HAND HELD TICKETING MACHINE

YVONE INGAN MATHEUS GIRES

FAKULTI KEJURUTERAAN
Universiti Malaysia Sarawak
2001

Borang Penyerahan Tesis
Universiti Malaysia Sarawak

BORANG PENYERAHAN TESIS

Judul: HAND-HELD TICKETING MACHINE.

SESI PENGAJIAN: 2000/2001

Saya **YVONE INGAN MATHEUS GIRES**
mengaku membenarkan tesis ini disimpan di Pusat Khidmat Maklumat Akademik, Universiti Malaysia Sarawak dengan syarat-syarat kegunaan seperti berikut:

1. Hakmilik kertas projek adalah di bawah nama penulis melainkan penulisan sebagai projek bersama dan dibiayai oleh UNIMAS, hakmiliknya adalah kepunyaan UNIMAS.
2. Naskhah salinan di dalam bentuk kertas atau mikro hanya boleh dibuat dengan kebenaran bertulis daripada penulis.
3. Pusat Khidmat Maklumat Akademik, UNIMAS dibenarkan membuat salinan untuk pengajian mereka.
4. Kertas projek hanya boleh diterbitkan dengan kebenaran penulis. Bayaran royalti adalah mengikut kadar yang dipersetujui kelak.
5. * Saya membenarkan/tidak membenarkan Perpustakaan membuat salinan kertas projek ini sebagai bahan pertukaran di antara institusi pengajian tinggi.
6. ** 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)

(TANDATANGAN PENYELIA)

Alamat tetap: 978J Taman Kemena,
Jalan Tanjung Batu
97000, BINTULU

Dr. Lim Tiong Hieng.
Nama Penyelia

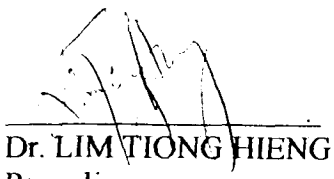
Tarikh: 25 MAC 2001

Tarikh: 25 MAC 2001

CATATAN * Potong yang tidak berkenaan.
** **Jika Kertas Projek ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/ organisasi berkenaan dengan menyertakan sekali tempoh kertas projek. Ini perlu dikelaskan sebagai SULIT atau TERHAD.**

Perakuan Penyelia

Tesis ini teleh dibaca dan disahkan oleh:



Dr. LIM TIONG HIENG
Penyelia

Tarikh

HAND HELD TICKETING MACHINE

YVONE INGAN MATHEUS GIRES

Thesis Dikemukakan Kepada
Fakulti Kejuruteraan, Universiti Malaysia Sarawak
Sebagai Memenuhi Sebahagian Daripada Syarat
Penganugerahan Sarjana Muda Kejuruteraan
Dengan Kepujian (Kejuruteraan Elektronik dan Telekomunikasi)
2001

Tesis (Ijazah Pertama)

Thesis Dikemukakan Kepada
Fakulti Kejuruteraan, Universiti Malaysia Sarawak
Sebagai Memenuhi Sebahagian Daripada Syarat
Penganugerahan Sarjana Muda Kejuruteraan
Dengan Kepujian (Kejuruteraan Elektronik dan Telekomunikasi)
2001

DEDICATED TO MY BELOVED FAMILY

ACKNOWLEDGEMENT

My heartiest gratitude to Dr. Lim Tiong Hieng for his ingenious advice and support received throughout the completion of this thesis.

I would also like to thank to the Dean of Faculty Engineering, Dr. Mohd. Kadim Suaidi, the Head of the Core Group of Electronics and Telecommunications Programme, Mr. Ng. Liang Yew, the Programme Coordinator, Mr. Al-Khalid Othman and to all lecturers and tutors of Electronics and Telecommunication Engineering Faculty.

I would also like to thank the technician of Faculty Engineering, Mr. Wan Abu Bakar Ngah and especially to Mr. Zakaria for his assistance in completing the project.

My sincere thanks to all fellow class mates and friends for their help in completing the thesis. Last but not least, my greatest appreciation goes to my family for their continuous love and support.

ABSTRACT

Hand-held Ticketing Machine is built with taking account of its hardware and software design. The most important component used to build the hardware is the Phillips 87C51 microcontroller. A matrix keypad is used to accept input to the microcontroller. The output signal is then sent to seven-segment display. An integrated circuit chip MAX232 is used to assist in the serial data transmission. This enables the output signal to be sent to serial port printer. The microcontroller is controlled by the software. The software is written using 8051 assembly language.

ABSTRAK

Mesin Tiket Mudah Alih dibina dan memerlukan rekaan alatan serta perisian. Komponen utama yang digunakan dalam alatan ialah mikrokawalan Phillips 87C51. Papan kekunci matriks digunakan sebagai alatan menerima input kepada mikrokawalan. Output yang terhasil akan dipamerkan melalui tujuh segmen LED. MAX232 merupakan cip litar bersepadu yang berfungsi untuk menyediakan output dalam penghantaran data secara bersiri. Ini membolehkan output dihantar ke mesin pencetak yang mempunyai port sesiri. Operasi mikrokawalan dikawal oleh perisian. Perisian ini ditulis dengan menggunakan 8051 assembly language.

LIST OF CONTENTS

LIST OF TABLES

CHAPTER 1

INTRODUCTION

1.1 Introduction to the Hand-Held Ticketing Machine

The hand-held ticketing machine that is made available today with the improvement of digital design is now widely used to simplify the routine of distributing, selling and printing of tickets. One of the important features in most common hand-held ticketing machine is being able to key in necessary information to the machine and to send it out to output devices. For this project, a matrix keypad is assigned to accept input and send the input to the microcontroller's port to be processed. The necessary input is processed by the microcontroller and is sent as an output signal to output devices such as a seven-segment display or printer.

1.2 Objectives of the Project

There are several objectives set for this project. The main objective of this project is to design the Hand-Held Ticketing Machine. The hardware of Hand-held Ticketing Machine will be based on the operation of 8051 microcontroller. Thus, the next objective is to use 8051 microcontroller's features to produce the basic operation of hand-held ticketing machine.

This project also includes the software design. Therefore the next objective is to design software that would instruct necessary functions of hand-held ticketing machine.

The other objective of this project is to choose the other peripherals needed to implement the Hand-held Ticketing Machine.

The next objective is to design the hardware and software of the hand-held ticketing machine using several technical tools and software. The objective is to use the knowledge and theories of digital design and put into practice with the completion of this project.

1.3 Basic Operation of Hand-Held Ticketing Machine

The Hand-held Ticketing Machine designed for this project consists of:

(i) Input and output peripherals. A matrix keypad is the basic input peripheral that will provide numbers to be keyed in. A printer will be used to print numbers that are keyed in. MAX 232 is used for the serial communication. Apart from that, the number of the key pressed will be displayed using seven-segment display.

(ii) The Printed Circuit Board (PCB). The PCB designed would have the 8051 microcontroller as the heart of the operation.

(iii) The software needed to run the operation of the 8051 microcontroller.

The requirement for building this project is listed in Table 1.2.

Processor	87C51
Input device	Switches, Matrix keypad
Output device	Seven segment display, MAX232
Language	Assembly Language
DC Input	5 V

Table 1.2 Specifications for the Project.

A block diagram representing the hardware design of the project is shown in Figure 1.3.

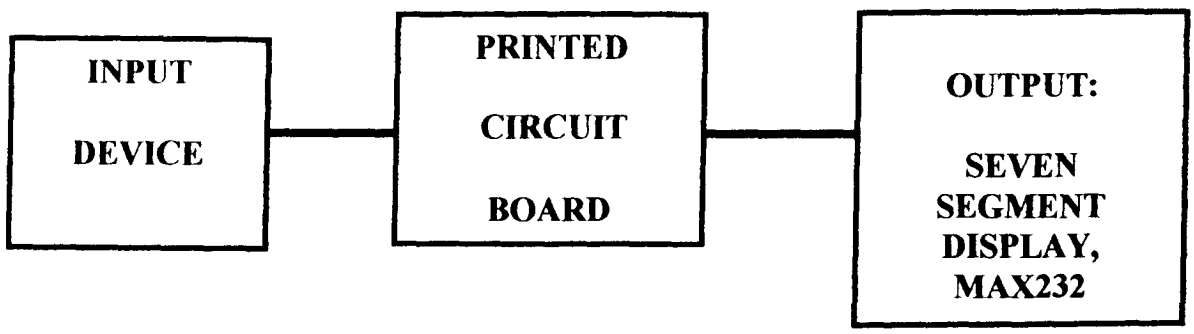


Figure 1.3 Block diagram of hardware design.

1.4 Project Overview

Tasks that are planned for completing this project will be listed in this section. The tasks are listed in order in which they are implemented step-by step.

(a) A close study of 8051 microcontroller and its function is essential before the microcontroller can be embedded into the design system.

(b) To find the other components or peripherals required for building the project.

(c) To come up with the hardware design for the hand-held ticketing machine that is a microcontroller based system.

(d) To build the software development for the function of the project.

(e) To carry out the implementation of the software and hardware design.

(f) To perform the evaluation of the implementation and discussion for the overall project done.

1.5 Chapters Overview

Chapter 1 covers the introduction to the project. Chapter 1 will include the objectives set upon completing this project. The project overview will also be discussed.

Chapter 2 will discuss on the brief history of microcontroller. In Chapter 2, a survey is done on types of components needed for building the hand-held ticketing machine. Chapter 2 will also include the function of components needed for building the hand-held ticketing machine. This chapter will also describe some of the microcontroller's pins and their function that are related for the design.

Chapter 3 will discuss on the hardware design of the project and its implementation. This will include the testing of the hardware.

Chapter 4 will include software design of the project and its implementation. Subroutines that are included in the software are elaborated. Some examples describing the assembly language instructions in the subroutine are included in this chapter.

Chapter 5 will cover the discussion on problems encountered during the completion of this project. Recommendations for the improvement of the project will also be discussed in this chapter.

Chapter 6 gives the conclusion on the overall work done for the project. Lastly, the planned scheduled set for the project and the actual progress done for the project is shown in the activity chart given in **Appendix P**.

CHAPTER 2

INTRODUCTION TO 8051 MICROCONTROLLER

2.1 Introduction to Microcontroller

Microcontroller is a computer on a single chip that contains of a CPU and a variety of peripheral, which assists required application[1]. Microcontrollers are basically classified by the number of bits in a data.

2.1.1 History on Microcontroller

Intel Corporation was credited with the invention of the microcomputer in 1972. The Intel 4004 was the first 4-bit programmable device that was primarily used in calculators. The next unit was the 8008 device, which was basically an 8- bit 4004. It was then superseded by the Intel 8080.

In the mid 1970s, the Intel 8080 was widely used in control applications as well as small computers were designed using the 8080 as the CPU. Within few years later the emergence of the 8080, the Motorola 6800, the Zilog Z80 and the Intel 8085 were developed as improvements over 8080[2].

2.1.2 8051 Microcontroller

8051 is a single-chip microcontroller first offered by Intel in the late 70s. Phillips is the biggest 8051 manufacturer in the market, followed by Intel. Phillips offer a very wide range of 8051 varieties, from very fast (40 MHz) 24-pin parts to large chips with a variety of specialised peripherals[3].

2.2 Advantages of 8051 Microcontroller

8051 8-bit microcontroller is chosen for the design of this project because of the following reason[4]:

(i) Flexibility.

8051 microcontroller that is ROMless makes it flexible for the design of the Hand-held Ticketing Machine. This is because more peripherals and memory could be added later after the microcontroller is built in the PCB.

(ii) Variety

8051 8-bit microcontroller has a very wide range of varieties. Phillips semiconductors offer a wide selection of 8-bit microcontrollers specifying to their functionality and characteristics. Some of the microcontrollers have EPROM built inside such as 87C51 while 8031 is ROMless. Some microcontrollers are manufactured for serial port communications while some are designed for parallel port communications.

(iii) Reliability

Although 8051 8-bit microcontroller comes with a wide variety, they all have almost similar hardware architecture and still use the same software.

(iv) Support

8051 microcontroller is a popular family and manufactured by most of the big companies such as Phillips and Intel. 8051 8-bit microcontroller is suitable for most projects that need not much memory peripherals. 8051 8-bit microcontroller has been used since 1970s and the information on the microcontroller can be gained from the manufacturer's catalogue book or it's website.

(v) Availability and Cost

8051 8-bit microcontroller can be obtained with affordable cost and available from its distributor.

2.3 Selection of Components

This section will cover the selection of components.

2.3.1 87C51 Microcontroller

For this design, a **87C51 microcontroller** is chosen because of its special feature. 87C51 has 128 bytes of on-chip data memory (internal memory) that will be used for data