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Hidayah Ajohan.

**FERRY TERMINAL TRAFFIC AND RAMP  
CONTROL SYSTEM**

**NURHIDAYAH BINTI AJOHAN**

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# **FERRY TERMINAL TRAFFIC AND RAMP CONTROL SYSTEM**


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**This Progress Report Is Submitted In Partial Fulfillment of  
Requirements for The Degree of Bachelor In Electrical Engineering  
(Power Electronic and Drives)**

**Faculty of Electrical Engineering  
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“I hereby declared that this report entitled ‘Ferry Terminal Traffic and Ramp Control System’ is the result of my own work except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.”

Signature :  .  
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Date : 06<sup>TH</sup> MAY. 2009

**For my beloved parents, sisters, brothers, and also in memory my  
associate friends**

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## ABSTRACT

The technology using the microcontroller can help humans to solve many matters in automatically process or activity. In this project, it used for replacing human energy in controlling traffic and ramp at terminal .It is because that human capability is limited and easy to being careless. Due to overcome those problem, a systematic system should be built to make sure that problem such as miss counting vehicles and ramp controlling due to water level can be solve. This project is a prototype which can be an idea to upgrade the traffic and ramp control system at Penang ferry terminal for being more systematic and efficient. Traffic control is important at the terminal because it controlling the vehicles to enter and out from the ferry services. The ramp structure is a structure which connecting between the ferry terminal and transport ferry. It's function as entering and outgoing way for pedestrians and vehicles such as motorcycle and cars to the ferry services in safely. The ramp parts have the main structure, DC motor and detect switch at the terminal. The ramp controller in the control room are including ramp controller, traffic controller, counting sensor and water level sensor. For this project, the Microcontroller can reduce the cost of materials and human energy compare to PLC.

## ABSTRAK

Pembangunan teknologi yang melibatkan sistem '*Microcontroller*' membolehkan manusia mengawal pelbagai aktiviti dan proses dalam industri secara automatik. Bagi projek ini, sistem '*Microcontroller*' digunakan untuk menggantikan guna tenaga manusia dalam mengawal trafik dan '*ramp*' di terminal feri. Ini kerana, keupayaan seseorang manusia itu adalah terbatas dan ia mendorong kearah kelalaian ketika melaksanakan sesuatu pekerjaan. Bagi mengatasi masalah tersebut, suatu sistem yang sistematik perlulah dibina untuk memastikan masalah seperti keciciran bilangan kenderaan dan pengawalan sistem '*ramp*' berdasarkan tahap air laut di terminal dapat diselesaikan. Projek ini merupakan sebuah model yang mungkin dapat memberi sedikit cadangan dalam menaiktaraf sistem kawalan trafik dan '*ramp*' terutamanya di feri Terminal Pulau Pinang untuk menjadi lebih cekap dan sistematik. Kawalan trafik merupakan suatu sistem yang penting kerana ia membantu mengawal kemasukan dan keluaran kenderaan daripada sesebuah feri pengangkutan. Manakala, struktur '*ramp*' merupakan struktur yang menghubungkan antara terminal dengan feri. Ia berfungsi sebagai jalan masuk dan keluar kepada pejalan kaki dan kenderaan seperti motorsikal dan kereta kedalam feri pengangkutan dengan selamat. Bahagian struktur '*ramp*' di terminal meliputi struktur utama, motor Arus Terus, dan suis pengesan. Sistem kawalan '*ramp*' di dalam bilik kawalan terminal mempunyai pengawal '*ramp*' dan trafik, pengesan aras air dan pengesan pembilang. Antara kebaikan projek ini adalah penggunaan sistem '*Microcontroller*' yang boleh mengurangkan kos penggunaan peralatan yang mahal dan tenaga manusia berbanding dengan penggunaan sistem '*PLC*'.

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## LIST OF GLOSSARY

ADC	Analog Digital Converter
DB	Data Bus
I/O	Input/Output
LDR	Light Dependent Resistor
PLC	Programmable Logic Control
RPM	Rotation per Minutes
SPI	Serial Programming Interface
VSS	Voltage Sources Supply

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# CHAPTER 1

## INTRODUCTION

### 1.1 Project Background

The ferry terminal operates as a port, dock or harbour, where passengers and vehicles can embark or disembark using ferry services. This project is a prototype which can be an idea to upgrade the traffic and ramp control system at Penang ferry terminal for being more systematic and efficient. Traffic control is important at the terminal because it controlling the vehicles to enter and out from ferry services. The ramp control also important to make sure that the vehicles and passengers embark to the ferry services safely. Today, the traffic and ramp control at the terminal are still use human task to control it and it show that the traffic control system is still not systematic. From our logical thinking, the human capability is limited because they will easily to fill sleepy and tired while works. Due to overcome those problem, a systematic system should be built to make sure that problem such as miss counting vehicles and ramp controlling due to water level can be solve. This project used for replacing human energy in controlling traffic and ramp at terminal.

The main structure to complete this project is the microcontroller which use to replacing the PLC system. The PLC system is still using in nowadays industry but it still has several disadvantages which including high maintenance, expensive equipment and need more supervise. So, to solve those problems, the microcontroller programme will help to process all data input from the input system and produce the output system to operate automatically. Nowadays, the technology using the microcontroller helps humans to solve many matters in automatically. There are too many advantages when using this programme. Such as, it is saving time and energy.

There are three input system used in this project such as ferry detector, water level detector and vehicles detector and including counter to make this project more systematic. The ferry detector use to make sure the links between the ramp and the ferry services is more safety. So, the passenger will fill more comfortable and safe when they want to pass through the terminal ferry. While for the water level detector use to detect the water level at the ferry terminal to make sure that the condition for ferry services to embark and disembark the passengers is safe. It also will help the officer to monitoring the water level sensor from the control room. The car detector and counter use to completed the counting programme which helps to avoiding the ferry services being overload. Others, it will help to control the traffic system at the terminal.

In term to make the traffic control system more efficient, the traffic information display system will be add to show the information about traffic to the passenger and also the officer at the ferry terminal. The entering gate controller will use to control the entering gate to move up and down. It will help passenger fill more safety and comfortable when waiting for ferry services. The ramp controller will use to make sure the links between ferry services and the terminal are safe and ready to use by passenger to pass through it.

The advantages of this project will decrease using human energy and low maintenance due to long period. This project can be use as an idea to improve the operation of the old system at the Penang Ferry Terminal.

*Refer to the Appendix A for the picture of the Penang Ferry Terminal.*

## 1.2 Problem statement

The problem statements of this project are:

- a) The traffic control system still not systematic which also using human energy to controlling vehicles enter or outgoing the ferry terminal.
- b) The ramp control system still operate manual which still using human energy.
- c) The capability of human is limited where they fill sleepy and tired.

## 1.3 Project Objective

This project is focus on the following objectives:

- a) To elaborate between hardware (including electronic devices) and software to making a successful design of ferry terminal traffic and ramp control system.
- b) To built a systematic traffic control system for vehicles to enter and out from ferry.
- c) To complete design of moving ramp as well as construction of this project on schedule.
- d) To develop LCD display for greeting and information regarding about traffic control system.

## 1.4 Project Scope

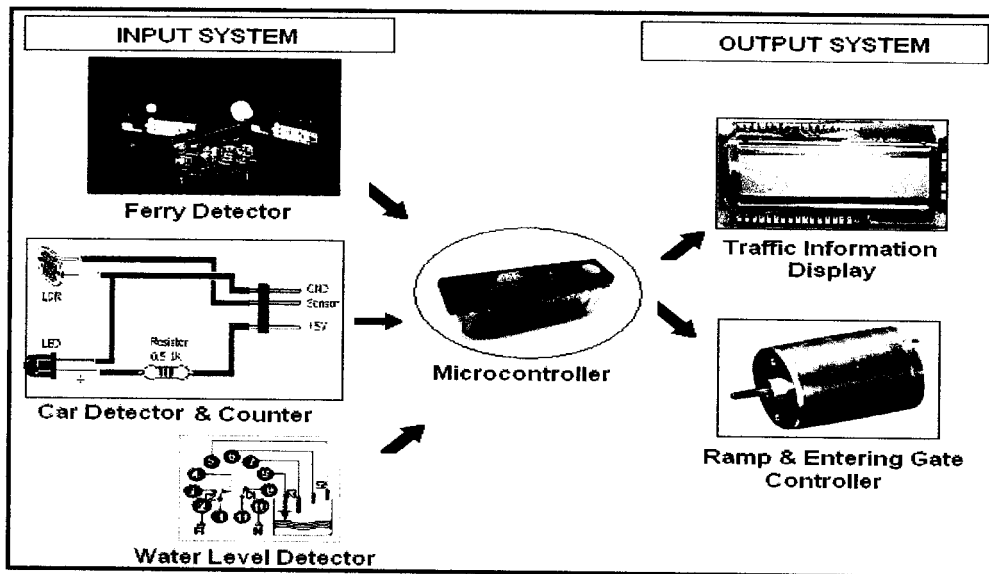


Figure 1.1: System Block Diagram

The main scope of this project is hardware design which including input and output system. Others scope are software development and the integration of both hardware and software in term to have a successful design. Figure 1.1 shows the systems block diagram of the project. There are three input system which are ferry detector, car detector and counter and also water level detector. All of the input system will be controlled by microcontroller to perform the output system such as traffic information display, entering gate controller and also ramp controller. The descriptions for each of the system such below:

(i) Ferry detector

This input system use a switch to detect the ferry services after the ramp had touch the ferry body. In term of safety, it will make sure the connection between the ramp from the ferry terminal and the ferry's body is correct. In addition, the passengers or users of the ferry services will be more safety if they want to crossing from the terminal to the ferry services.

(ii) Car detector and counter

This system is completed as a module which will detect any type of car which wants to get out and enter from the ferry terminal. After the sensor had detected the car, it will send signal to the microcontroller to counting using the instruction which had been programmed in it. As a result, it will help the passenger with vehicles and officer in the control room get information about traffic system at the terminal.

(iii) Water level detector

This system will detect the water level at the ferry terminal. It will detect three water levels such as minimum, middle and maximum level and send the result signal to the microcontroller to show the result at LCD display. The user will also know the information if the water level rises at the maximum level and need them to be more careful.

(iv) Microcontroller

This controller system will control all the input system and output system with the instruction that have been programmed in it. Each of input signal receive by the input module will be read and transfer the output signal to the output module for perform action at the ferry terminal according to the commands needed. It will make all the operations at the terminal move in automatically.

(v) Traffic information display

This output system is completed with LCD display which can display the numbers of counted vehicles, information regarding to water level and traffic at the terminal.

(vi) Entering gate controller

This output system will control the entering gate to go up or down position according to the instruction from the microcontroller. The DC motor used to move the entering gate. It will help controlling the traffic at the ferry terminal.

(vii) Ramp controller

This output system is to controlling ramp using the DC motor. This part is including the ramp activities to go up after the ferry services full with the passenger and it go down when the ferry services arrive at the ferry terminal to disembark the passengers.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter provides information about the basic ferry terminal traffic and ramp control system. This part will explain about theory and basic of operational system and material which are used for this project. It will help to have more understanding and knowledge from all the information. Furthermore, the information about language used in the programming was also including in this chapter. Finally, the advantages and capabilities of Proteus and Bascom 8051 will be explain in the subtopic of this chapter.

The purpose to this research is to find any information according to the controlling system concept using microcontroller. The applications in design control system have electrical and mechanical systems which have connected between both systems.

#### **2.2 The Information of Penang Ferry Terminal**

The ferry terminal services began operation in 1920, under the management of a Chinese-owned company. However, today, it is jointly operated by the Penang Port Commission (PPC) and Penang Port Sdn Bhd <sup>[10]</sup>. Penang Port provides ferry services from 5.30 am to 1.00 am linking Georgetown on the island to Butterworth on the mainland. It operates a fleet of eight ferries.

The ferries which carry passengers / vehicles on the upper deck and vehicles on the lower deck depart the terminals at eight minute intervals during peak periods

with a reduced frequency after midnight. The ferry journey across the 3.2 kilometer long channel takes between 15-20 minutes. The overall ferry traffic in 2006 which included pedestrians, bicycles, motorcycles, cars and lorries increased 1.1% from 5.859 unit to 5.922 unit <sup>[9]</sup>.

Refer to articles entitled ‘Ferry Services Still Relevant For Penang’, the writer had said that the management company got losses due to high maintenance cost of the ageing fleet and the rising cost of fuel <sup>[11]</sup>. Furthermore, the ferry terminal was lack of maintenance and there are many of complaints from the passenger due to the ferry terminal’s operations. From the researched about the Penang Ferry Terminal’s operations, the comparison between the nowadays technology used at the terminal and the future upgrading in orders to make sure the terminal operates smoothly were shows in the table below.

Table 2.1: The comparison of operation’s system use for today and future at the Penang Ferry Terminal

No.	Today’s Operation System	Future’s Operation System
1	Use high maintenance system such Programmable Logic Controller (PLC) to perform operation	Using integrated circuit such Microcontroller to perform operation.
2	Use human’s energy to control the traffic system.	An automatic’s system from Microcontroller programming.
3	Need maintenance for all system’s actuator frequently which highly cost.	Only to checking on sensor and make sure the programming flows correctly.

*Refer to Appendix A and B for Penang Ferry Terminal information.*