing the system. The step of development is important to make the system run as expected. The Construct phase refers to production of the actual software product at every spiral. In the baseline spiral, when the product is just thought of and the design is being developed a POC (Proof of Concept) is developed in this phase to get customer feedback.

Then in the subsequent spirals with higher clarity on requirements and design details a working model of the software called build is produced with a version number. These builds are sent to the customer for feedback.

Phase 4: Evaluation

After testing the build, at the end of first iteration, the tester evaluates the software and provides feedback. The software that receive an unsatisfied result are undergo the proses of testing and debugging to make sure everything is follow the procedure. From the overview we can decide whether it reach a final output or not. For the product that do not reach satisfying it will return to the planning phase and so on until it reach the full requirement.

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2.4 Project Requirement

This section can describes the types of the software, hardware, and network requirements, and brief descriptions. These requirements can collaborate to develop the project which is alphabet braille translator using an Optical Character Recognition.

2.4.1 Software Requirement

Table 2.2: Software Requirement

Software	Function
Matlab R2017a	To run code and graphic user interphase (GUI)
Microsoft Word 2013	Documentation of the project report
Microsoft PowerPoint 2013	Presentation of the project overview

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2.4.2 Hardware Requirement

Table 2.3: Hardware Requirement

Hardware	Function
PC with Intel Core I5 with 4Gb RAM	To run the Matlab software need high performance PC to do the project with compatible

2.5 Project Schedule and Milestone

Table 2.4: Milestone of PSM 1

Week	Activity	Note /Action
1 13-17 Feb Meeting 1	Proposal PSM: Discussion	Deliverable – Proposal Action – Student
	Proposal assessment & verification	Action – Supervisor, Evaluator
2 20-24 Feb	Proposal Correction / Improvement	Action – Student
	List of supervisor / Title	Action – PSM/PD Committee
3 27 Feb - 3 Mac Meeting 2	Proposal Presentation & Submission via PSM Online System Chapter 1 (System Development Begins)	Deliverable – Proposal Presentation (PP) Action – Student
4 6-10 Mac	Chapter 1 Chapter 2 - LR	Deliverable – Chapter 1 Action – Student, Supervisor
5 13-17 Mac	Chapter 2	Action – Student
6 20-24 Mac Meeting 3	Chapter 2 Chapter 3	Deliverable – Chapter 2
		Progress Presentation 1 / Pembentangan Kemajuan 1 (PK 1) Action – Student, Supervisor
	Student Status	Warning Letter 1 Action – Supervisor, PSM/PD Committee
7 27-31 Mac	Chapter 3 Chapter 4	Action – Student
8 3-7 Apr	MID SEMESTER BREAK	

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9 10-14 Apr	Chapter 4 Project Demo	Deliverable: Chapter 3 Action – Student, Supervisor
10 17-21 Apr Meeting 4	Chapter 4 Project Demo	Deliverable – Progress Presentation 2 / Pembentangan Kemajuan 2 (PK 2) Action – Student, Supervisor
	Student Status	Warning Letter 2 Action – Supervisor, PSM/PD Committee
11 24-28 Apr Demonstration	Project Demo	Action – Student
	Determination of student status (Continue/Withdraw)	Submit student status to Committee Action – Supervisor, PSM/PD Committee
12 1-5 May	Project Demo PSM1 Report	Action – Student, Supervisor
13 8-12 May Meeting 5	Project Demo PSM1 Report PSM 1 Showcase Poster Submission	Action – Student, Supervisor
14 15-19 May	Project Demo Submission of the PSM1 Report onto the PSM e-Repository online system	Deliverable – Complete PSM1 Draft Report Action – Student, Supervisor
15 22-26 May PSM 1 Showcase	PSM 1 SHOWCASE Wed, 24 May 2017; 8:00am - 5:00pm	Action – Student, Supervisor, Evaluator, PSM/PD Committee
16 29 May - 2 Jun	REVISION WEEK Correction on the draft report based on the comments by the Supervisor and Evaluator during the final presentation session	Deliverable – Complete PSM1 Logbooks Action – Student, Supervisor
	Submit PSM1 Logbooks to PSM Online System	
	Submission of overall marks to PSM/PD committee	Deliverable: Overall PSM1 score sheet Action – Supervisor, Evaluator, PSM/PD Committee
17 & 18 5-18 Jun	FINAL EXAMINATION WEEKS	

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Table 2.5: Milestone PSM II

Week	Activity	Note/Action
1 3- 7 Jul	Chapter 4: Design Chapter 5: Implementation	Deliverable – **Chapter 4** Action – Student
2 10 – 14 Jul	Chapter 5: Implementation Progress Evaluation	Deliverable – **Progress Presentation 1 (Pembentangan Kemajuan 1,(PK1)** Action – Student, Supervisor
3 17 – 21 Jul	Chapter 5: Implementation Chapter 6: Testing	Deliverable – **Chapter 5** Action – Student, Supervisor
4 23 – 28 Jul	Chapter 6: Testing	Deliverable – **Progress Presentation 2 (Pembentangan Kemajuan ,(PK) 2)** Action – Student, Supervisor
	Student Status	Action –PSM/PD Committee, Supervisor Warning Letter 1
5 31 Jul – 4 Aug	Chapter 6: Testing Chapter 7: Conclusion Progress Evaluation	Deliverable – **Chapter 6** Action – Student, Supervisor

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6 7 – 11 Aug	Chapter 7: Conclusion Complete Final Report (draft) Determination of student status	Deliverable – **Chapter 7** Action – Student, Supervisor
7 14 – 18 Aug	Presentation Schedule PSM 2 presentation and evaluation	Deliverable – **Complete Report(draft)** Action – Student, Supervisor, Committee
8 21 – 25 Aug	- Correction report based on supervisor's and evaluator's comments during the final presentation session. -Submit overall marks to committee	Action – Evaluator, Supervisor, Committee
9 28 Aug – 1 Sept	-Submit PSM complete report for supervisor's signature and binding	Deliverable – **PSM report, log book, project materials** Action – Student, Supervisor

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2.6 Conclusion

Then next chapter we discuss about analysis for the development of this project.

Chapter III

3.1 Introduction

Analysis phase consist the smaller part from the complex or matter subject to get better understanding. From the previous chapter we have gained lots of information from research paper, journal and other resourced to making an overview to find our findings.

3.2 Problem Analysis

In this chapter problem analysis are be discuss to understand and identify to get problem solving for make the proses begin. The analysis have been done before in the previous chapter to find the constraint the existing system. Moreover, from the lacking of the previous system this analysis are made to solve problem that features do not provided in the current situation.

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3.2.1 Background of Current System

The current system that was built in the Alphabet braille translator using an Optical Character recognition help the user to gain the proses translate in ease. The proses of translator is doing from the image braille is taking as input and the output result is translating it into alphabet word. The proses of translating begin after the image input undergoing image pre-processing to reduce noise and increased the enhancement or quality of the input. Making proses of matching the right braille with right alphabet without effect the proses the translating.

3.2.2 Problem Statement

The proses to learn braille for the normal person is challenging. Impaired vision person are used their finger to read braille and proses it ease way. For the normal person that use eye for sight and proses it to get the information is different from the view of impaired vision person. In the special branch in the school, there are section call 'Pendidikan Khas', it is a place for the unnormal person that attend to the class. The class usually contain of hyperactive, syndrome down and impaired vision or blind person. The proses learning of blind person is totally different than other because they are thinking well but cannot see. The blind person will attend a normal class but their works we will do in a braille system. The problem is begin when an instructor want to begin to proses the translating. It hard for the normal instructor if the braille is many then it take time to translating it into normal word and may fatigue their eyes to see it. By this problem it reduce motivate of new instructor if he/she want to teach or learn in subject that contain braille translating.

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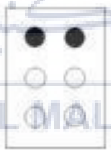
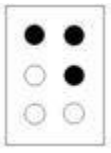
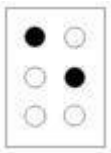
3.3 Requirement Analysis

The important for identified the data requirement make the system flow with fluently. All the data is gathering by the research from the previous chapter. Make the data that important only is highlight from in this section. The input or output should present in the system storage by manually to get the actual result.

3.3.1 Data Requirement

Table 3.1: Data requirement for the braille translating to the alphabet

Binary Structure	Braille Cell	Alphabet Representation
1 0 0 0 0 0		A
1 0 1 0 0 0		B
1 1 0 0 0 0		C
1 1 0 1 0 0		D
1 0 0 1 0 0		E

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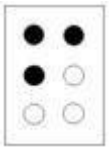
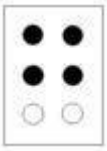
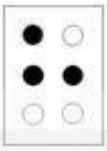
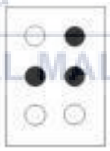
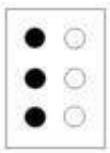
1 1 1 0 0 0		F

1 1 1 1 0 0		G
1 0 1 1 0 0		H
0 1 1 0 0 0		I
0 1 1 1 0 0		J
1 0 0 0 1 0		K
1 0 1 0 1 0		L

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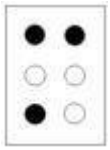
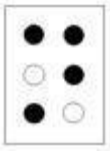
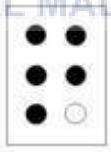
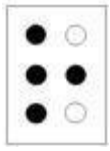
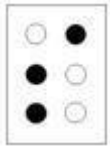
1 1 0 0 1 0		M

1 1 0 1 1 0		N
1 0 0 1 1 0		O
1 1 1 0 1 0		P
1 1 1 1 1 0		Q
1 0 1 1 1 0		R
0 1 1 0 1 0		S

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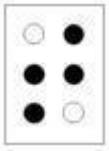
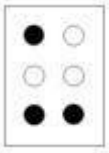
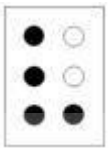
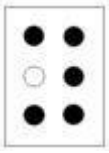
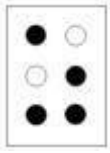
0 1 1 1 1 0		T

1 0 0 0 1 1		U
1 0 1 0 1 1		V
0 1 1 1 0 1		W
1 1 0 0 1 1		X
1 1 0 1 1 1		Y
1 0 0 1 1 1		Z

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3.3.2 Functional Requirement

This stage for define and describe the functional requirement of Alphabet braille translator using an Optical character recognition system. This application need requirement that hold high capability to make user experienced the functional system, hence deliver benefit from that. Then, this phase will describe and discuss the functionality of the system.

This Alphabet braille translator using an Optical Character Recognition and Support Vector Machine using the artificial intelligence technique to run that need to functionality of the overflow of the system. Firstly, the code in run in the Matlab Software. This software have high capability when do image processing compare than other software. The language that use for this software is call matlab programming and is considered as high language programming language. To run the specific code also do not have to long coding. This because to read the image file from the other programming language take a long code to run , instead of matlab just need two line of code to call them. The package inside the matlab also offer the graphical user interface that can integrated with the code inside. Make the program is run is graphical system instead in shell.

The system is readily after user clicking the braille.fig to call or activate the program. Then the user is ask to call the any image consist of braille character to process it in system. After the user click the load button only the image will be display. To see the output result the user must click the button translation to begin the proses of translating of the braille to alphabet. User must wait in second for the output to be display. Furthermore the system provide the save button to save the image that convert to the alphabet to ease their work after that.

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3.3.2.1 Use case Description

- Load the image

Table 3.2: Use case for load image

Use Case : Load the image contain braille
Use Case ID : -
Primary Actors : User
Preconditions : The image do not have load yet
Flow of Event : 1. Use case begin when the user start the program by clicking the system application file 2. The graphical user interphase will be display 3. User required to load the image contain braille before begin the proses translation 4. User click the load button to load the image from the file of computer 5. User choose the image from the file of computer 6. User click the image that want to be upload 7. After double click , the user can view the image back in the display of the system

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- Translating the braille

Table 3.3: Use case for translating the braille

Use Case : Translating the image contain braille into the alphabet
Use Case ID : -
Primary Actors : User
Preconditions : The image contain braille must upload first
Flow of Event : 1. The Use case continues when the user upload the image file 2. To begin the proses translating user are required to click the translating button 3. After the click, the user can view the output image that contain alphabet instead of braille cell 4. User can see the two different of image that consist of original image before proses and the output result image in split window

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3.3.3 Non-Functional Requirement

This phase consist of requirement that important which need to ensure the system is functional well as expected. The system is readily to function as well without any error and bug or any problem.

Table 3.4: Non-Functional Requirement

Requirement	Description
Graphical user Interphase (GUI)	The system is needed to do in GUI to ease the user do the process. The GUI need in the properly display to make the user easily recognize the functionality of the system.
Reliability	The placement and display of image must take place in the system display to make the user know exactly know what is happen to the system. The proses input and output must functional well through the system.

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3.3.4 Other Requirement

- **Software Requirement**

Table 3.5: Software Requirement

Software	Function
Matlab R2017a	To run code and graphic user interphase (GUI)
Microsoft Word 2013	Documentation of the project report
Microsoft Power Point 2013	Presentation of the project overview

- **Hardware Requirement**

Table 3.6: Hardware Requirement

Hardware	Function
PC with Intel Core – I5	To run the matlab software need the high processing PC to run smoothly

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3.4 Conclusion

From the analysis phase requirement system it is discuss the functionality of the system in order to proceed to the system scope and the next stage element. This chapter have provide the elements that acts as guided to visualize the planning system. Through the flow chart of the planning system it can access clearly as it been explained in detailed through the text and symbol.

Chapter IV

4.1 Introduction

Due to the previous discussion analysis chapter, the high level and preliminary design have been described. In design, the all requirement must be defined to satisfy the process that finding, hence the presentation of the system are followed after been described in the previous analysis phase.

In designed chapter the appearance of the system are affected because it related from the requirement need from the previous stage. The system requirement will be design as described from the way the flow of procedure that show in the analysis stage. It important to ensure the appearance of system is follow as conduct.

In the architecture design, the product development a follow a standard decomposition from the high level and logical design. The result and specification are analysed to create the module for the functionality and working system. Moreover, the result of the output are process to conduct the image braille in translate or convert them into the alphabet form.

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4.2 High Level Design

In this phase , high level design explain the focus and need for developing the system product .It discuss the main component that provide the interface and entire system that related from the previous analysis. It also can be described and illustrated the high level design according the package from the architecture in the project.

The high level design will described graphic user interface design, flow chart, input and output that need in this project overview. From the previous analysis, after identifying the main component to build the system it is important to use all of the sourced to make the system is well and optimized.

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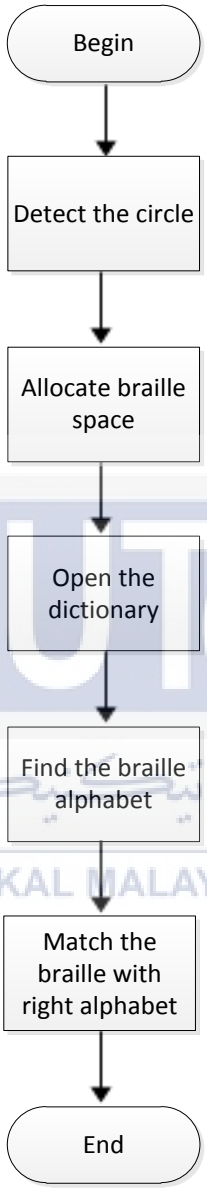
4.3 Detailed Design

4.3.1 Flow Chart of the System for BTUOCR



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4.3.1.1 Image Pre-processing

The Image after been load of the user will undergo a process to make image is convert to grayscale image. The grayscale image make any color image turn into black and white. The image also will do enhancement and reduce the noise make quality of the image is high before proceed to the next process.

4.3.1.2 Detect the circle

After undergoing the process of the image pre-processing, the circle will detected using Hough technique to detect the braille dot or circle.

4.3.1.3 Allocate braille space

Using K nearest neighbour. The first dot will be detect another dot of braille as the algorithm has been set as K < 4 and certain distance, make the dot only group the near other 2 of dot braille. Then it will grouping this as one braille cell that will translate later on with right alphabet.

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4.3.1.4 Open the dictionary

After the all braille cell is recognizes, the system will through to the dictionary or library of the braille that have been created to begin the process translating.

4.3.1.5 Find the braille alphabet

The program will be keep a braille alphabet that have found for the matching of alphabet in dictionary.

4.3.1.6 Find the alphabet braille

Then the proses of matching will undergo to find the best result of braille to the right alphabet. It been recognized by find the character recognition that have been setup because the all braille have different features and dots.

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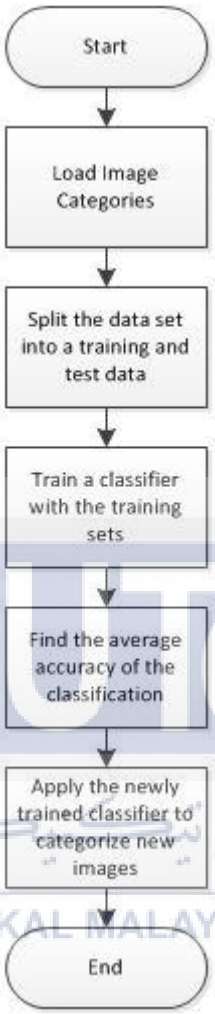
4.3.2 Flow Chart of the System for BTUOCR



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4.3.2.1 Load Image Categories

The image of file contain the braille image are store in the specific folder for the access by the system of program.

4.3.2.2 Split the data set into a training and test data

The image of the braille will be splitting into two set which is training and test set. Training will be taken by 70% while test of data is taken by 30%.

4.3.2.3 Train a classifier with the training sets

The splitting data of training set will be train by the classifier support vector machine (SVM) to train the image for the classification.

4.3.2.4 Find the average accuracy of the classification

The system will be get the average accuracy after the training image. The change to get the right output for the testing data must be 70% to reduce the error while test it by new braille image.

4.3.2.5 Apply the newly trained classifier to categorize new images

The training data will be saved after completed and the new image braille can be tested for test the ability of system using the graphical user interface (GUI).

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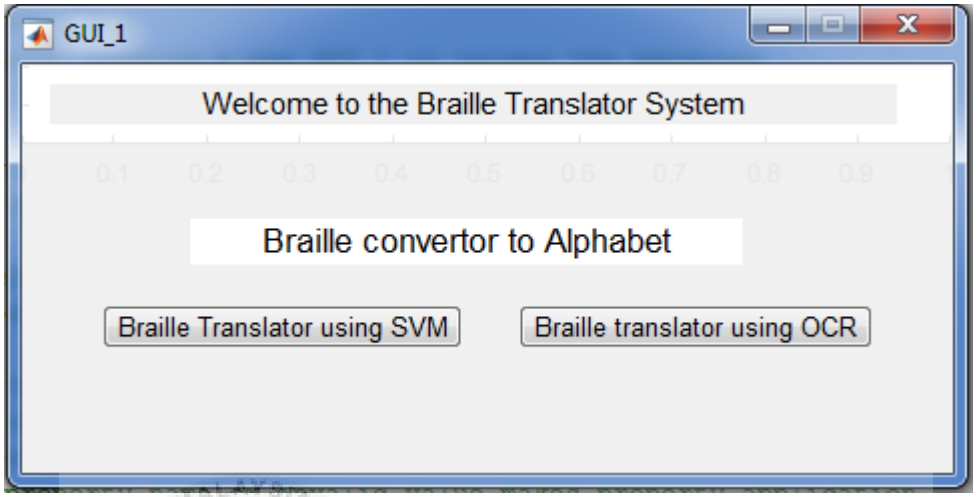
4.3.3.1 Graphical User Interfaces for front end system

Figure 4.3 : Graphic user interface for front end system



The system consist of two different artificial intelligence technique that used for translating the braille to the alphabet. The system can be navigation by the user by push either button to activate the new pop GUI whether Braille translator using Support Vector Machine (BTUSVM) or Braille translator using Optical character recognition (BTUOCR)

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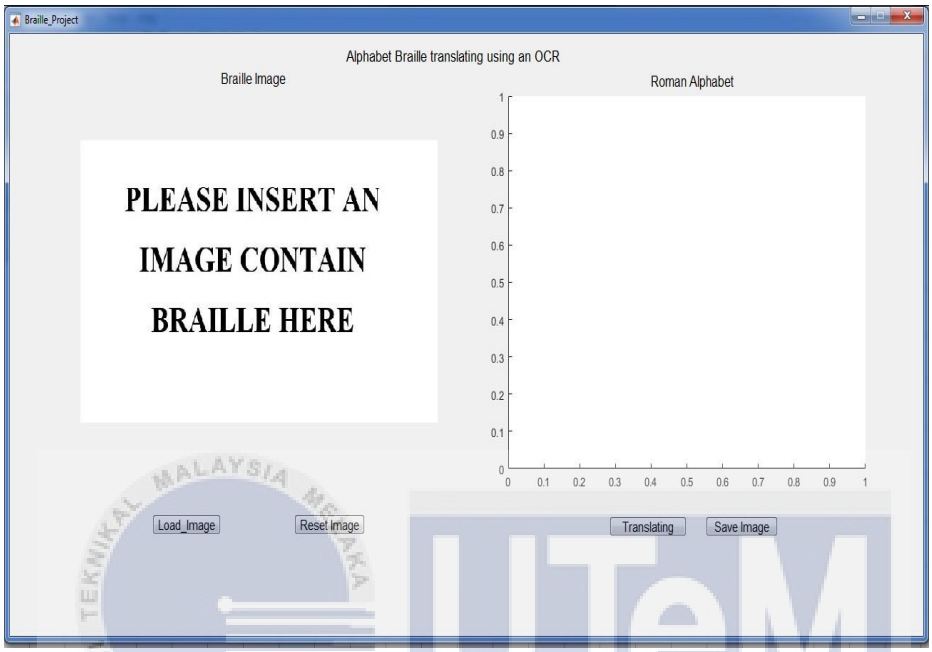
4.3.2.2 Graphic User Interfaces for BTUOCR

Figure 4.5: Graphic user Interphase for BTUOCR



4.3.2.2.1 Function of the Click Button

The alphabet braille translating using an OCR system have several button to make the proses interaction between the user and system is ease and faster without doing it from the shell. This button have provided within its function and role in table below.

Table 4.1: Function button of the GUI

Button	Function
Load Image	To load the image contain braille to the system then display through the GUI
Reset Image	To make user reset the image to load another image of contain Braille
Translating	The proses of translating the braille to the alphabet is begin when user hit click this button

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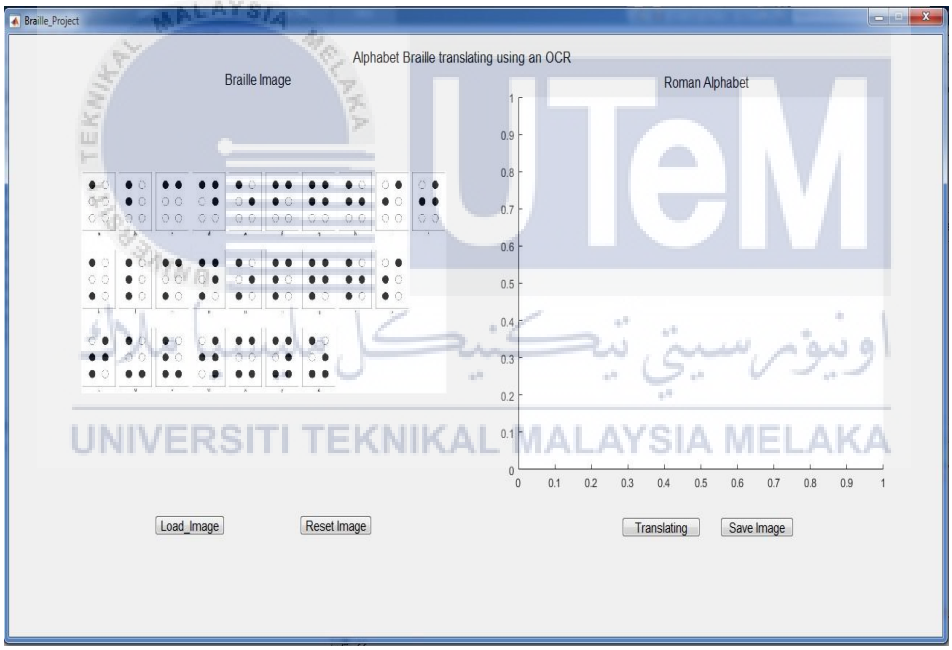
Save Image	After the result output is produced user can save the image at any folder from his/her computer

4.3.3.2.2 Input

This is the testing of image that contain braille. To load the image from the window or Mac user must click load_Image button to upload it. User must consider to insert the image contain Braille only before the proses of translating begin.

Figure 4.6: Inserting the input image through the system



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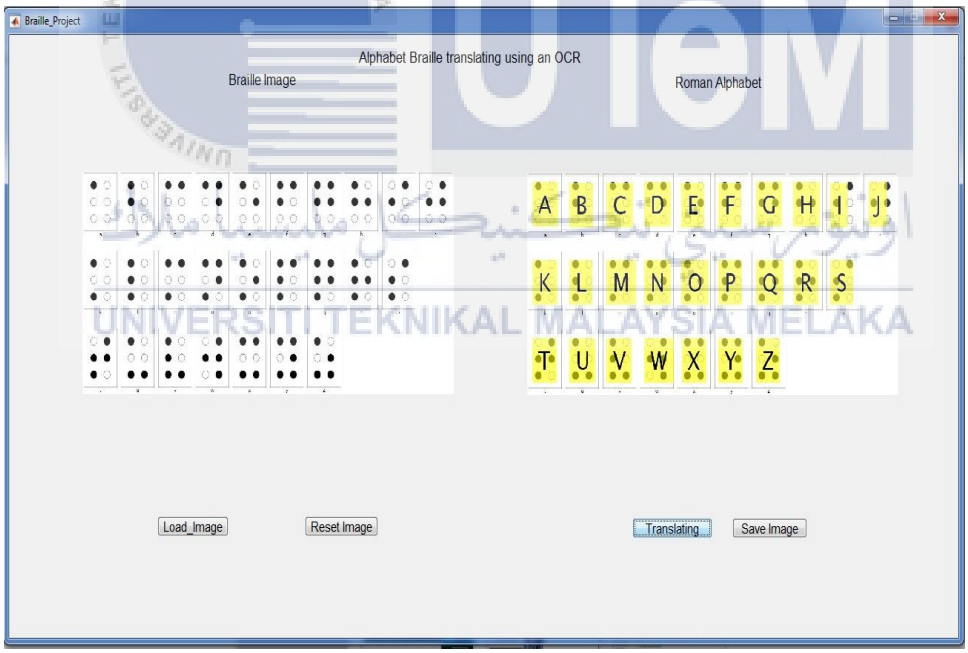
4.3.2.2.3 Output

The result output will be produced after the user click the translating button, the proses is depend from the image is contain braille or not. From this testing the braille is translated to the right alphabet.

Figure 4.7: The result output after translating proses



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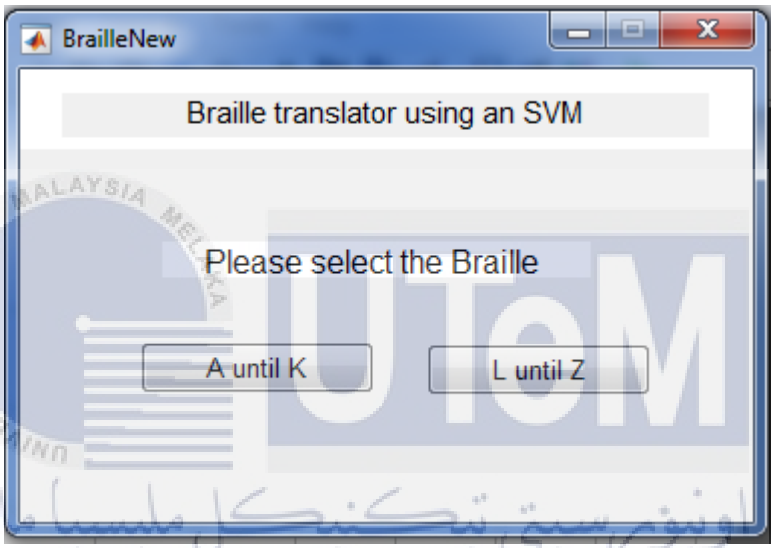
4.3.3.3 Graphic User Interfaces for BTUSVM

Figure 4.8: Graphic User Interfaces for BTUSVM



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Braille translator using an SVM are splitting into two part. The first art is from Braille A until K while another from Braille L until Z.

4.3.3.3.1 Function of the Click Button

The alphabet braille translating using an SVM system have several button to make the proses interaction between the user and system is ease and faster without doing it from the shell. This button have provided within its function and role in table below.

Table 4.2: Function button of the GUI

Button	Function
Load Image	To load the image contain braille to the system then display through the GUI
Training Image	To make user training the image contain braille in the specific folder for the access by the system
Translating	The proses of translating the braille to the alphabet is begin when user hit click this button

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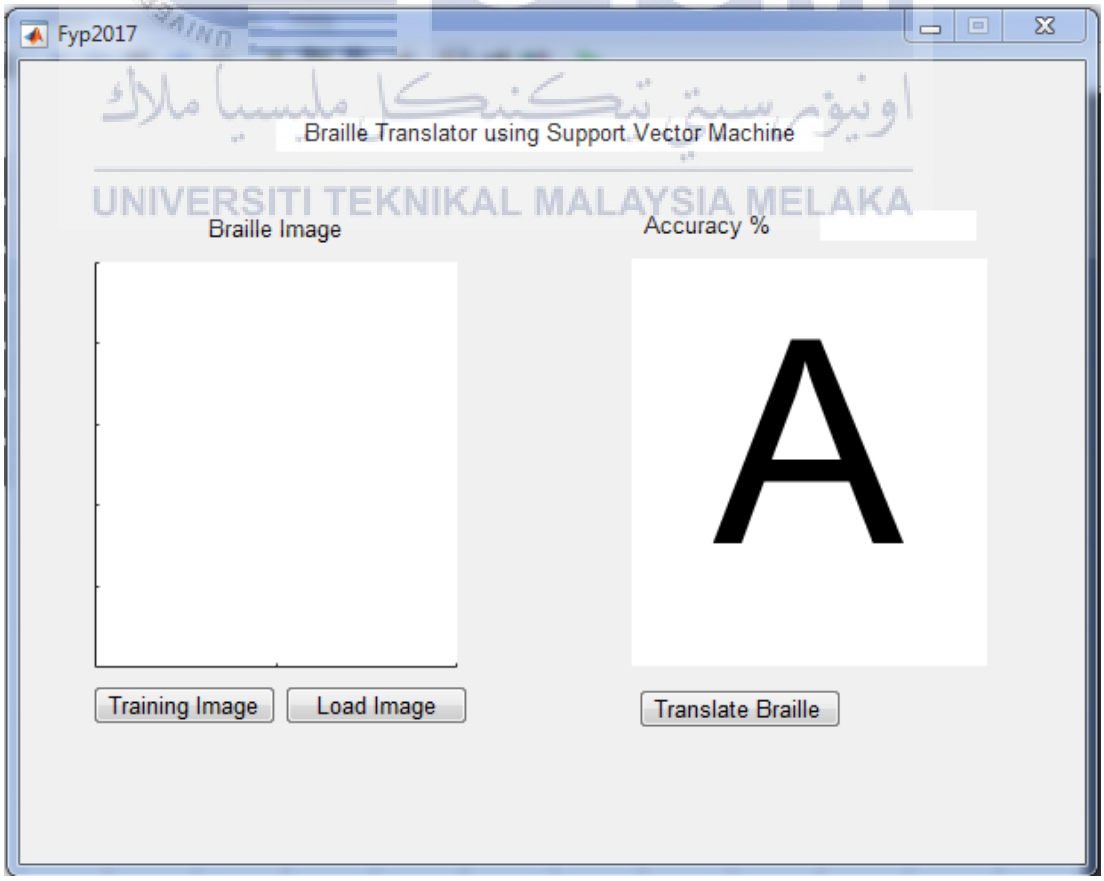
4.3.3.3.2 Input

The image will loaded by press the Load image button to open the image browser that contain braille to upload it to the system. The training button is used to training the image before use the system for increased the accuracy of the output.

Figure 4.9: Input for BTUSVM



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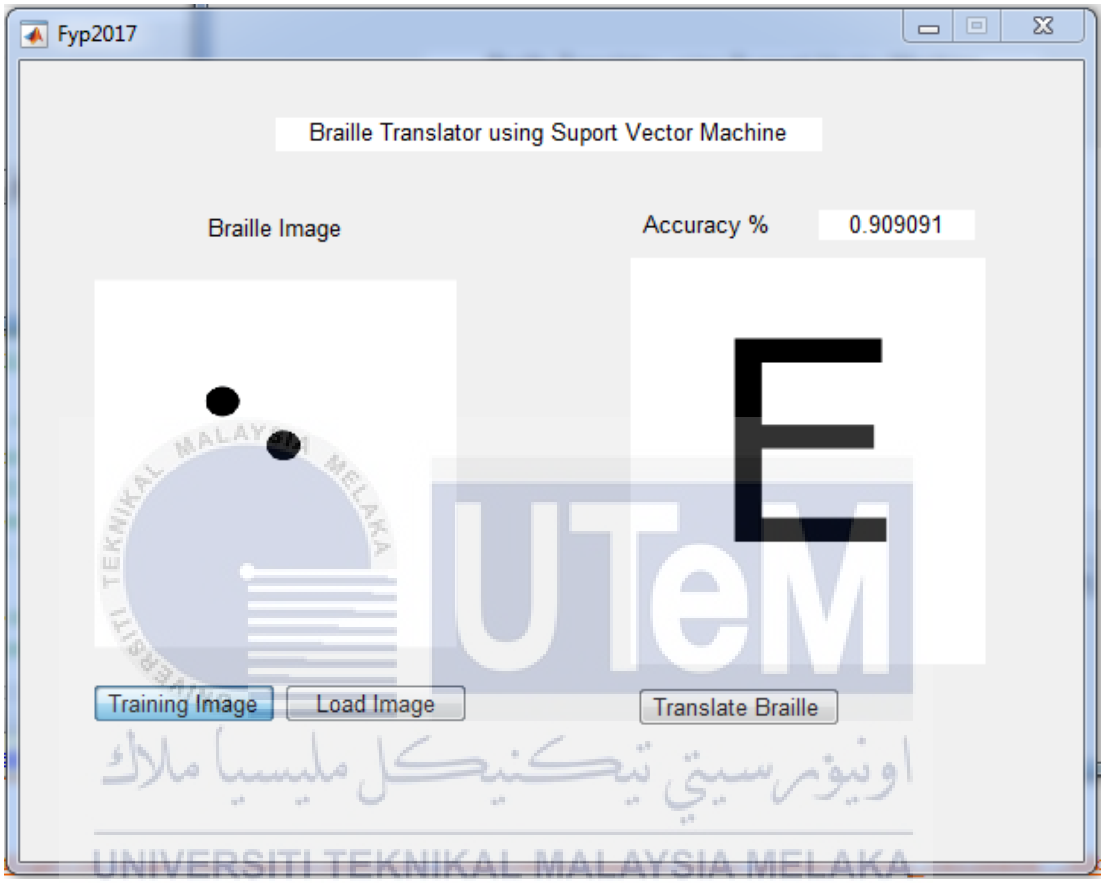
4.3.3.3.2 Output

The output will be given after user click translate button to get the answer. The user also can view the accuracy of the result.

Figure 4.10: Output for BTUSVM



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4.4 Conclusion

The proses of design of system is one of the important thing when develop of the project. This proses is crucial to avoid any issue while proses developing and implementation including of graphical user interfaces such navigation of the button, input and output design. Design of the project represent the real result of the output for the future design.

Chapter 5: Implementation

5.1 Introduction

The system development is based on the requirements and architectural design. In this chapter inspire following by developing the best and right system to fulfil of all of the requirement by using the right setup, tool and other.

5.2 Application Development Environment Setup

Braille translator application consist of three parts which is user services, input of user and output of the result. The user services are for the graphical user interphase that displayed to the user for the navigation by the interface. Input of the user is the picture that contain braille image and the output of the result is the actual right output which should being produced.

5.3 Version Control Procedure

During the implementation of the system, the documentation and the coding process keep changing. The changing of the version is recorded for future reference. It is to make sure that system has its own history record. With this version control procedure, a latest version of the document can be obtained at any time. Below shows the version of the system.

Table 5.1: Version Control Procedure

Version	Description
BTUOCR 1.0	This version only consist of graphical user interface without working functionality
BTUOCR 1.1	This version is started to include function in the right button in the GUI stage by stage
BTUOCR 1.2	This version is for the unit testing. Each modules are testing to obtain the bug and fixed the error
BTUOCR 1.3	The BTUOCR 1.2 is corrected and improved and enhanced with better specification for the system testing through all modules function
BTUOCR 1.4	The full version of system is completed

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5.4 Conclusion

This chapter is discuss about the implementation of the application to show the deployment of the system for setup the environment of the application. In the next chapter the testing unit will be discussed.

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CHAPTER VI

Testing

6.1 Introduction

In this chapter the testing of the application is needed to obtain the expected output. Software testing is an important part that need to evaluate the ability of the application for correct outcome by testing the algorithm. Test plan and the result of the testing can be discussed in this chapter to find out whether it fulfil the requirement for the project. The system functionality are make to test the quality, verify and validate the application.

6.2 Test Plan

The system of the application can be test and observe in each of the testing along with chosen input data. The outcome of the test can be evaluated and analysed by the observer or developer. The observer developer assure that testing or developer carries the testing procedure according have been planned and get the satisfaction of the outcome that should produce.

6.3 Test Strategy

Test strategy has been prepared to test the feature of the system whether it meet the requirement or not. The testing strategy in BTUOCR are categorized as functional or structural. Functional testing based on the specification or model while structural testing related to the implementation.

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6.3.1 Classes of Test

In this project, each testing consist of white box testing, black box testing and performance that been involved for the procedure and testing requirement for the project development.

- White box testing

Test cases are gotten from the program structure. There are numerous procedures accessible in this testing because the issue or immovability is facilitated by specific consideration and learning on the structure of the framework under unit testing

-Black box testing

Test cases are focus on part the best way to boost the adequacy of testing, for the most part the quantity of the experiments with minimum cost. It is unrealistic to altogether test a subset of the info space.

-Performance testing

The framework not set a limitless asset or opportunity to execute. Run of the mill of assets that should be considered incorporate disk space, CPU cycle, memory utilization and disk access operation. The assessment, bottleneck ID and performance are the objective for the execution of the unit testing.

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6.4 Test Design

Test design is use to setup an environment to test the system featuring the test case and lets the user gain information from real world. The input data are testing by create or take the actual input from the resource.

6.4.1 Test Description

All the test case available in the system has been identify and documented in the report. Tester can do the testing based on the script given and the report can be generated based on the obtain result.

6.4.1.2 Test Description: Training Test

Table 6.1: Training Test

Training Input Image		Accuracy Result	
A - K	**M - Z**	**0.9090**	**0.7333**
A - N	**M - Z**	**0.6923**	**0.7333**
A - L	**M - Z**	**0.5300**	**0.7333**

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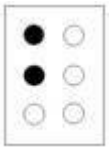
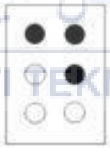
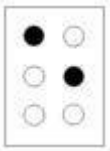
6.4.1.2 Test Description: Data Testing

Table 6.1: Data testing

No.	Input Image	Expected Result	Final Result	Status Test
1		A	A	Ok
2		B	D	Not Ok
3		C	C	Ok
4		D	D	Ok
5		E	E	Ok
6		F	F	Ok

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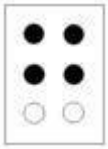
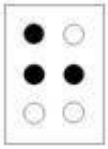
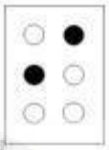
7		G	G	Ok
8		H	H	Ok
9		I	I	Ok
10		J	J	Ok
11		K	K	Ok
12		L	N	Not Ok

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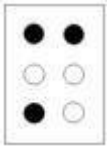
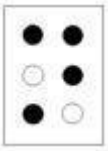
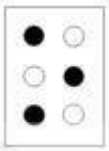
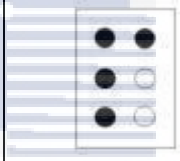
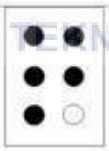
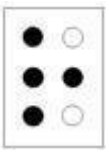
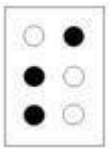
13		M	M	Ok
14		N	P	Not Ok
15		O	O	Ok
16		P	P	Ok
17		Q	Q	Ok
18		R	R	Ok
19		S	M	Not Ok

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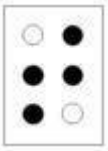
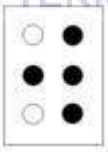
20		T	T	Ok
21		U	U	Ok
22		V	V	Ok
23		W	W	Ok
24		X	X	Ok

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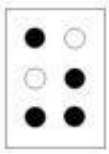
25		Y	Y	Ok
26		Z	Z	Ok

6.5 Conclusion

In this chapter, the entire test plan, test strategies and test phase has been discussed. The test outcome is appeared in the last part and the vast majority of the outcome is successful and have some error for the test stage. This demonstrates the testing stage is a helpful stage keeping in mind the end goal to decide the blunder or slip-up in the application. It also can give contribution in further system development and in additionally can give commitment in advance framework improvement

For next part, it can be the conclusion for entire project which include the strength, plans for future improvement and the contribution of the entire project toward the society.

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Chapter VII

Project Conclusion

7.1 Observation on Weaknesses and Strengths

The observation of the weaknesses and strengths of the system that have been developed in this project, its contribution to the user and proposition for improvements in the future. In this chapter, it can review the project whether the system developed is successfully achieved its scope and objectives that was discussed in the previous chapter. The weaknesses and the strengths are normal to have in any system development. The strengths in the system are good thing that can be the system be successful while the weaknesses in the system are the thing that important to addresses in the future the improvement

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7.1.1 Strength

For this project the strength can be seen in aspect of the development. This system a build for helping the instructor to convert the braille to the Roman alphabet. The application is easily to use as it have own graphical user interphase for the navigation of the system.

The development of the application are truly will help the instructor to do the teaching and marking with this system. The instructor just insert the image contain the braille dot and the system will matching it with the right alphabet. From this application usage the instructor will never to matching it by self as the system are capability to detect the all braille in the most accurate.

Hence make the process of teaching and marking are more interactive and will help to motivate young instructor to teach the impaired vision student. The application also can be used to learn the braille for the amateur instructor whose want to learn the braille.

7.1.2 Weakness

After doing a full analysis on the whole project, there are some error been detected for the braille translator using an OCR and SVM. Firstly the radius of the dot most not exceed the limit which will make the system cannot detected or recognized as a braille in the main system. This is because the system is been set to make the efficacy and ease the recognized the braille. Hence, make the system matching the right braille to the right alphabet.

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While in the braille translator using SVM the image contain braille must supposedly in the PNG format rather than JPEG it is because the background of the image is remove immediately when entering the system instead of JPEG image that make the system process the all background contain in it. The computing power also are factor to make the system efficiency because there many braille image are used as trainings set. Then the braille image in the PNG format are been choose cause the medium computing power can be used to run the system smoothly when do training and test set.

7.2 Proposition of Improvement

This application need more improvement to recover all the weaknesses and find the suitable solution to make this application more useful. Moreover this application must be always tested by developer to make the system is stable and free from error. The suggestion by the user also must be taken as priority and complement when build and develop this application.

In the future development the image of the braille also can be in any format especially in the PNG and JPEG as an input. The braille image must be taken with the clearly and high resolution to help and enhance the process of the converter of braille image to alphabet.

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The development of the system must do in the CPU with more computing power, higher graphic card and processor to run the system smoothly and efficiency. The training and test data are need a high computing power to the process because the process of doing the calculation are very lot. After the training process, the test data then are implement to find the accuracy which are crucial part to make the process of matching the braille with the right alphabet are higher than 70%.

7.3 Contribution

• Contribution to a university: This system are develop by the degree student of the UTeM, thus can be reference by the other lecturer and student when doing the same or similarity project as a tutorial and guided.

• Contribution to the school: The amateur instructor will be able to learn the braille and marking the paper that contain the braille easily. Hence make young instructor more motivate when the teaching process with the impair vision student are fluently and relaxing.

• Contribution for an individual: From development of the application make the student more confident and skilful to build a more advance application as them are take about 20 week to finish the final year project.

•Contribution to the instructor: This system is develop and design for the instructor to help them improve the way of their teaching in the school with the impair vision student. The process of learning will became interactive with this help from this application.

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7.4 Conclusion

For the conclusion the project documentation have been successfully accomplished in the range of the time given. The application are finished before a deadline make the process of documentation are smoothly and design carefully for the report to the higher up of the final year project committee. Most of the requirement and specification are completely distribute and fulfil with the term and condition to accomplish the benchmark of the final year project subject.

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