

AUTOMATED ROAD SAFETY CONTROLLER SYSTEM

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PROJEK SARJANA MUDA II

Tajuk Projek : AUTOMATED ROAD SAFETY CONTROLLER SYSTEM

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## **DEDICATION**

*Dedicated to my beloved supervisor, lecturer, my family and all my friends.*

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## ABSTRACT

This system introduce the new technologies in automating traffic flow in road construction site. The implementations of the Automated Road Safety Controller System (ARSCS) have capability of mimicking human intelligent for controlling traffic light. Flagman is a very common practice in controlling the traffic flow in two lane road closure. The road users are solely dependent on the signal from the flagman's as they approach a road construction site [1].

As human factors is always to be questioned especially when they deal with safety of human life's, many new technologies is being exploit to substitute flagman's. By implementation new technologies in automating traffic flow in road construction site could possibly eliminate the usage of a conventional flagman [2]. For this system, it consist of two main component which is connected each other wirelessly via communication device which are master control unit and slave unit.

There are a types of sensor will be used to enable this control system without man power. Motion sensor will used to detect the presence of vehicle at the warning bulb and make sure all vehicles are out before transition of the traffic light changed. ARSCS will use two display warning bulb as the output. The portable warning bulb can be best utilized in any two lane road closure regardless of working hours and weather conditions. The automated wireless traffic light system can increase safety for the road users by eliminating the need for a human flagman.

## ABSTRAK

Sistem ini memperkenalkan teknologi terbaru dalam automasi aliran trafik di kawasan pembinaan jalan raya. Pelaksanaan sistem aliran trafik secara automatik (ARSCS) ini mempunyai kebolehan untuk menggantikan kebolehan manusia dalam mengendalikan aliran trafik jalan raya. Pengguna jalan raya bergantung sepenuhnya kepada pemegang bendera setiap kali berada di kawasan baik pulih jalan raya [1].

Kebolehan manusia untuk mengendalikan aliran trafik kini dipersoalkan kerana tugas mereka yang melibatkan nyawa pengguna-pengguna jalan raya yang lain. Pelbagai kaedah ataupun teknologi terkini cuba diperkenalkan bagi menggantikan penggunaan tenaga kerja manusia[2]. Bagi sistem terbaru ini, ia dilengkapi dengan dua komponen utama yang disambung secara wayarless menerusi teknologi perhubungan dimana ia terbahagi kepada dua iaitu “Master unit” dan “Slave unit”.

Terdapat satu jenis alat pengesan yang akan digunakan untuk membolehkan ia mengesan kehadiran kenderaan bergerak masuk ke kawasan pembaikpulihan jalan raya. Sistem ARSCS ini akan menggunakan 2 keluaran dimana ia akan memaparkan dua warna iaitu (merah, hijau) yang direka untuk kegunaan yang berbeza. Sistem ini sebaiknya digunakan sewaktu kemudahan jalan raya ditutup disebabkan cuaca ataupun waktu bekerja yang tidak mengizinkan. Dengan terciptanya teknologi aliran trafik secara automatik ini diharapkan mampu untuk mengurangkan kadar kemalangan yang berlaku sekaligus menggantikan tenaga kerja manusia yang harus berdepan dengan risiko kemalangan.



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## LIST OF ABBREVIATIONS

PIC	-	Programmable Interface Controllers
IR Sensor	-	Infra Red Sensor
LED	-	Light Emitter Diode
JKR	-	Jabatan Kerja Raya
JKJR	-	Jabatan Keselamatan Jalan Raya
DOSH	-	Department of Occupational Safety and Health
RF	-	Radio Frequency
PLC	-	Programmable Logic Controller
Op- Amp	-	Operational Amplifier



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## CHAPTER I

### INTRODUCTION

#### 1.1 Introduction

This project is about the system that existing on construction which is, nowadays they still used flagman to make sure the vehicle can pass smoothly by hold a flag green or red. Flagman is the person that ensures the smoothness of the road traffic operation and alerts the road users on road construction activity. The risk of fatal accidents is high for the flagman since he is placed in the highest risk zones. Authorities and contractors seek for various methods on how to minimize the number of flagman. The usage of a flagman can be replaced by implement Automated Road Safety Controller System. This project controls the traffic flow without human intervention. This project will use a LED, sensor (IR), Radio Frequency, counter and PIC programming (microcontroller).

This project operates of two warning bulb that will function by counting the total vehicle bypass at construction site. Sensor 1 will detect car that are come from Lane 1 (30 meters), PIC 1 will send the data to PIC 2 and get ready turn into RED. PIC 1 will turn to GREEN, vehicle will bypass and counter will count (decrease). After 10seconds, if no more vehicles, Lane 1 will turn to RED and warning bulb 2 will turn to GREEN.

## 1.2 Problem Statement

Risk of fatal accidents is high for the flagman since he is placed in the highest risk zones. Traffic will become chaos because way temporary closed and sometime its can cause an accident.

## 1.3 Objectives the Project

A few objectives were determined to make sure this project is work as planned. The objectives of this project are:

- i. To reduce the fatal accidents for flagman.
- ii. To ensure the traffic went smooth during the road construction besides optimized the safety.
- iii. To design and make an Automated Road Safety Controller System

## 1.4 Scope of Project

Scope for this project consists of two things. There is for Road Construction and another one is two different LANE. The explanation will be at below:

- i. For Road Constructions
  - This project suitable for roads that has construction and have a chaos way when it's happen. Automated Road Safety Controller System will be smooth the traffic along the construction on progress.
- ii. Two different LANE
  - Means of two different LANE is, this project more suggest to used at road that has Two Lane that different direction.

Figure 1.1 shows the scope of work for this project. It consists of two categories, which is software and hardware. For Software, it use MPLAB IDE for do a coding programming, Proteus for fabricate PCB and MultiSim for simulation circuit.

For hardware that are used in this project is LED that are consists of two colours (RED & GREEN), Sensor ( IR Sensor, Counting Sensor & RF Sensor), PIC16F877A, and 7-Segment.

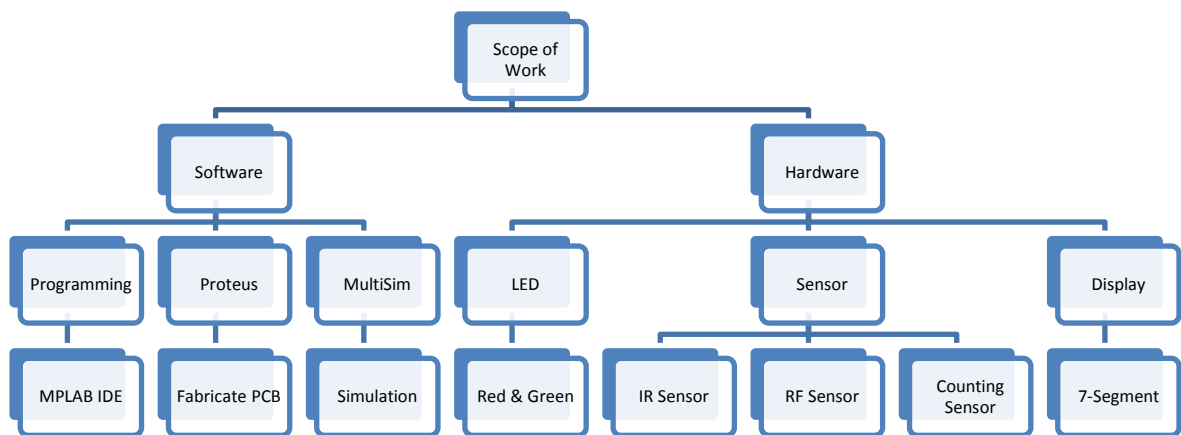


Figure 1.1: Scope of Work

## **CHAPTER II**

### **LITERATURE REVIEW**

This chapter is consisting of explanation and review on the past projects that have been done before. It is mostly consist of the products in the market. There are few approach that have been used to study the details of this project. There are literature review, journal, article, reference book, lecture notes, product manual and via surfing internet. This is main step to collect the idea from previous design. All the theories and technique will be learning here. The idea that was developed by another researcher is important to help in generating idea to complete the design, analysis and prototype. The existing system to control the traffic flow during the road closure is by using the human flagman. By implemented the new Automated Road Safety Controller System, we can eliminate the human intervention in traffic controlling.

## **2.1 TITLE: Flagman and Risk Involved in Road Construction Site. [1]**

This paper highlights the risk factor of flagman in certain road construction or road maintenance site. Risk of fatal accidents is high since flagman is placed in the highest risk zones. Authorities and contractors seek for various methods and measures in eliminating the usage of flagman, yet it is impossible since the usage of flagman is considered the best practice around the globe. Intelligent traffic light which proposed in this paper can be wisely utilized to overcome problems arising on the safety measures in a road construction site. Ignorance of the road safety regulation has results in various fatal accidents for both domestic users and construction workers. In the effort to maintain safety and smoothness in traffic flow on the road construction site, the usage of a traffic controller or so called “flagman” is essential.

### **2.1.1 Usefulness Of The Intelligent Construction Safety Traffic Light System**

The proposed traffic light system is designed based on the factors which are occurring around the road construction site and limitations of a flagman. The system could be one of the best practices in road construction traffic control systems. This designed system is to replace the flagman who needed during the lane closures on a certain construction zone. Since the designed system is a portable traffic light and best to be utilized in temporary traffic control for long term or short term lane closures on construction sites, it is suitable to control two-way traffic in a single lane. The system can be used in publicly and privately-funded road construction projects which require overnight or 24-hour traffic control regardless of weather conditions. The system is also less compare to the invested cost in the long run. The factor which is contributing towards the down fall of a flagman compare to the intelligent construction safety traffic light system. The intelligent construction safety traffic light system can be best utilized by road construction site contractors and for any temporary traffic flow control. The system can replace the use of humans in any kind of traffic control operation and the comparison can see in Table 2.1 below.

Table 2.1: Comparison between Flagman and the Intelligent Construction Safety Traffic Light System

Factors	Flagman	Intelligent Construction Traffic Light System
Working hours	Limited	Un-limited
Weather Condition	Not Reliable	Reliable
Effectiveness	Vary	Consistence
Fatal Risk	High	Low

## 2.2 TITLE : Automated Traffic Light System For Road User's In Safety In Two Lane Road Construction Sites. [2]

This paper highlights about road construction safety traffic light system is considered one of the best devices in work zone traffic flow control systems. Contractors and flagman are less competent and do not obey the road safety during constructions. The device is a portable traffic light unit which can be best utilized in controlling traffic flow in a road construction site for long or short term lane closures and to control two-way traffic in a single lane. Implementing new technologies in automating traffic flow in road construction site could possibly eliminate the usage of a conventional flagman at all times.

### 2.2.1 Road Contractors

Most of the contractors are less competent and they do not obey the road safety regulations during construction. These regulations are created by responsible authorities and agencies such as The Department of Occupational Safety and Health (DOSH) which contains legal requirements to ensure safety of the workers at work zone and public. Indirectly, this irresponsible attitude causes problem to numerous parties. Apart from that, a flagman who is appointed by the contractors might not be well trained by their

employment. These untrained flagmen could be harmful for the road users and themselves. At times the flagman's concentration on controlling the traffic flow also can result in various miseries not only to his life but also to the public. For an example, when the flagman works under the hot sun, they get tired easily and lose their concentration on work like shown in Figure 2.1.



Figure 2.1: Flagman Disobeying the Safety Rules [2]

The basic structure of the intelligent construction safety traffic light system is :

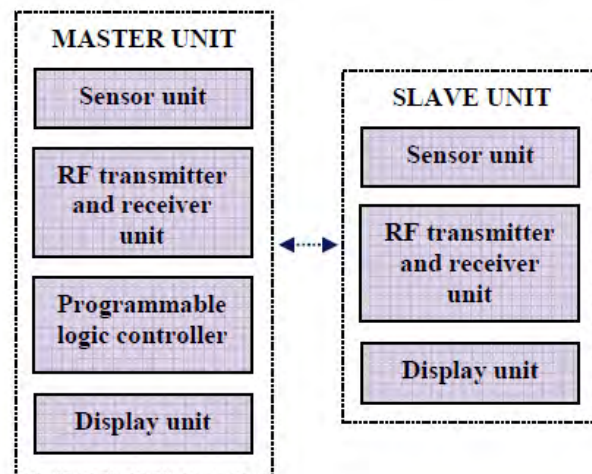


Figure 2.2: Structure of the Intelligent Construction Traffic Light System [2]