PARKING CONTROL SYSTEM USING MICROPROCESSOR

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Dedicated to ***my parents, Hashimn bin Omar*** *and* ***Fatimah binti Osman ,my siblings, and all my beloved persons.***

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ABSTRACT

The purpose of this project is to develop a parking system that can solve the problem regarding the availability of parking space with high efficiency through application of microprocessor. The objective of this project is to develop a prototype which is fully functional, usable and can sufficiently accurate follow the available number of free space. This parking system will be able to detect and count the incoming and outgoing vehicles (cars/vans) at a parking space and at the same time each of the parking lot will provide some indicators to indicate the availability of the parking area. In addition, this research also includes the mechanism on how the FULL indicator will be triggered by a chosen metal detector. As an early indication for available parking space, a screen will be posted in front of the ticket machine as a way to visualize and information medium to drivers. This screen will be used Visual Basic software to design the required output that should be display on the screen and the display will be updated time to time depend on the availability of parking space. Furthermore, the drivers therefore can decide which parking lot area that he will be able to park. Once the vehicle is parked, a sensor that placed over the parking lot will mark the parking lot is occupied and activate the suitable indicator.

ABSTRAK

Tujuan projek ini itu adalah bagi membangunkan satu sistem tempat letak kereta yang dapat menyelesaikan masalah-masalah mengenai kekosongan tempat letak kereta dengan kecekapan yang lebih tinggi melalui Programmable Logic Controller (PLC). Objektif projek ini adalah untuk membina sebuah prototaip yang berfungsi sepenuhnya, dapat digunakan dan tepat mengikut jumlah kekosongan .Sistem tempat letak kereta ini mampu mengesan dan mengira kenderaan keluar masuk pada tempat letak kereta dan pada masa yang sama juga, setiap tempat letak kenderaan akan menyediakan beberapa penunjuk untuk menunjukkan kekosongan kawasan tempat letak. Tambahan lagi, penyelidikan ini juga termasuk mekanisme tentang bagaimana penunjuk *'FULL'* itu akan diaktifkan oleh satu pengesan logam yang dipilih. Sebagai satu penunjuk awal untuk kekosongan tempat letak kenderaan, sebuah skrin akan diletakkan di depan mesin tiket sebagai satu cara untuk memvisualkan dan menjadi perantara maklumat untuk pemandu-pemandu. Skrin ini akan menggunakan asas visual untuk mereka keluaran yang dikehendaki dan dipaparkan melalui skrin. Paparan itu akan dikemaskinikan ke semasa bergantung kepada kekesongan tempat letak kereta itu. Tambahan pula, pemandu-pemandu boleh memilih kawasan tempat letak kenderaan yang disukai. Apabila kenderaan diparkir di salah satu tempat letak kenderaan, sensor yang terdapat di situ mengenai tempat letak kereta itu akan mengaktifkan penunjuk sesuai sebagai menandakan tempat letak kereta digunakan.

TABLE OF CONTENTS

TABLE OF FIGURE

CHAPTER 1

INTRODUCTION

1.0 Project Introduction

The conventional car park system normally just have some signboard of direction of vehicles need to follow. It does not have any display panel and it cannot show the total vacancy of parking lot in the parking area. The drivers has taken risk to seek either there are any vacancy or not. By developing a parking system that includes the availability of vacancy display can help the drivers as a user to shorter their searching time. This Microprocessor based Parking system is an electronic application will be improved the conventional parking system by using suitable sensor and display panel.

Upgrading the conventional parking system is a needed especially in the urban area. Most of the urban areas suffer from parking traffic, where the traffic is caused by the vehicles that looking for parking space or moving out of parking area. For example, an article from THE TIMES OF INDIA [1] stated that overall 35 lakh or approximately 25,500 vehicles that wasting almost 4 hours daily seeking for parking. This has become an issue to the country as well to others country.

1.1 Project Objectives

1.2.1 To build a system based on Microprocessor based parking system.

1.2.2 To design a system that can detect any changes of number of available parking space and inform the drivers through Indicators.

1.2.3 To build a mini prototype of this parking system.

1.2.4 To build parking lot by using numeral system..

1.2 Problem Statement

Nowadays, there are many shopping malls, hotels, hospitals and airports that use a conventional way for their parking system where all the vehicles in and out or by an auto-pay system entering and leaving a parking lot [2]. The problem that often faced by the drivers is they do not know on how many parking spaces that still available and whether all the parking lots are full or not. Besides, they also wasted their time by roaming round and round just to get a car park and some of them need to leave the parking area because of no empty space at the roadside of the parking lot. These problems are occurred usually during peak hours and festive time.

1.3 Scope of Work

SOFTWARE

i. Counting the free parking space

The system must able to calculate the number of available parking space. A sensor will be used to sense a vehicle and will be an input to the counting program. Increasing or decreasing the total number of free parking space (output) is depends on the number of car entering and leaving the parking area [3].

ii. Display number of available parking space and display the info of available parking space through a screen**.**

The number of free parking space will be displayed on a 7 segment as the output. The 7-Segments will be displayed at the main Entrance/Exit. It also needed to ensure the hardware can trigger the Visual Basic on a screen that will display the total vacancy of parking lots [3].

iii. Build a parking system that can operate at real time.

A complete parking system need to be developed by integrate the software and hardware application. Furthermore, the system must be ensured can be operated at real time. When software and hardware is put together using the internal interface inside the PLC and the whole system will cooperate to make it functional smoothly [4].

iv. To build parking lot by using numeral system

This car park will also be equipped with a numeral system. By using numeral system, when a vehicle enters a parking lot, a numbered ticket will be issued so that the vehicle will be able to park at a specific parking space based on the number given. Moreover, when a vehicle goes out from its parking space and exits the parking lot, the number of the empty parking space will be re-printed and will be issued for the next vehicle. The user can use the keypad at the automatic ticket parking and enter the plat of their car and the plat number will be display at the parking space as written on the ticket.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

For this chapter, the whole description is about methodology choice, techniques applied and technology used in completing process of Parking Control System by using Microprocessor. A methodology tells developer what he or she has to do, to manage the projects from start to finish. It describes every step in the project life cycle in depth, so developer knows exactly which tasks to complete, when and how. Whether they are an expert or a novice, it helps in completing tasks faster than before.

2.1 Literature Review

This part will focus to explain about the processes that used when undertaking this project, and survey that carried out to incorporate and renew under total that is in project that earlier. In this part, information of component that used and that component advantage to this project will be explained.

2.2 Car parking knowledge

Nowadays, the conventional parking system that preparing need to be confirmed own system that can facilitate user to attract consumer interest. Although system that is in supermarket now has been dignified but still is weakness that need to be repaired. For example present system never mentions proper place Consumer Park their vehicles. By renew this system, it stated to parking consumer that they achieve. This can facilitate user and able to save time consumer to find parking vacancy.

2.2.1 Project Significant

This parking system that renewable, provide LCD display to facilitate consumer know the true position of vacancy parking. Consumer only required to key in the car number and LCD display the parking that available. Parking guidance and information can improve network efficiency significantly, reported benefits include able to save time consumer to find vacancy parking, apart from that can facilitate user know their parking and also consumer no need go around and around to find the available parking.

2.3 LCD (Liquid Crystal Display).

The LCD is used to display the output of the devices. This LCD is a 5x8 dots Crystal Display controller/driver which is manufacturer by Vishay. It is suitable for any portable battery driven product that required low power because the power supply for this LCD is about (2.7V to 5.3V). The LCD 016M002B dot matrix liquid crystal controller and driven LSI able to display alphanumeric, Japanese kana character and symbols. It can b configured to driver a dot matrix liquid crystal display under the control of a 4 or 8 bit microprocessor. A single LCD-016M002B contains the display controller/driver, so the output pins was simplified to 16 pins only.

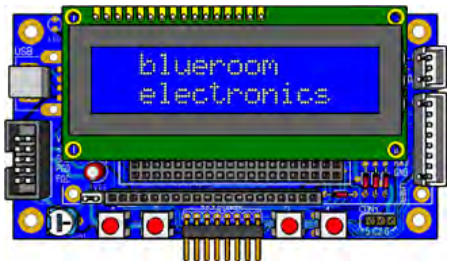

Figure 1- LCD - 016M002B

2.4 Voltage Regulator LM7805

Figure 2 Pin Assigment of Voltage Regulator

The LM78XX series of three terminal positive regulators are available in the TO-220 package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

2.4.1 Features

• Output Current up to 1A
• Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24

• Thermal Overload Protection
• Short Circuit Protection
• Output Transistor Safe Operating Area Protection

2.4.2 Block Diagram

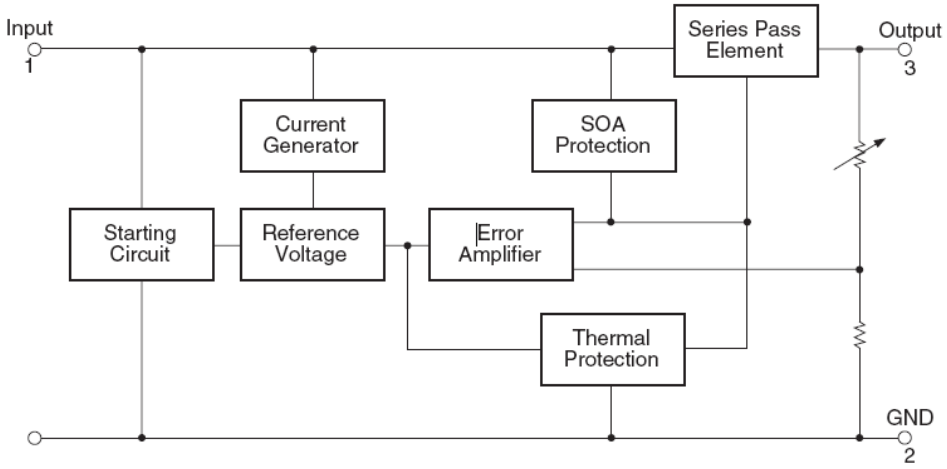

Figure 3 Block Diagram of Voltage Regulator

2.43 Absolute Maximum Ratings

Absolute maximum ratings are those values beyond which damage to the device may occur. The datasheet specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables.

Symbol	Parameter		Value	Unit
V_I	Input Voltage	V_O = 5V to 18V	35	V
		V_O = 24V	40	V
$R_{\theta JC}$	Thermal Resistance Junction-Cases (TO-220)		5	°C/W
$R_{\theta JA}$	Thermal Resistance Junction-Air (TO-220)		65	°C/W
T_{OPR}	Operating Temperature Range	LM78xx	-40 to +125	°C
		LM78xxA	0 to +125	
T_{STG}	Storage Temperature Range		-65 to +150	°C

Table 1 : Absolute Maximum Ratings

2.4.4 Electrical Characteristics (LM7805)

Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used. These parameters, although guaranteed, are not 100% tested in production.

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
V_O	Output Voltage	T_J = +25°C		4.8	5.0	5.2	V
		5mA ≤ I_O ≤ 1A, P_O ≤ 15W, V_I = 7V to 20V		4.75	5.0	5.25	
Regline	Line Regulation(1)	T_J = +25°C	V_O = 7V to 25V	–	4.0	100	mV
			V_I = 8V to 12V	–	1.6	50.0	
Regload	Load Regulation(1)	T_J = +25°C	I_O = 5mA to 1.5A	–	9.0	100	mV
			I_O = 250mA to 750mA	–	4.0	50.0	
I_Q	Quiescent Current	T_J = +25°C		–	5.0	8.0	mA
ΔI_Q	Quiescent Current Change	I_O = 5mA to 1A		–	0.03	0.5	mA
		V_I = 7V to 25V		–	0.3	1.3	
$\Delta V_O/\Delta T$	Output Voltage Drift(2)	I_O = 5mA		–	-0.8	–	mV/°C
V_N	Output Noise Voltage	f = 10Hz to 100kHz, T_A = +25°C		–	42.0	–	$\mu V/V_O$
RR	Ripple Rejection(2)	f = 120Hz, V_O = 8V to 18V		62.0	73.0	–	dB
V_{DROP}	Dropout Voltage	I_O = 1A, T_J = +25°C		–	2.0	–	V
r_O	Output Resistance(2)	f = 1kHz		–	15.0	–	mΩ
I_{SC}	Short Circuit Current	V_I = 35V, T_A = +25°C		–	230	–	mA
I_{PK}	Peak Current(2)	T_J = +25°C		–	2.2	–	A

Table 2 : Electrical Characteristic LM (7805)

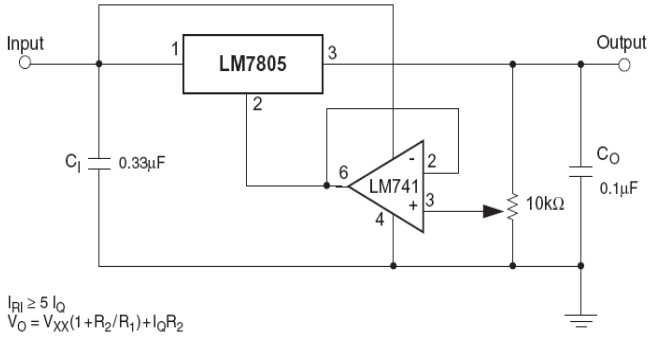

Figure 4 : Adjustable Output Regulator

$I_{RI} \geq 5I_Q$

$V_O = V_{XX}\ (1+R_2/R_1) + I_QR_2$

2.5 Transistor

There are two types of standard transistors, NPN and PNP, with different circuit symbols. The letters refer to the layers of semiconductor material used to make the transistor. Most transistors used today are NPN because this is the easiest type to make from silicon. The leads are labeled base (B), collector (C) and emitter (E).

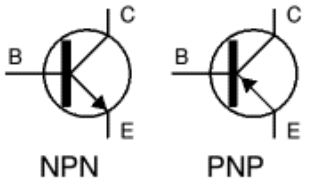

Figure 5 : Transistor Circuit Symbols

2.5.1 Transistor Current

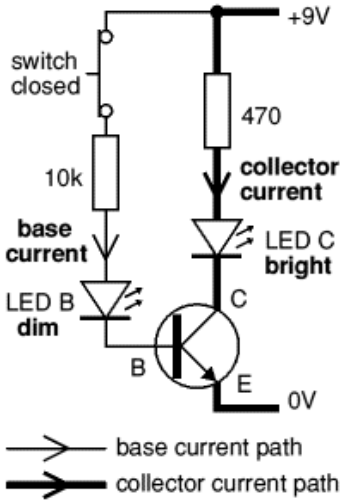

Figure 6 : Transistor Current

2.5.2 The small base current controls the larger collector current.

When the switch is closed a small current flows into the base (B) of the transistor. It is just enough to make LED B glow dimly. The transistor amplifies this small current to allow a larger current to flow through from its collector (C) to its emitter (E). This collector current is large enough to make LED C light brightly.

When the switch is open no base current flows, so the transistor switches off the collector current. Both LEDs are off.

2.5.3 A transistor amplifies current and can be used as a switch.

This arrangement where the emitter (E) is in the controlling circuit (base current) and in the controlled circuit (collector current) is called common emitter mode. It is the most widely used arrangement for transistors so it is the one to learn first.

2.5.4 Functional model of an NPN transistor

The operation of a transistor is difficult to explain and understand in terms of its internal structure. It is more helpful to use this functional model:

- The base-emitter junction behaves like a diode.
- A base current I_B flows only when the voltage V_{BE} across the base-emitter junction is 0.7V or more.
- The small base current I_B controls the large collector current Ic.
- $Ic = h_{FE} \times I_B$ (unless the transistor is full on and saturated)
  h_{FE} is the current gain (strictly the DC current gain), a typical value for h_{FE} is 100 (it has no units because it is a ratio)
- The collector-emitter resistance R_{CE} is controlled by the base current I_B:
  - $I_B = 0$ R_{CE} = infinity transistor off
  - I_B small R_{CE} reduced transistor partly on
  - I_B increased $R_{CE} = 0$ transistor full on ('saturated')

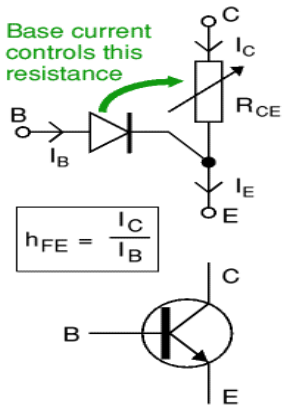

Figure 7 : NPN Transistor