BRAILLE TO VOICE CONVERTER USING PIC MICROCONTROLLER

ZAMZALIZA BINTI ROSLAN

This report is submitted in partial fulfillments of the requirements for the award of Bachelor of Electronic Engineering (Industrial Electronics) with Honors

Faculty of Electronic and Computer Engineering

Universiti Teknikal Malaysia Melaka

April 2010

UNIVERSTI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : BRAILLE TO VOICE CONVERTER USING PIC MICROCONTROLLER

Sesi Pengajian : 2009/2010

Saya ZAMZALIZA BINTI ROSLAN
mengaku membenarkan Laporan Projek Sarjana Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. Sila tandakan (√) :

[ ]	**SULIT***	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)
[ ]	**TERHAD***	(Mengandungi maklumat terhad yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)
[/]	**TIDAK TERHAD**	

Disahkan oleh:

(TANDATANGAN PENULIS)

(COP DAN TANDATANGAN PENYELIA)

ADIE BIN MOHD KHAFE
Pensyarah
Fakulti Kejuruteraan Elektronik Dan Kejuruteraan Komputer
Universiti Teknikal Malaysia Melaka (UTeM)
Karung Berkunci No 1752
Pejabat Pos Durian Tunggal
76109 Durian Tunggal, Melaka

Alamat Tetap: Kg. Pt. Abd Rahman
Kayu Ara Pasong, 82010
Pontian, Johor.

Tarikh:

Tarikh: 30/4/2010

"I hereby declare that this report is the results of my own work except for quotes as cited in the reference."

Signature : ....

Author : Zamzaliza binti Roslan

Date : 29 April 2010

"I hereby declare that I have read this report and in my opinion this report is sufficient in terms of the scope and quality for the award of Bachelor of Electronic Engineering (Industrial Electronics) With Honors"

Signature : ....

Supervisor's name : En Adie bin Mohd Khafe

Date : 30 April 2010

ACKNOWLEDGEMENT

First and foremost, I would like to thank ALLAH SWT The Most Gracious and Merciful for giving me the strength to carry out this project. I would like to express my gratitude to my project supervisor, Mr Adie b. Mohd Khafe for his guidance, motivation, encouragement and endurance during the whole course of this project.

A special thank to my family for their unconditional love and support and also motivation despite the distance. All of your support rather in there, physically and mentally indeed giving me a lot of joy.

To my beloved friends, I would like to express the highest appreciation. For their technical advice and material aid that have helped and supported me along the way, I thank you from the bottom of my heart. I wish you all the best in life and hope that our friendship will last forever.

Last but not least, I would also like to thank those who had helped me directly and indirectly. Unfortunately, it is not possible to list all of them in this limited space. Thank you.

ABSTRACT

This project is about to design Braille to Voice Converter using PIC Microcontroller. The whole system of this project combines infrared sensor, comparator, and 'Peripheral Interface Controller' (PIC) microcontroller. Translation using current method need to be translated alphabet by alphabet and not practical if we are in emergency situation. So the main purpose of this project is to translate Braille writing faster, easy and can used by anyone even with zero knowledge of Braille writing. Infrared sensor is used to detect raise dot of Braille and translate using microcontroller.

ABSTRAK

Projek ini berkenaan merekabentuk Penterjemah Braille kepada suara dengan mengunakan mikropengawal *'Peripheral Interface Controller' (PIC).* Keseluruhan projek ini menggabungkan sensor inframerah, pembanding, dan mikropengawal PIC. penterjemahan dengan menggunakan cara yang biasa memerlukan terjemahan huruf ke huruf dan merupakan cara yang tidak praktikal ketika berada di dalam kecemasan. tujuan utama projek ini adalah menterjemah tulisan Braille dengan lebih pantas, mudah dan boleh digunakan oleh sesiapa sahaja walaupun tanpa pengetahuan mengenai tulisan Braille. Sensor inframerah digunakan untuk mengesan titik tulisan Braille dan diterjemah menggunakan mikropengawal.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

1.1 Project Overview

This project is to develop a product where it can help the student (blind person) in their Braille training. Student will do exercise of Braille word reading where they will touch the Braille dot and tryto read it. This device will help the student by informing the blind person of what actually the answers of the Braille word via voice whether what they read is correct or wrong. Students also need to utilize combination of appropriate sensor and fiber optic and convert the information to voice. This device hopefully can also be utilized, to help the blind person during their Braille typing session and to check whether article or essay they write is correct.

1.2 Problem Statement

In school for blind student, they learn about the Braille writing. When they write, they don't know whether what they write is correct or wrong. Current method, they can check what they have done by touching the Braille dot. The projects, Braille to voice converter system are build so that can help blind person to check what they write in Braille is right or wrong.

1.3 Project Objective

1. To design a system that can help the blind person to check whether the phrase of word for Braille which they created is correct or wrong by using Brailleto voice converter.
2. To complete a mini prototype of this Braille to voice converter system using PIC Microcontroller by combining software and hardware part.

1.4 Scope of Work

Scope of work in this project consists of two major parts:

1) hardware
2) Software

1.4.1 Hardware

This part is focusing on hardware for infrared sensor circuit and comparator. The circuit will use six infrared and the output of each sensor must be in 5V or 0V. The high and low voltage will be read by microcontroller as 1 and 0. Using PIC16f87A to control the input from the sensor and convert it into equivalent voice or audio form.

1.4.2 Software

This part is focusing on the programming aspect to read data fromsensor and convert to voice. The suitable program arrangement needs to be programmeddt ensure synchronization between sensor programs. The program will be written using C language. The output of the project will convert to voice converter. Testing and calibration on real hardware will carry out to ensure it is functionally correct.

1.5 Project Methodology

Basically, this project starts with study all the research and study journals, application notes, all data and book about Braille writing, the working of PIC and study on available design. Then study the C language and simulation using PICC Compiler software. After that is circuit designing using simulation software, Proteus 7 to simulate the circuit and microcontroller programming.Lastly construct the prototype circuit and test the circuit with real device.

1.6 Report Structure

This report divides of five chapter where Chapter 1 is an introduction of this report which explains briefly Braille writing. This chapter includes the project introduction, project objective, problem statements, scope of work, brief explanation about project methodology and the report structure.

Chapter 2 is about background study where details research on the Braille writing, PIC microcontroller, Infrared sensor, and other theory related with this project.

Chapter 3 is about project methodology that is explaining step by step about the whole method being using for this project. This chapter contains the methods used such as data collecting, process and analyzing of data and flowchart.

Chapter 4 covers about the circuit used in this project, simulation and pratical results.

Chapter 5 will explain theconclusion of this project. Any suggestion regarding of this project willbe covered in this chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

For implementation of this project, several methodologis have been employed and need to be understood thoroughly. This chapter covers the study of Braille writing, infrared sensor and PIC 16f877A microcontroller (hardware and software).

2.2 Braille

The Braille system is a method that is widely used byblind people to read and write. Braille was devised in 1821by Louis Braille, a blind Frenchman. Each Braille character or *cell* is made up of six dot positions, arranged in arectangle containing two columns of three dots each. A dot may be raised at any of the six positions to form sixty four (2^6) permutations, including the arrangement in which no dots are raised[5]

For reference purposes, a particular permutation may be described by naming the positions where dots are raised, the positions being universally numbered 1 to 3, from top to bottom, on the left, and 4 to 6, from top to bottom, on the right. For example, dots 1-3-4 would describe a cell with three dots raised, at the top and bottom in the left column and on top of the right column, i.e., the letter *m*. The lines of horizontal Braille text are separated by a space, much like visible printed text, so that the dots of one line can be differentiated from the Braille text above and below. Punctuation is represented by its own unique set of characters.

The Braille system was based on a method of communication originally developed by Charles Barbier in response to Napoleon's demand for a code that soldiers could use to communicate silently and without light at night called night writing. Barbier's system was too complex for soldiers to learn, and was rejected by the military. In 1821 he visited the National Institute for the Blind in Paris, France, where he met Louis Braille. Braille identified the major failing of the code, which was that the human finger could not encompass the whole symbol without moving, and so could not move rapidly from one symbol to another. His modification was to use a 6 dot cell - the Braille system - which revolutionized written communication for the blind.

2.2.1 The Braille Alphabet

Braille can be seen as the world's first binary encoding scheme for representing the characters of a writing system. The system as originally invented by Braille consists of two parts:

1. A character encoding for mapping characters of the French language to tuples of six bits or *dots*.
2. A way of representing six-bit characters as raised dots in a Braille cell.

Today different Braille codes (or code pages) are used to map character sets of different languages to the six bit cells. Different Braille codes are also used for different uses like mathematics and music. However, because the six-dot Braille cell only offers 63 possible combinations (2^6 - 1 = 63), of which some are omitted because they feel the same (having the same dots pattern in a different position), many Braille characters have different meanings based on their context. Therefore, character mapping is not one-to-one. In addition to simple encoding, modern Braille transcription uses contractions to increase reading speed.

2.2.2 The Braille Cell

Braille generally consists of cells of six raised dots arranged in a grid of two dots horizontally by three dots vertically. The dots are conventionally numbered 1, 2, and 3 from the top of the left column and 4, 5, and 6 from the top of the right column as shown in figure 2.1.

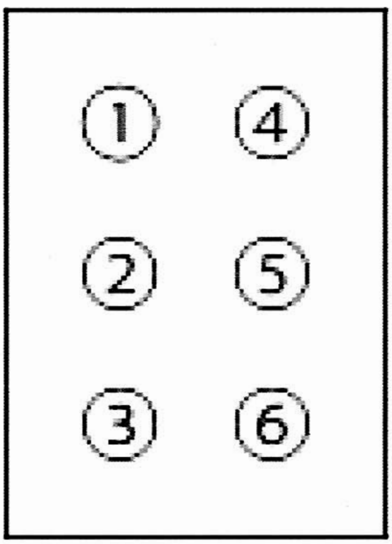

Figure 2.1: Braille dot arrangement

The presence or absence of dots gives the coding for the symbol. Figure 2.2 show the Braille size that the dot height is approximately 0.02 inches (0.5mm); the horizontal and vertical spacing between dot centers within a Braille cell is approximately 0.1 inches (2.5 mm); the blank space between dots on adjacent cells is approximately 0.15 inches (4 mm) horizontally and 0.2 inches (5.0mm) vertically. A standard Braille page is 11 inches by 11.5 inches and typically has a maximum of 40 to 43 Braille cells per line and 25 lines.

As originally conceived by Louis Braille, a sequence of characters, using the top four dots of the Braille cell, represents letters a through j. Dot 3 is added to each of the through j symbols to give letters k through t. Both of the bottom dots (dots 3 and 6) are added to the symbols for "a" through e to give letters u, v, x, y, and z. The letter w is an exception to the pattern because French did not make use of the letter "w" at the time Louis Braille devised his alphabet, and thus he had no need to encode the letter "w".

English Braille codes the letters and punctuation, and some double letter signs and word signs directly, but capitalization and numbers are dealt with by using a prefix symbol. In practice, Braille produced in the United Kingdom does not have capital letters.

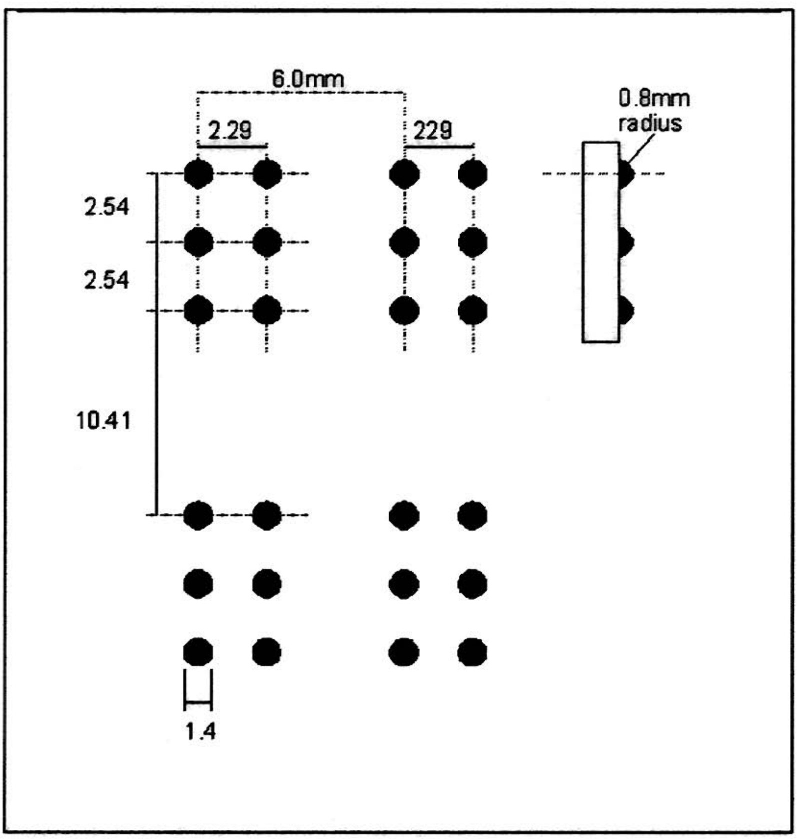

Figure 2.2: Braille size

2.2.3 Letters, Number and Symbol.

There are three different versions of Braille:

1) Grade 1, which consists of the 26 standard letters of the alphabet and punctuation. It is only used by people who are first starting to read Braille.

2) Grade 2, which consist of the 26 standard letters of the alphabet, punctuation and contractions. The contractions are employed to save because a Braille page cannot fit as much text as astandard printed page. Books, signs in public places, menus, and most other Braille are written in Grade 2 Braille.

3) Grade 3, which are used in personal letters, diaries, and notes. It is a kind of shorthand, with entire words shortened to a few letters.

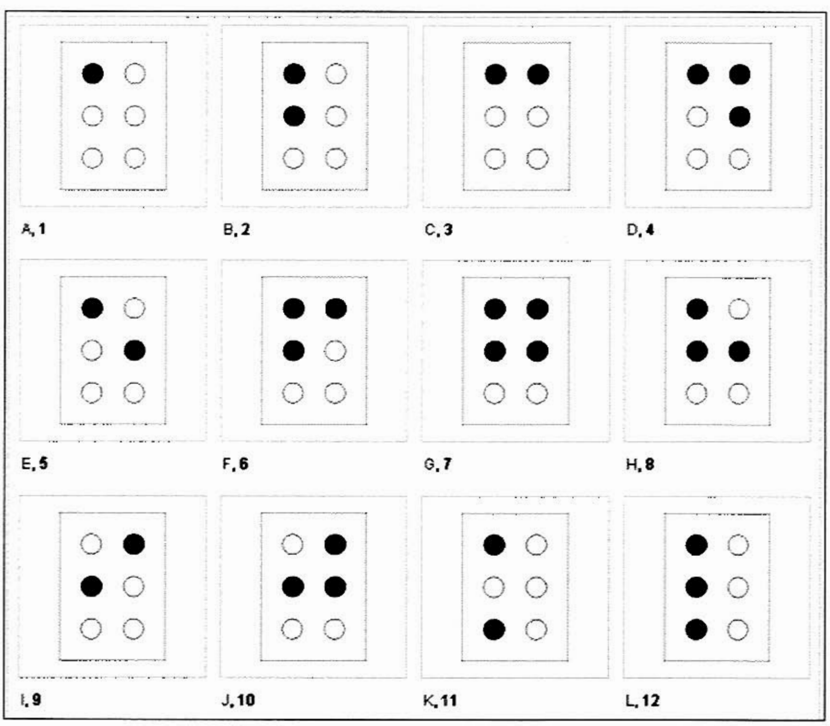

Figure 2.3: Letter of Braille Alphabet

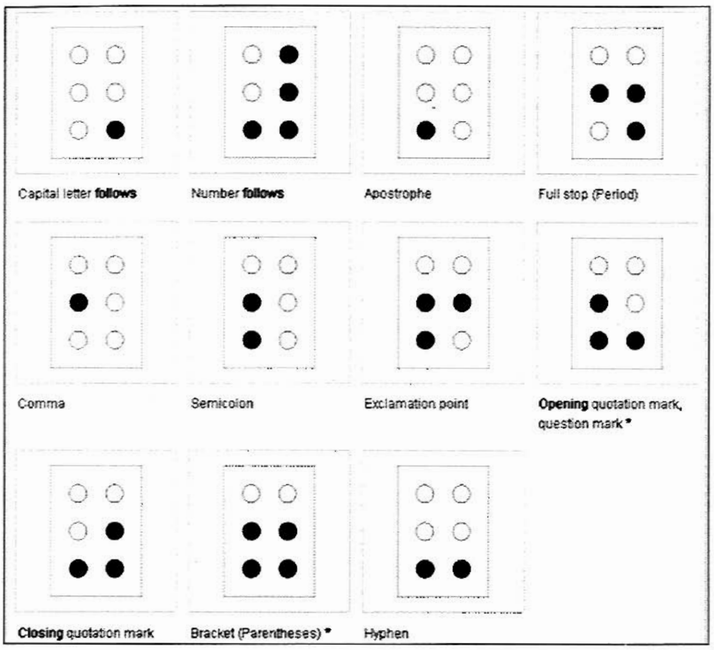

Figure 2.4: Other Symbols for Braille Writing

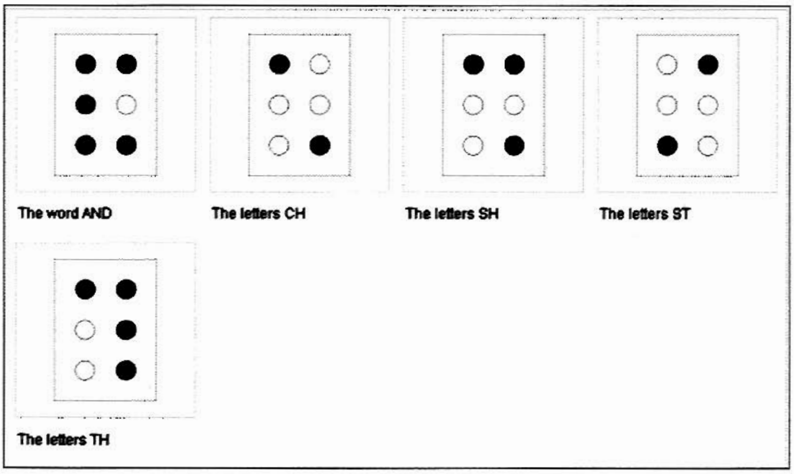

Figure 2.5: Grade 2 Braille Writing

2.3 PIC Microcontroller

PIC is a family of Harvard architecture microcontrollers made by Microchip Technology, derived from the PIC1640 originally developed byGeneral Instrument's Microelectronics Division. The name PIC initially referred to Peripheral Interface Controller". PICs are popular with both industrial developers and hobbyists alike due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, and serial programming (and re-programming with flash memory) capability.[3]

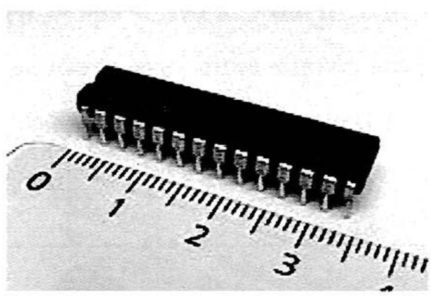

Figure 2.6: Single Chip PIC

The PIC architecture is distinctively minimalist. It is characterized by the following features: [3]

- Separate code and data spaces (Harvard architecture)
- A small number of fixed length instructions
- Most instructions are single cycle execution (4 clock cycles), with single delay cycles upon branches and skips
- A single accumulator (W), the use of which (as source operand) is implied (i.e. is not encoded in the opcode)
- All RAM locations function as registers as both source and/or destination of math and other functions.
- A hardware stack for storing return addresses
- A fairly small amount of addressable data space (typically 256 bytes), extended through banking

- Data space mapped CPU, port, and peripheral registers
- The program counter is also mapped into the data space and writable (this is used to implement indirect jumps).

2.3.1 PIC16F877A

In this project, we choose the PIC16F877 as the brain for the project. The microcontroller is chosen because it common used and provides more input and output port and supports more function. The PIC16F877 microcontroller will serves as medium to encode the data input and decode to text. Input signals are sent to the microcontroller and the microcontroller will process the data and convert the data to Roman character. [3]

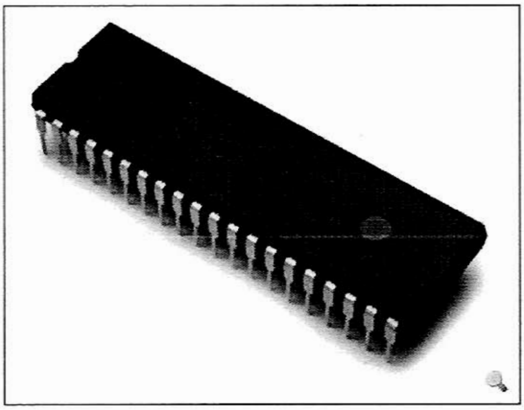

Figure 2.7: Microchip PIC16F877A

A unit of microchip PIC16F877A microcontroller running at 20MHz with 8Kbytes of flash memory and 256 bytes EEPROM will used as controller. This type of microcontroller is selected because it has large memory for programming. PIC16F877A microcontroller has 5 ports that could be used as input or output. If the prts that used as input or output, programmer must assigned port in order to use that port as input or output. The figure below shows pins and block diagram for PIC16F877A microcontroller.