CHAPTER 1

THE PROBLEM AND ITS BACKGROUND

A. Introduction

A Braille character or cell which is depicted in Figure 1.1 is composed of six dots arranged in two columns and three rows. It has sixty-four possible combinations that contain letters, numbers and special characters [Lao,2009].

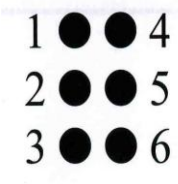

Figure 1.1
Numbered positions of dots on a Braille cell

Braille is a method of reading and writing text through touch, rather than sight. It is mainly used by those with impaired vision; however, sighted people can read Braille as well. There are many reasons for this, especially for those with a blind or visually impaired person in their household. There are many types of literary Braille. The most commonly taught and used is Grade 2 Literary Braille (see Figure 1.2), which is a space-saving alternative to Grade 1 Braille. In Grade 2 Braille, a cell can represent a shortened form of a word.

a	but	can	do	every	from	go	have	just	knowledge	like	more	not
people	quite	rather	so	that	us	very	will	it	you	as	and	for
of	the	with	child/ch	gh	shall/sh	this/th	which/wh	ed	er	out/ou	ow	bb
cc	dd	en	gg; were	in	st	ing	ar					

Figure 1.2
Example of Grade 2 Braille

B. Background of the Study

Nowadays, computers are very helpful and important. It help the people do a lot of things easier, from school work to office work. These computers are important due to the data it process and store because those significant bits are the computers' need in order to accomplish something. Data contain information that are stored inside the computer's hard disk which are very useful since it can easily be kept without the worry of deteriorating itself even as time goes by.

In the early years, important documents are being converted to data or being digitalized for an easier accessibility and storage but converting hard copies to their equivalent data form can be very hard and time consuming since one would need to retype everything in a given document. With the technology and OCR (Optical Character Recognition) these tasks are done easier. Through OCR, a scanned image of the document can be used to translate the document page to a word processor file, thus eliminating the process of retyping every letter in the document. OCR is the basis of other recognition systems that also deal with digitalizing documents, one example is OBR (Optical Braille Recognition). OBR is needed because of the need to digitalize Braille documents that are slowly deteriorating. Those Braille documents which are much more bulky than text only documents contain very important information that have been gathered and those Braille documents would often be needed by other people so digitalizing them would help a lot of people that would need it and also reading a Braille document would require a special course to be read thus those who do not know how to read would often just disregard Braille documents

in their research. Through OBR, Braille documents would be digitalized and also be translated to common English.

To describe a Braille document, it has a standard size of 11 by 11.5 inches. A Braille document may be single or double sided. This study will focus on double sided Braille documents. A double sided Braille document has 2 sides, the dots facing the reader is called the protrusions or called as the embossed side. The other side which is called as the depressed side has the dots called depressions which are the ones facing the other side

This study is based on a previous study on Optical Braille Recognition entitled Optical Braille Recognition Using Modified Character Isolation Box and Pattern Generation. The previous study deals with the recognition of Grade 1 Braille using Character Isolation Box and Pattern Generation algorithm. Pattern Generation was modified by the proponent to solve the problem in recognizing the Braille characters. In implementing his study, the proponent went through image preprocessing first. In the preprocessing phase, the image underwent noise reduction and thresholding. The image skews were also corrected to preserve the data in the scanned image. However, the cropping process of the de-skewing phase sometimes fails due to some poor edge detection problems.

C. Statement of the Problem

1. How will the system interpret the Braille document if upon scanning, the document/page is already skewed?

The absence of an input de-skewing algorithm leaves very little margin of error in terms of the angle of the scanned image input, the segmentation algorithm

immediately attempts to cut the image into equal and usable segments. If the image is skewed, the image will be cut into useless segments because the associated Braille dots that should go together in one segment will most likely end up in separate segments. The previous study lacks an input de-skewing process that comes before the segmentation algorithm.

2. How will the algorithm for character recognition identify it as a Grade 2 Braille?

Since Grade 2 Braille is used and the previous study is limited to Grade 1 Braille, there is a need to develop a system that is able to accommodate Grade 2 Braille. The previous study does not come with a grouping function that takes into consideration the preceding and succeeding characters, it only maps one cell to one character and does not recognize the arrangement of the letters. Because of this, the existing program can only identify one Braille character at a time thus limiting it to the system to recognizing only Grade 1 Braille while Grade 2 Braille is made up of at least 2 characters to form shortened words and is governed by very different contraction rules.

3. How will the system differentiate the embossed side from the depressed side since they both produce shadows that is recognized a character?

Since the current system applies thresholding and then commences the recognition of the dots based on a cluster of black pixels, a scanned image of a double sided Braille would not be properly interpreted due to the impressions caused by the other side of the document. These impressions would be identified as dots in the

faced side of the document in effect this would produce misleading dots that could be interpreted as a part of the Braille cell that is being read. The previous system is unable to differentiate the embossed dots from the impressed dots.

The Braille system has six possible places of dots (see Figure 1.3). For example a Braille cell that is equivalent to letter A (see Figure 1.4), the only dot that should be visible is the 1st dot, however the Braille cell could be misinterpreted as a Braille cell equivalent to letter B (see Figure 1.5). If there happens to be an impression on the 2nd dot on the Braille cell, that impression will be interpreted as a dot, the Braille cell would be interpreted as a Letter B instead of A.

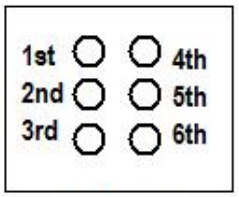

Figure 1.3
6 possible places of dots

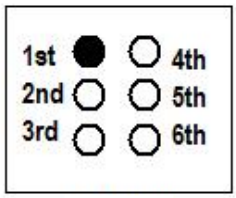

Figure 1.4
Braille cell equivalent
to letter A

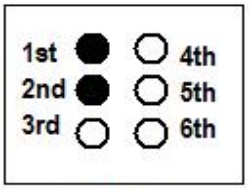

Figure 1.5
Braille cell equivalent
to letter B

D. Objectives of the Study

i. General Objective

The primary goal of the study is to modify the existing segmentation and recognition approaches to accurately and correctly translate scanned Grade 2 Braille documents into English text.

ii. Specific Objectives

1. To modify the existing image recognition algorithms to recognize Grade 2 Braille;

2. To create a stand alone application that interprets a double sided and Grade 2 Braille document; and

3. To improve de-skewing process of the scanned image.

E. Significance of the Study

Many people can benefit from this thesis. Everyone who works with blind people and does not read Braille can benefit from using the OBR. For example: teachers who do not read Braille, people who work in public organizations, those who communicate with the Blind individuals and people who work in computerized Braille libraries [Neovision]. In school, normal individuals like students and teachers may gain knowledge on Braille to help them communicate with the visually impaired ones and vice versa. Since Braille documents are stored in computers, there is a big chance that many people may access those Braille documents therefore, those people may not buy Braille documents because as everyone knows, buying Braille documents is a little bit costly and tiresome. Grade 2 Braille is actually an addition to Grade 1 Braille. The study can reduce the computer memory used by Grade 1 Braille documents because some Grade 2 Braille characters are abbreviated and combined to represent some words. The use of contractions of Grade 2 Braille reduces the bulk of the material and speed up the reading process [Wilson, 2005].

F. Scope and Delimitation of the Study

Scopes

- The system can only scan Grade 2 Braille documents.
- The system is focused on double sided Braille documents.
- The system can interpret a 6-dot Braille cell

- The system can accept lowercase Braille characters.
- The system can cover the Grade 2 Braille contractions.
- The flatbed scanner must be set into 200 dpi.

Limitations

- The system can only support JPEG & 24-bit BITMAP image formats.
- The system only accepts English alphabetic Braille and not other type of Braille documents like musical Braille or other languages like Arabic, Chinese and French.
- Numeric Braille, uppercase Braille letters and special Braille characters are not covered.
- The system can only translate Braille word or short phrase/s to its equivalent English word/phrase that is cut or cropped from the scanned page of the Braille document.
- The Braille document to be scanned should be in excellent condition.
- The Braille document to be scanned should not contain foreign objects.
- The Braille document to be scanned should not have dots that are very close/ joined with each other.
- The system can only correct slanted or skewed images at an angle less than or equal to 5.5 degrees.
- A single character input should have at least 1 dot per row and column.
- Only Braille documents that have a standard size of 11 x 11.5 inches can be used as source.