

**BRAILLE TO ROMAN TEXT CONVERTER USING PIC
MICROCONTROLLER**

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

Faculty of Electronic and Computer Engineering
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**BRAILLE TO ROMAN TEXT CONVERTER USING PIC
MICROCONTROLLER**

Laporan ini dikemukakan untuk memenuhi sebahagian daripada syarat
penganugerahan Ijazah Sarjana Muda Kejuruteraan Elektronik (Elektronik Industri)
dengan kepujian.

Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer
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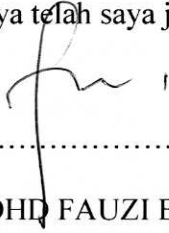
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ABSTRACT

This project is about to designing Braille to Roman Text Converter using PIC Microcontroller. The whole system of this project combines infrared sensor, comparator, “Peripheral Interface Controller” (PIC) microcontroller and Liquid Cristal Display (LCD). Translation using current method need to translate letter by letter 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 be used by anyone even with zero knowledge of Braille writing. Infrared sensor used to detect raise dot of Braille and translate using microcontroller. The Roman text output display then on LCD.

ABSTRAK

Projek ini berkenaan tentang merekabentuk Penterjemah Braille kepada Teks Roman dengan menggunakan mikropengawal "*Peripheral Interface Controller*" (*PIC*). Keseluruhan sistem projek ini menggabungkan sensor inframerah, pembanding, mikropengawal PIC dan paparan cecair kristal (LCD). Terjemahan menggunakan cara yang biasa memerlukan terjemahan huruf ke huruf dan ini adalah tidak praktikal ketika situasi kecemasan. Jadi tujuan utama projek ini adalah untuk menerjemah tulisan Braille dengan pantas, mudah dan boleh digunakan oleh sesiapa walaupun tanpa sebarang pengetahuan mengenai tulisan Braille. Sensor inframerah digunakan untuk mengesan titik tulisan Braille yang timbul dan diterjemah menggunakan mikropengawal. Keluaran teks Roman kemudiannya dipaparkan di LCD.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGES
	PROJECT TITLE	i
	ACKNOWLEDGEMENT	viii
	ABSTRACT	ix
	ABSTRAK	x
	TABLE OF CONTENTS	xi
	LIST OF FIGURES	xv
	LIST OF TABLES	xvii
CHAP I	INTRODUCTION	1
	1.1 Project Overview	1
	1.2 Problem Statement	1
	1.3 Project Objective	2
	1.4 Scope of Work	2
	1.4.1 Hardware	2
	1.4.2 Software	2
	1.5 Methodology Project	2
	1.6 Report Structure	3
CHAP II	LITERATURE REVIEW	4
	2.1 Introduction	4
	2.2 Braille	4
	2.2.1 The Braille Alphabet	5
	2.2.2 The Braille Cell	6

2.2.3 Letters and Numbers and Symbol	7
2.3 PIC Microcontroller	9
2.3.1 Microcontroller PIC16F877A	7
2.4 CCS C Compiler	11
2.4.1 File Format	13
2.4.2 Overall Structure	14
2.4.3 Boot Loader	15
2.5 LCD	15
2.6 Infrared	16
2.6.1 Infrared Proximity Sensor	20
2.7 Comparator	21
2.8 Proteus VSM	23
2.8.1 ISIS and Simulation	24
2.8.2 General Points about Libraries	25
CHAP III METHODODOLOGY	27
3.1 Introduction	27
3.2 Project Flowchart	27
3.2.1 Project Proposal	27
3.2.2 Hardware Development	28
3.2.3 Software Development	29
3.2.3 Combining Software and Hardware	30
CHAP IV RESULTS AND DISCUSSION	32
4.1 Introduction	32
4.2 Project Circuits	32
4.3 Voltage Regulator	33
4.3.1 Voltage Regulator Schematic	33

4.3.2 Voltage Regulator Layout	34
4.4 Infrared Sensor and Comparator	34
4.4.1 Infrared Sensor and Comparator Schematic	35
4.4.2 Infrared Sensor and Comparator PCB Design	35
4.4.3 Infrared Sensor and Comparator PCB	36
4.5 Microcontroller and LCD	36
4.5.1 Microcontroller and LCD Schematic	37
4.5.2 Microcontroller, LCD and Voltage Regulator PCB Design	37
4.5.3 Microcontroller, LCD and Voltage Regulator PCB Design	38
4.6 Simulation Result	39
4.6.1 Program Codes	40
4.6.2 Main Program	40
4.6.3 LCD Program	41
4.6.4 Download the Programming to PIC	42
4.7 Practical Result	45
4.7 Discussion	47
CHAP V	
CONCLUSION AND RECOMMENDATION	49
5.1 Introduction	49
5.1 Conclusion	49
5.2 Suggestion and Future Work	50
REFERENCES	52
APPENDIX A1	53

APPENDIX A2	54
APPENDIX B1	55
APPENDIX B2	56
APPENDIX C	57
APPENDIX D	60
APPENDIX E	61

LIST OF FIGURES

NO	TITLE	PAGES
2.1	Braille Dot Arrangements	6
2.2	Braille Size	7
2.3	Single Chip PIC	9
2.4	Microchip PIC16F877A	9
2.5	Pin Diagram for PIC16F877A Microcontroller	10
2.6	Block Diagram for PIC16F877 Microcontroller	11
2.7	CCS C Compiler developed by Custom Computer Services	12
2.8	LCD	16
2.9	Infrared Spectrum	17
2.10	Infrared Reflection	20
2.11	Architecture for PROTEUS VSM	24
2.12	Library Browser	26
3.1	Project Flow Chart	28
3.2	Hardware Flow Chart	29
3.3	Software Flow Chart	30
3.4	Combining Software and Hardware Flow Chart	31
4.1	Braille to Roman Converter Block Diagram	33

4.2	Voltage Regulator Schematic	34
4.3	Infrared Sensor and Comparator Schematic	35
4.4	Infrared Sensors and Comparator PCB Design	36
4.4	Infrared Sensors and Comparator PCB	36
4.4	Microcontroller Circuit and LCD Schematic	37
4.5	Microcontroller, LCD and Voltage Regulator PCB Design	38
4.6	Microcontroller, LCD and Voltage Regulator PCB	38
4.7	Program Flowchart	39
4.8	Main Coding – Malay Braille Grade 2	41
4.9	flex_lcd.c Coding	42
4.10	Hardware to Download the Programming to PIC Microcontroller	43
4.11	Connecting to the Computer	43
4.12	The Programmer detect the PIC	44
4.13	The Programming is Successful	45
4.14	Braille to Roman Converter Prototype	46
4.15	Braille Dot Prototype	46

LIST OF TABLES

NO	TITLE	PAGES
2.1	PIC16F877A Device Features	10
2.2	Standard Code for File Format	13
2.3	LCD Pin Connection	16
2.4	Comparator Input Output	23

CHAPTER I

INTRODUCTION

1.1 Project Overview

This project is to build a prototype circuit to convert Braille character to Roman text by using PIC microcontroller. Braille character used by blind people to read and write, is made up of six dot positions, containing two columns of three dots each. The difference height of each dot will be sensed by using infrared sensor and represent as binary code. Microcontroller then used it to read the binary code and convert it to Roman text. The output will be displayed on LCD.

1.2 Problem Statement

Braille writing use by blind people. Normal people like us not necessary to used this writing but sometimes we need to translate these writing especially when we communicate with blind people. We can use books/website to translate each alphabet but it is time consuming and not practical if we are in emergency situation or we need the answer quick. With Braille converter, translation to Roman text will become more easily and can be used by anyone even with zero knowledge of Braille writing.

1.3 Project Objective

In order to ensure that the project objectives are met, one should:

1. To sense dots in Braille character cell using optical sensor
2. To develop PIC program to convert binary to Roman text
3. Built suitable Braille cell prototype that can be sense by optical sensor

1.4 Scope of Work

Scope of this project consists of two major part, hardware and software.

1.4.1 Hardware

This part is focusing on hardware development 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.

1.4.2 Software

This part is focusing on the programming aspect to read data from sensor and convert to. The suitable program arrangement needs to be programmed to ensure synchronization between sensor and program.

The program will be written using C language. The output of the will be displayed on LCD. Testing and calibration on real hardware will be carried 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 PIC C Compiler software. After that is circuit designing using simulation software, Proteus 7 to simulate the circuit and microcontroller's programming. Lastly construct a prototype circuit and test the circuit with real device. Troubleshoot the prototype if it is not functioning as expected.

1.6 Report Structure

This report divides to five chapters where Chapter 1 is an introduction of this report which explains briefly about 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 background study where details research on the Braille writing, PIC Microcontroller, Infrared sensor, LCD and other theory related with this project.

Chapter 3 is project methodology which explaining step by step about the whole method being used 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 practical results.

Chapter 5 is conclusion of this project. Any suggestion regarding of this project will be cover in this chapter.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

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

2.2 Braille

The Braille system is a method that is widely used by blind people to read and write. Braille was devised in 1821 by Louis Braille, a Frenchman. Each Braille character or cell is made up of six dot positions, arranged in a rectangle 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. 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 second (after Barbier's night writing system) 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 64 possible combinations, 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.

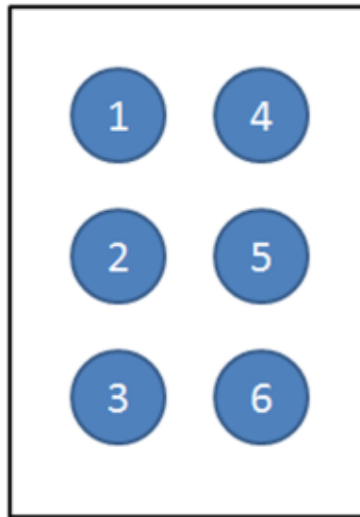


Figure 2.1 Braille Dot Arrangements

The presence or absence of dots gives the coding for the symbol. Dot height is approximately 0.02 inches (0.5 mm); 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 (3.75 mm) horizontally and 0.2 inches (5.0 mm) 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.

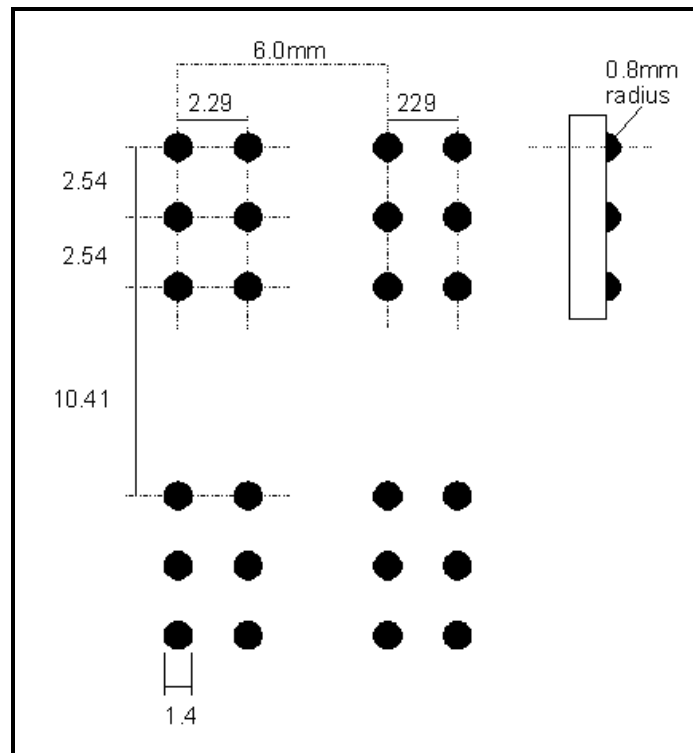


Figure 2.2 Braille Size

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 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.

2.2.3 Letters, Numbers and Symbol

There are three different versions of Braille: