SELF-MONITORING TRAFFIC LIGHT SYSTEM FOR T-JUNCTION OR MULTIPLE JUNCTIONS

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This report is submitted in partial fulfilment of the requirements for the award of Bachelor of Electronic Engineering (Wireless Communication) With Honours

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ABSTRAK

Projek ini membincangkan tentang rekacipta satu system pengawalan lampu isyarat yang berkesan. Sistem lampu isyarat ini beroperasi dengan menukar warna lampu secara berturutan selepas masa tertentu. Sistem pengawalan lampu isyarat ini akan mengesan bilangan kereta dalam jarak dan masa yang tertentu, dan beroperasi berdasarkan maklumat yang terkumpul. Tujuan system lampu isyarat ini adalah untuk mengurangkan pembaziran masa pengguna jalan raya. Berdasarkan objektif ini, satu system baru akan dicipta dan digunakan untuk meningkatkan taraf sistem lampu isyarat yang sedia ada.PLC akan digunakan dalam projek ini dan PLC akan mengendalikan lampu isyarat berdasarkan bilangan kereta di simpang jalan. Kelancaran lalu-lintas akan bertambah baik dengan menggunakan cara baru ini.

ABSTRACT

This project is discussed about the design of an efficient control of an existing traffic light system. Traffic light control systems operate on a timing mechanism that changes the light after a given interval. Intelligent traffic light control system will sense the presence or absence of vehicles with certain range by setting the appropriate duration for the traffic signals to react accordingly. The idea behind this intelligent traffic lights control system is that users are not spend unnecessary time waiting for the traffic light change. Based on this idea, a new sensing method will be design and develop to enhance the existing traffic light control system for multiple junctions. Programmable logic controller will be use in this project that will trigger the traffic light indicator according to the volume of vehicle on certain road junctions. Smoothness of traffic flow can be enhancing by using this method.

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LIST OF ABBREVIATION

PLC	- Programmable Logic Controller
EMF	- Electromotive Force
BFO	- Beat-Frequency Oscillation
VLF	- Very Low Frequency
PI	- Pulse Induction
SCADA	- Supervisory Control and Data Acquisition
CPU	- Central Processing Unit
OSR	- One Shot Relay
L	- Latch
U	- Unlatch
IOT	- Immediate Output
LED	- Light-Emitting Diode
PCB	- Printed Circuit Board

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CHAPTER I

INTRODUCTION

This chapter explains the conventional method of traffic controller in comparison with the proposal system.

1.1 Introduction

Stoplights or stop-and-go lights, which is commonly known as traffic lights are a source of signalling device used in junctions around the world. Traffic lights are usually positioned on a certain road intersections, pedestrian crossings and other locations to control competing flows of traffic in order to enhance the smoothness of traffic flow. Traffic lights have been installed in most cities around the world regardless of different standards. They assign timely directions for road users by demand in the form of colours which is Red, Amber and Green. Even though traffic lights are known as the best device in controlling traffic flow for road users, yet accidents reported at the traffic junction is very common.

There are 2 methods in controlling the traffic light system placed on a certain junctions. The most common method is sequencing method, whereby the traffic light system is designed to operate according to the pre-programmed sequence without any consideration of real time behaviour. The second method is sensor based

controller which response to the pre-programmed timer based on current demand on a certain road junction.

With both method widely used around the world, surety on traffic flow smoothness is not established. When authorities talk about efficiency and accuracy on real time traffic flow control, there are always room for further enhancement especially on the controlling and sensing method. In afford to provide a solution for such miseries, a novel implementation of sensing method which will be incorporated with self conditioning program will be a practical solution. The new sensing method is capable of counting the total number of vehicles entering a certain junction and exiting from a certain junction on real time basis. Based on this detection, the programmable logic controller will trigger the traffic light indicators according to real demand. The new method should also be easy for further enchantment of traffic light system in ensuring smoothness of traffic flow especially during peak hours.

1.2 Project Objective

The objectives of this project are:

i. To design an efficient controller for existing traffic light system that can reduce waiting time for road users.
ii. To apply the knowledge of the Programmable Logic Controller (PLC) in controlling traffic light system.
iii. To design and develop a new sensing method for T- junction traffic control.
iv. To develop a prototype of simple traffic light to show the function of the new sensing method.

1.3 Problem Statement

This project is proposed to reduce the waiting time at a certain traffic light junction for the road users. For the existing traffic light control system, there is only 1 sensor placed at the road end before the junction. Such a practice creates an inefficiency system because with only 1 sensor for all vehicle detection. The current

practice only detects the availability of vehicle present at a certain junction or road. If the sensor malfunction or faulty, the traffic light control system will operate in a pre programmed mode while the vehicle could not be detected at all.

To improve the current system and to create a better traffic flow controller, a new approach is attempted. This projects prone the use of more than 1 sensor for detection on each road or junction. Based on those sensors, the total number of vehicles entering a certain junction and existing from a certain junction on real time basis can be counted. Based on this method, the smoothness of traffic light can be enhancing. A precise new sensing method which using more than 1 sensor (approximately 10 meters for 1 sensor).

1.4 Scope of Work

This project will focus primarily on the hardware design (sensor type, sensor placement) and software design to implement an intelligent traffic light control system according to the volume of vehicles. Develop a new method to enhance the existing traffic light control system for multiple junctions (T-junction).

a) Hardware part:
   1. The metal detector circuit.
   2. Controller for the traffic light control system.
   3. PLC is an interface used for controlling the traffic light control system.

b) Software part
   1. To program a normal sequencing method for traffic light junction.
   2. To enhance the condition based programming method with sequencing for better traffic flow using PLC as a platform.

1.5 Existing Traffic Light Control System (Controller /Sensor)

Conventional traffic light control system is mostly using the computer controller and camera. Only 1 sensor is using at the junction of conventional traffic light.

1.5.1 Computer Controller/ Camera

The conventional traffic light system is typically control by computer controller or the camera as shown in Figure 1.1 and Figure 1.2. A traffic enforcement camera or also road safety camera, road rule camera, photo radar, speed camera, Gatso, are an automated ticketing machine. It may include a camera which may be mounted beside on over a highway or installed in an enforcement vehicle to detect traffic regulation violations, including speeding, vehicles going through a red traffic light, unauthorized use of a bus lane, for recording vehicles inside a congestion charge area and others.

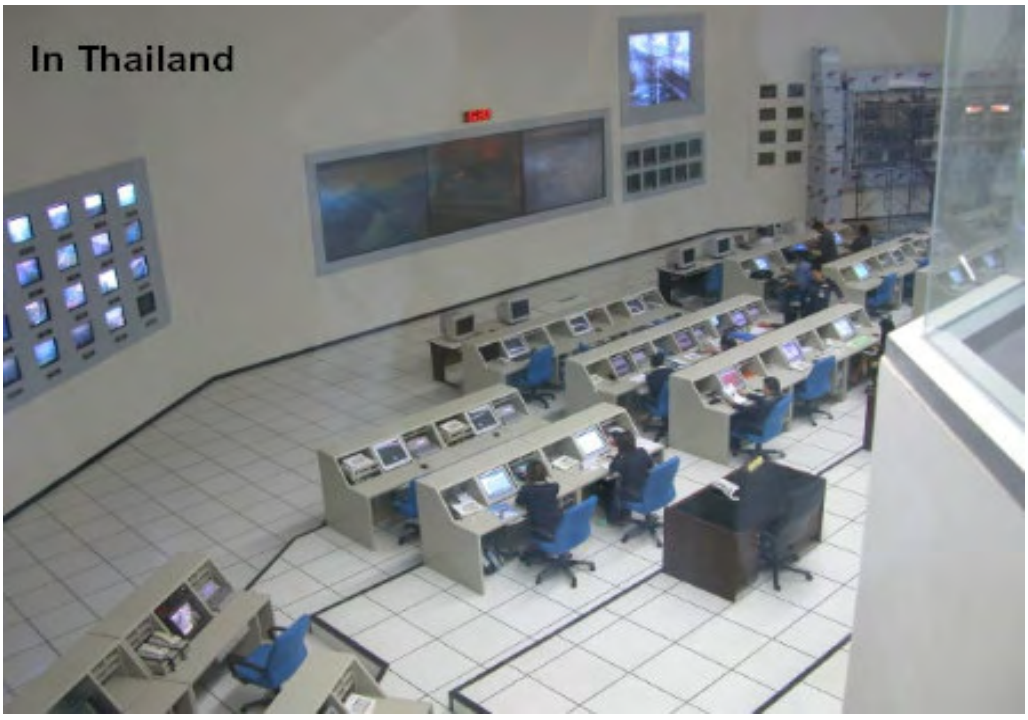

Figure 1.1: Traffic Control and Command Center in Thailand

Figure 1.2: Traffic Camera

1.5.2 PLC Type (1 Sensor)

Conventional traffic light is using 1 sensor for measuring the input of certain traffic junction as shown in Figure 1.3 below. The sensor will give the output to the controller and then the traffic indicator will change based on the output of the sensor. The block diagram for the system control for 1 sensor is shown in Figure 1.4.

Figure 1.3: Sensor mounted on the surface of road in traffic light

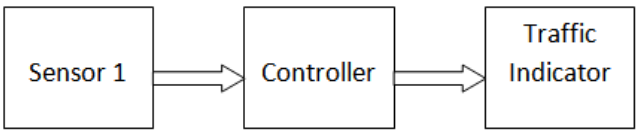

Figure 1.4: Block diagram for the system control for 1 sensor

1.6 New Method

The new methods for this propose system can measure the input and output of a certain traffic light junction. The volume of the vehicles entering and exiting certain junctions of traffic light can be counted. The block diagram of the control system for new method is shown in Figure 1.5.

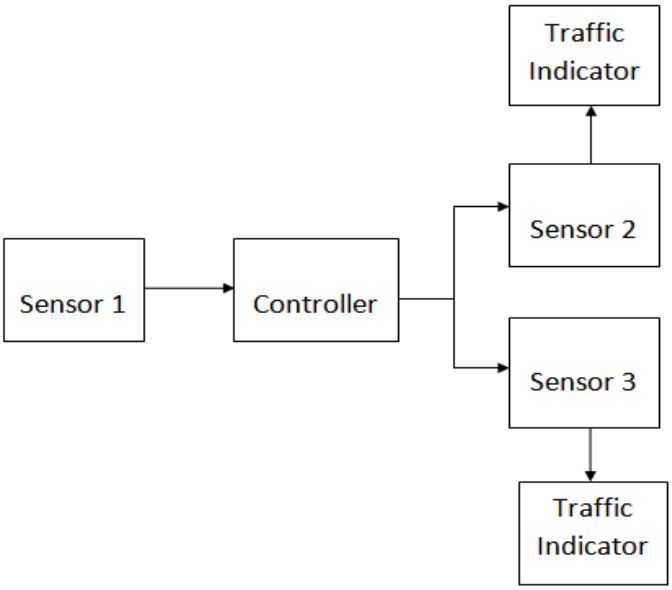

Figure 1.5: Block diagram of controller system for new method