Faculty of Electrical and Electronic Engineering Technology

DESIGN AND DEVELOPMENT OF AN AUTOMATED RAILWAY GATE SYSTEM USING WIRELESS NOTIFICATION FOR OBSTACLES DETECTION

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Bachelor of Electronics Engineering Technology (Telecommunications) with Honours

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I approve that this Bachelor Degree Project 1 (PSM1) report entitled DESIGN AND DEVELOPMENT OF AN AUTOMATED RAILWAY GATE SYSTEM USING WIRELESS NOTIFICATION FOR OBSTACLES DETECTION is sufficient for submission.

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I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electronics Engineering Technology (Telecommunications) with Honours.

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Date : .....

DEDICATION

To my beloved mother, Mrs Soorya Kala,
and father, Mr Jude Amal Raj,and
my siblings.

ABSTRACT

The railway system is the most commonly used transportation mode. More safety features should be added into the system to ensure less operation failures to happen in future. Railroad related accidents are more dangerous than other transportation accidents in terms of severity and death rate. In this project, IR sensors play the main role as the detection of incoming train in several places. Six IR sensors were used in terms to detect the incoming train. Those sensors are placed in various places where IR sensor 1 gives signal to change the level crossing signal and IR 2 gives the signal to close the gate in the level crossing. In addition, IR sensor 3 and 4 were placed at the level crossing to ensure obstacles to be detected and the gate opens when there are obstacles with a message through GSM modular to the train master telling the train to slow down. This procedure also follows with an emergency alarm buzzing while the message is being sent. Furthermore, there is two other sensors which is IR sensor 5 and IR sensor 6 which acts to close the gate back if there is no obstacles detected and the signal at the level crossing changes when the trains passes IR sensor 6. The overall system works is dual direction because in certain countries railway industries are still using single tracks for trains to move. This project ensures that the system works even when the train approaches in either direction.

ABSTRAK

Sistem kereta api adalah mod pengangkutan yang paling biasa digunakan. Lebih banyak ciri keselamatan harus ditambah ke dalam sistem untuk memastikan kurang kegagalan operasi berlaku pada masa hadapan. Kemalangan berkaitan kereta api adalah lebih berbahaya daripada kemalangan pengangkutan lain dari segi keterukan dan kadar kematian. Dalam projek ini, sensor IR memainkan peranan utama sebagai pengesanan kereta api yang masuk di beberapa tempat. Enam sensor IR digunakan dari segi untuk mengesan kereta api yang masuk. Sensor tersebut diletakkan di pelbagai tempat di mana sensor IR 1 memberi isyarat untuk menukar isyarat lintasan aras dan IR 2 memberi isyarat untuk menutup pintu di lintasan aras. Selain itu, sensor IR 3 dan 4 diletakkan di persimpangan aras untuk memastikan halangan dikesan dan pintu pagar terbuka apabila terdapat halangan dengan mesej melalui modular GSM kepada jurulatih kereta api yang memberitahu kereta api diperlahankan. Prosedur ini juga diikuti dengan penggera kecemasan berdengung semasa mesej dihantar. Tambahan pula, terdapat dua lagi sensor iaitu IR sensor 5 dan IR sensor 6 yang bertindak menutup kembali pintu pagar sekiranya tiada halangan dikesan dan isyarat di peringkat lintasan berubah apabila tren melepasi IR sensor 6. Keseluruhan sistem berfungsi adalan dua arah kerana negara tertentu industri kereta api masih menggunakan landasan tunggal untuk kereta api bergerak. Projek ini memastikan sistem berfungsi walaupun kereta api menghampiri kedua-dua arah.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS

LIST OF ABBREVIATIONS

IR Sensor	Infrared sensor
GSM Modular	Global System for Mobile communication

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background

Railway system is commonly used transportation mode and which of those kinds of transportation that is affected by human mistake such as level crossing accidents and collisions [1]. The severity of railway accidents and death rate is higher compared to other transportation accidents. In many countries like Canada, India and Russia are still using the train as their primary transport. Those countries are still focusing on this transportation due to the high cost and the duration of journey time which necessitates greater initiative in improving the railway system.

The railway system needs accurate planning to offer a secure and accident-free ride. Since the advent of railway transportation system, many accidents have involved train and other vehicles such as cars, motorcycles and even accident between trains. A level crossing is an intersection where a railway line crosses a road. This level crossing is at risk of accidents and death. Human coordination in controlling the level crossing is very important. Failure to coordinate will result in disasters. The majority of level crossings in many countries are still regulated manually rather than automatically. Oversleeping, laziness, timing faults, and other human flaws all contribute to railway accidents.

Level crossings that are manually controlled by humans who operates the gates have a higher risk of accidents due to road users' negligence or time errors made by the gatekeepers [2]. If the gate operations are eventually automated based on sensors, the time

taken to operate the system will be greatly decreased and so would the number of accidents caused by railway transit.

1.2 Problem Statement

In most instances, an incoming train requires human power to open and close the gate. To reduce delays in manual gate opening and closing, an automatic system must be used to prevent mishaps [3]. Moreover, if there are any obstacles stuck on the railway track, there will be a delay for the train master to receive information about the obstacles so a wireless message/notification need to be sent to the train master to inform the train to slow down or stop at the previous station [4]. Until the obstacles are removed the gate should be automatically opened when obstacles are detected [5]

1.3 Project Objective

a) To develop an automated railway gate system, automatic opening and closing of the gate when train is arriving and departing.

b) To detect obstacles and send notification to train master through wireless system

c) To develop an automated opening and closing of the gate when obstacles detected.

1.4 Scope of Project

The scope of this project are as follows:

a) IR sensors that limit the human power needed to open and close the gate manually

b) Reduce cost spend on paying people to work in opening and closing of the gate

c) IR sensor detecting the obstacles without human investigating

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The first section discusses how automated train system's mechanism works. Second section discusses the intelligent traffic light system and the usage in this project. The third section demonstrates these ideas by explaining and integrating the GSM module into this project.

2.2 Automatic Control of Railway Gates

In order to manage the railroad gate, the railway project uses two sets of IR sensors, with a couple of IR sensors situated near to the intersection level. The sensors are placed at a certain distance from one another. An upward sensor, for example detects the entry of the prepare. The drawback sensor is a sensor that detects the flight of prepare. Combining both the sensors and can be describe as drawback sensor. A transmitter and a recipient are included in each sensor combination [6]. The ideal gap which the sensors could be placed to identify the landing of the prepare is 5km from the level crossing and 1km of the takeoff and the doorway would be open for 8 minutes. This presents a framework that includes five sensors: IR one, IR two, IR three, IR four as well as a light dependent resistor (LDR), a laser source(L), a counter, and one signal (B1). The IR sensors are gradually placed on the track at a distance of 5km and 1km on both sides of the level intersection. To determine the proximity of a snag between the railroad gate, the LDR and laser source are used [7]. DC engines are used to control the operation of the doors in the system. The ringer is used to signal the train's arrival within a certain amount of time. The idea behind the automatic

railroad entryway control framework is to reduce human involvement in closing and opening the railroad entrance gate which allows and prevents automobiles and people from colliding with railroad lines[8].

2.3 Sensor Automatic Railway Gate Control System

The ideal opportunity for which the entryway is shut is reduced because the entryway operations are mechanized in light of the sensors. The research intends to create a programmed railway track door control framework that is more solid and secure than the manual frameworks. A sensor-based railroad entryway mechanization framework has been developed to automate the process of opening and closing entryways at railroad level crossings [1]. This project's parameters include a base pulse, a most extreme pulse, and a redundancy rate. The servos are regulated by delivering them a variable-width pulse. This pulse is sent using the control wire. This pulse contains three parameters: a base pulse, a maximum pulse, and a redundancy rate. The landing and flight of the prepare are decided using an IR handset [9]. By utilizing an IR Transceiver, in which the distance between the prepare and the receiver is determined to be legitimate zero. The IR LED converts the IR radiations from the episode into an equal electric current, which when passed via a resistor result in a precise voltage drop. This voltage estimation will be based on the power of occurrence IR radiations or, there will be distance between the IR transmitter and the receiver [10]. The circuit is separated into three sections. The microcontroller comes first, followed by the IR sensor segment on a continuous rail, and finally the servo engine that operates the doorway.

2.4 Intelligent Traffic Control System

One of the most serious problems that large urban areas face is the problem of activity clogging. The line activity light concept is a result of research into movement building, in which vehicles touch base at a crossing point regulated by an activity light and shape a line [11]. Several research projects developed unique ways for assessing the lengths of the lines in each path on road width and the number of cars that are usual at a given time. This work demonstrated an innovative technique for the design and implementation of an intelligent movement lights control framework. The Structured System Analysis and Design Methodology (SSADM) and the Fuzzy Based Design Methodology were combined to create this technique [12].

2.5 Wireless Signal Automation in Railway

There are countless train accidents occurring at levels between railroad and interstate due to unresponsiveness and irresponsibility in manual operations or a lack of labourers. The MSP430 microcontroller is used as the main component in this system [4]. The framework is built around the MSP430 microcontroller. The main purpose of the android application is to communicate the Wireless flag to the Wi-Fi module. The android application features two catches that may be used to open the door and near to close it. The framework receives input from the vibration sensors in the unmanned mode and automatically closes the door. The yield displays on the LCD whether to open or close the door. Vibration sensor are sensors that measure the vibrations produced by the devices on display and break them down into direct speed, uprooting and proximity. Vibration sensors sense the vibration of a train approaching or passing by. The vibration sensors installed beneath the track provide input to the framework. The android versatile comes with an application that sends a message to the WIFI module. There are two options in the android

application: open and close. When we select open or close, the WIFI module receives the flag and sends it to the microcontroller, causing the doorway to open or close naturally [2]. We can determine the current longitude and scope position of the prepare in caverns and high altitudes using an android application and a WIFI module. This system greatly improves the dependability of correspondence while also being a simple system. The DC engine entrance can work in a natural way.

Figure 2.1 explains the wireless signal automation for a railway with block diagram illustration

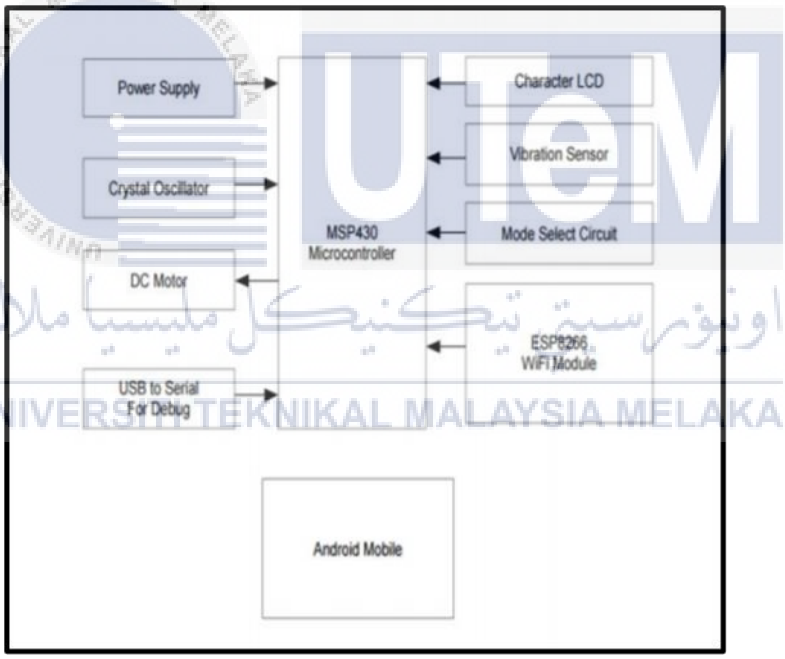

Figure 2.1: Operating system of wireless automation
(Source : www.ijircce.com)