UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AUTOMATED STREETLIGHT MALFUNCTION ALERT SYSTEM (ASMAS) BY USING GSM

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree in Engineering Technology (Electronic Industrial) with Honours

By

MOHAMAD HAFIZ BIN MAT
B071210173
900913-03-5077

FACULTY OF ENGINEERING TECHNOLOGY
2015

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **AUTOMATED STREETLIGHT MALFUNCTION ALERT SYSTEM (ASMAS) BY USING GSM**

SESI PENGAJIAN: **2015/16 Semester 1**

Saya **MOHAMAD HAFIZ BIN MAT**

mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (✓)

☐	SULIT	(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)
☐	TERHAD	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972)
☐	TIDAK TERHAD	

Disahkan oleh:

(TANDATANGAN PENULIS)

(TANDATANGAN PENYELIA)

Alamat Tetap:

KAMPUNG JENEREH KUBANG GADONG, 17000 PASIR MAS, KELANTAN.

Cop Rasmi:

Tarikh: 09 DISEMBER 2015

** Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.

DECLARATION

I hereby, declared this report entitled "Automated Streetlights Malfunction Alert System (ASMAS) by using GSM Modem" is the results of my own research except as cited in the references.

Signature **:……...**

Name **: MOHAMAD HAFIZ BIN MAT**

Date **: 09 DISEMBER 2015**

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Industrial Electronics) (Hons.). The member of the supervisory is as follows:

……

(En. Khairul Anuar Bin A Rahman)

ABSTRACT

The street lighting breakdown is very common. This will lead to the hassle and insecurity for consumers. This project provides a new paradigm in automated street light malfunction system. The system has the capability to send multiple SMS to contractors and local council in the event of a malfunction street lighting. Basically, users have to call the contractor based on the information displayed in the street light. With the current system, the time taken to respond to the street light malfunction will depend on how soon a user calls the contractor. In this project, the system can detect of the street lighting malfunction system. Upon receiving the street light malfunction, SMS will be sent to the above mentioned parties for further action. The malfunction of street light can detected by the uses rocker switch. Where, when this condition switch is OFF, automatically SMS will be sent to the contractor. The microcontroller analyze the seriousness of the malfunction and sends the signal to a GSM module. Then the GSM module will be sent the details of malfunction, including location of the street light. The best coverage for the project are the coverage maxis. It's because the selective coverage has high coverage in line with the strategic areas can generate SMS delivery system most appropriate when the fault is effective street lighting. For this project, bulb 12 Volt was used as a prototype of the street light and to show how the street light malfunction is use rocker switch. The main hardware components of the system are SIM900A GSM/GPRS Module and PIC16F887A microcontroller.

ABSTRAK

Kerosakan lampu jalan adalah perkara biasa. Ini akan menyebabkan kepada kerumitan dan tidak selamat untuk pengguna. Projek ini mewujudkan paradigma baru dalam system pemantauan lampu jalan. Sistem ini mempunyai keupayaan untuk menghantar beberapa SMS kepada kontraktor dan majlis tempatan jika berlaku kerosakan lampu jalan. Pada asasnya, pengguna perlu memanggil kontraktor berdasarkan maklumat yang dipaparkan pada tiang lampu jalan. Dengan sistem semasa, masa yang diambil untuk membaiki kerosakan lampu jalan akan bergantung kepada tempoh masa yang diambil oleh pengguna untuk melaporkan kepada pihak kontraktor. Dalam projek ini, sistem boleh mengesan sistem lampu jalan rosak. Apabila menerima kerosakan lampu jalan, SMS akan dihantar kepada pihak-pihak yang dinyatakan di atas untuk tindakan lanjut. Kerosakan lampu jalan boleh dikesan melalui suis kegunaan jumpelang. Jika, apabila keadaan suis ini dimatikan, secara automatik SMS akan dihantar kepada kontraktor. Mikropengawal menganalisis betapa seriusnya kerosakan dan menghantar isyarat untuk modul GSM. Kemudian modul GSM akan menghantar butiran kerosakan, termasuk lokasi lampu jalan. liputan yang terbaik untuk projek ini adalah maxis. Ini kerana liputan yang terpilih mempunyai perlindungan yang tinggi selaras dengan bidang strategik boleh menjana sistem penghantaran SMS yang paling sesuai sewaktu kerosakan adalah lampu jalan yang berkesan. Untuk projek ini, mentol 12 volt digunakan sebagai prototaip lampu jalan dan untuk menunjukkan bagaimana kerosakan lampu jalan adalah dengan menggunakan suis jumpelang. Komponen-komponen perkakasan utama sistem ini adalah SIM900A GSM modul / GPRS dan PIC16F887A pengawal mikro.

DEDICATIONS

In the name of ALLAH the Most Gracious the Merciful Thousands of appreciation to ALLAH for giving me strength, strong, ideas and knowledge that helps me to finish this project.

For my beloved parents, my dear lecturers especially En. Khairul Anuar Bin A. Rahman as my supervisor and all my friends. May ALLAH bless all of you as for giving me the motivation and support to do with this project.

ACKNOWLEDGMENTS

First of all, I would like to express my thankfulness and gratitude to ALLAH S.W.T. Who has given me all the strength that I need to prepare this report. Besides, on this occasion, I would like to express my appreciation to my beloved lecturer, En. Khairul Anuar Bin A. Rahman for his help, advices and guidance that he gave during this project. I really appreciate him tips and guide that give me pleasant to solve this project. He encourages me to prepare this project. He also kindly read my paper and offered invaluable details, advices on grammar and organization. Without him, maybe I cannot be able to do this project.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLE

CHAPTER 1
INTRODUCTION

1.0 Background

Capacity to detect the malfunction of the system and street lights automatically and the location where the malfunction occurred. Meanwhile, the number of street lighting systems around the world is too much. Thus, the development of street lighting malfunction alert system using Global System for Mobile Communications (GSM) modem implemented in order to enable authorities or maintenance to alert malfunction to the system automatically. The GSM specifications define the functions and interface requirements in detail but do not address the hardware. Where, the reason for this is to limit the designers as little as possible but still make it possible for the operators to buy equipment from different suppliers. For this network is divided into three major systems: the switching system (SS), the base station system (BSS), and the operation and support system (OSS).

1.1 Problem Statements

Too many demands on the use of street lighting led to oversee the work becomes more difficult and complex. During the surveillance camera system for street lighting is higher in cost (installation and maintenance).

Usually, there is no monitoring system for street lighting in areas a friend. Users have reported that the street lights were damaged to the department in charge by phone. However, this depends on the intelligence of consumers. The time it takes to repair the damage to street lights may be longer if the user or owner fails to report.

1.2 Objectives

The objectives of this project are to:

a) To implement the interface PIC microcontroller with a GSM communication modem using the software.

b) To identify how GSM communication modem function for this system.

c) To analyze the system to be implemented using a wireless communications system its existing operation.

1.3 Scope

For this project, the model of street light made of simple timber and PIC microcontroller. This model uses instead of bulb 12V DC as a signaling device. This project also consists of a system that can detect alert bulb malfunction.

The bulb malfunction may happen because of the run in a long time. This system analyzes the output current of bulb and send to a PIC microcontroller.

The GSM module is used in this project to send the SMS to the contractor maintenance and local council. This SMS contains the location of the street light and the detailed of bulb malfunction.

1.4 Project Significance

This project can handle any weaknesses in the current street lighting system for wireless communications systems to track any damage or warnings automatically. Whereas, the system will automatically alert and this system will continue to send SMS to the authorities, including the location of the malfunction has been detected. Accordingly, with the wireless communication system, the malfunction can be repaired streetlights immediately upon notification.

1.5 Thesis Layout

This thesis was organized in six chapters. For detail explanation about the content of each chapter is as follows:

Chapter 1 to explain about the overview of the project about the alert malfunction of street lighting methods. This chapter contains the problem statement, objective, scope of project, project significant and thesis layout.

Chapters 2 focus on literature review on many previous projects related to this project. This literature review helps in giving the brief many ideas of this project.

Chapter 3 covers the methodology of this project, including the hardware development and software development.

Chapter 4 shows the result of this system. It consists the result of the hardware and software. Then, the discussion about the result was done.

Chapter 5 discusses about the management of the project. These chapters consist of the project Gantt chart for semester one and two.

Chapter 6 discuss about the conclusion and future work that could be done for this project.

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

Basically, street lighting is one of the important parts of a city‟s infrastructure where the main function is to illuminate the city‟s streets during the dark hours of the day. There are several factors need to be considered in order to design a good street lighting system such as night-time safety for community members and road users, provide public lighting at cost effective and the reduction of crime.

Furthermore, manual control is prone to errors and leads to energy wastages and manual dimming during midnight is impracticable. The current trend is the introduction of automation and remote management solutions to control street lighting.

This system consists of a central control system installed in command center; GSM mobile terminal networks. Information about the malfunction can be received from PIC microcontroller and send messages with the GSM network platform.

In this type sensor will be used as a light sensor. The light sensor detects darkness to turn ON / OFF switch, so the street lights would be willing to switch. LDR, which vary according to the amount of light falling on the surface, this is an inducement to whether it is a day-night time is controlled by PIC16F877A microcontroller and connected to a GSM modem.

It is designed to automatically detect malfunction. Where, when the street lights automatically apply the malfunction will send the location and the location data to a GSM modem. GSM modem is connected to the authorities because this

modem will send the information received earlier in the form of SMS to the authorities.

The block diagram as shown in Figure 2.0 on the street light system as shown consists of microcontroller, LDR sensor and GSM modem.

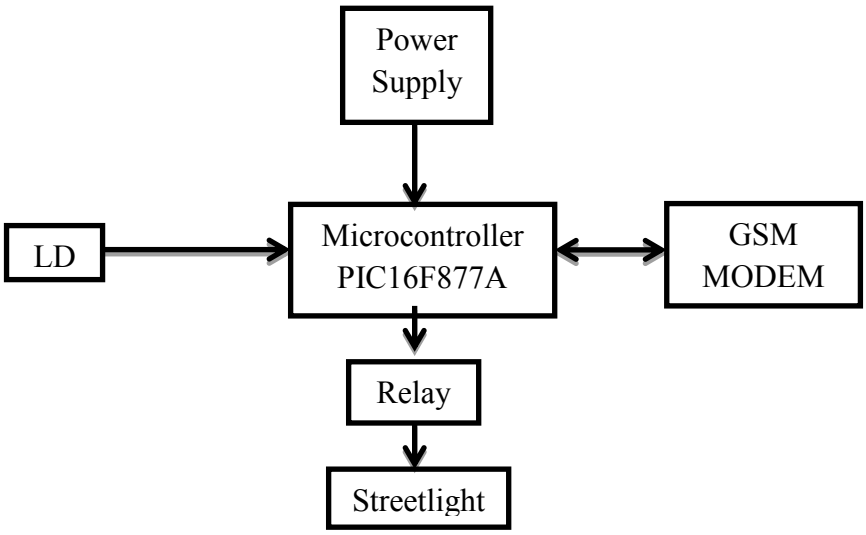

Figure 2.0: Block Diagram

2.1 Theoretical Background

2.1.1 Light – Dependent Resistor (LDR)

The theoretical concept of the light sensor lies behind, which is used in this circuit as a darkness detector. The LDR is a resistor as shown Figure 2.1 and its resistance varies according to the amount of light falling on its surface. When the LDR detect light its resistance will get decreased, thus if it detects darkness its resistance will increase. (Ahmad Zaki bin Hj Shukor, October 2009)

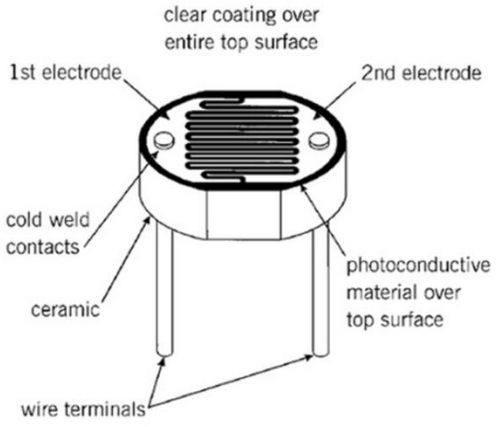

Figure 2.1: Light – Dependent Resistor (LDR)

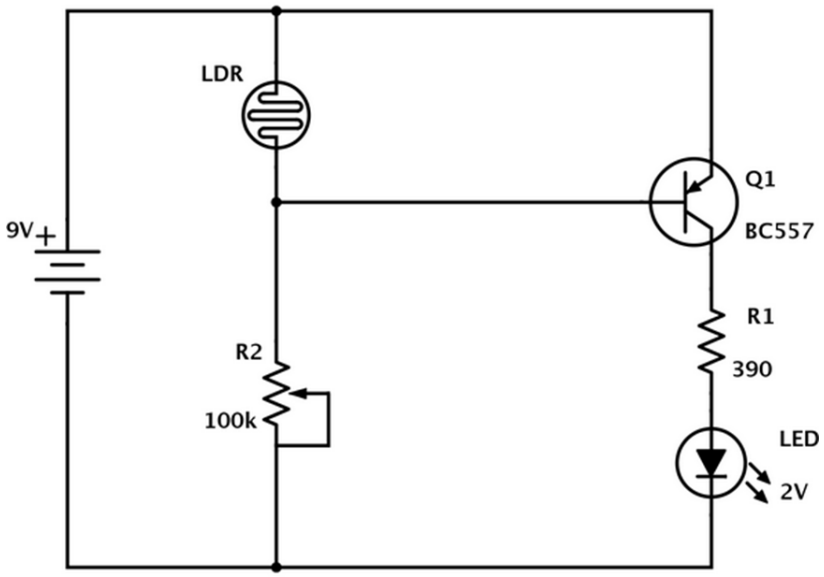

Figure 2.2: Schematic Diagram LDR

2.1.2 Regulated Power Supply

We start with an unregulated power supply ranging from a 9volt to 12volt DC. To make a 5volt power supply, KA8705 voltage regulator IC as shown Figure 2.3 has been used.

Figure 2.3: Regulated Power Supply

Simply connect the positive lead form unregulated DC power supply (anything from 9VDC to 24VDC) to the input pin, connect the negative lead to the common pin and then turn on the power, a 5 volt supply from the output pin will be gotten. (Ahmad Zaki bin Hj Shukor, October 2009)

2.1.3 Relays

Relays are remote control electrical switches that are controlled by another switch, such as a horn switch or a computer as in a power train control module. Relays allow a small current flow circuit to control a higher current circuit. Relays, which come in various sizes, ratings, and applications, are used as remote control switches. This Figure 2.4 shows different types of relays. (Ahmad Zaki bin Hj Shukor, October 2009)

Figure 2.4: Relay Component

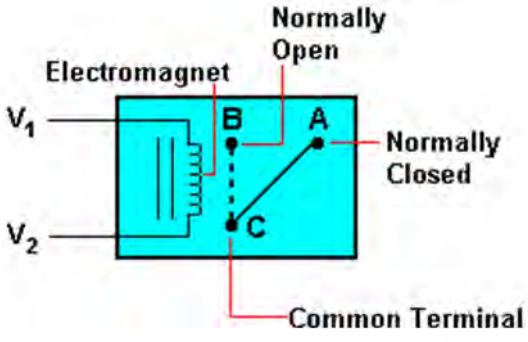

Figure 2.5: Schematic Diagram for Relay

2.1.4 PIC16F877A Microcontroller

A microcontroller is a computer control system on a single chip. It has many electronic circuits built into it, which can decode written instruction and convert them to electrical signals. So, the microcontroller will then step through these instructions and execute them one by one. As an example of this a microcontroller we can use it to control the lighting of the street by using the exact procedures.

The microcontroller is now changing electronic design. Instead of hard wiring a number of logic gates together to perform some function we now use instructions to wire the gates electronically. The list of these instructions given to the microcontroller is called a program. These are different types of microcontroller, this project focus only on the PIC16F877A microcontroller where its pins as shown Figure 2.6.

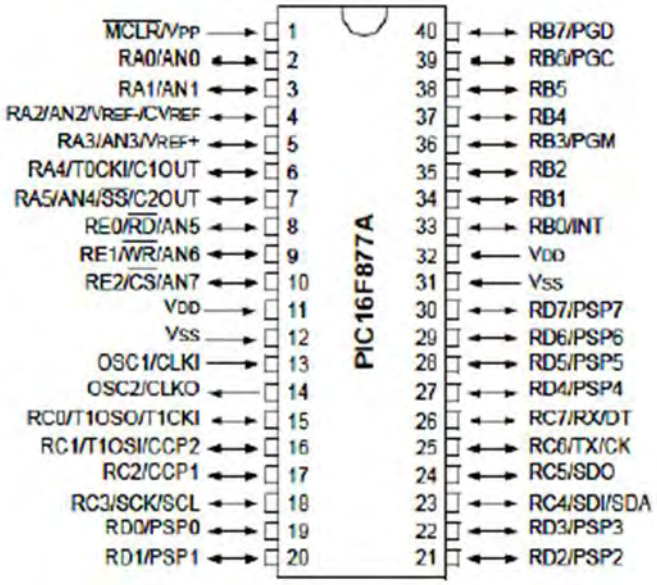

Figure 2.6: PIC16F877A Microcontroller

2.1.5 Global System for Mobile (GSM)

Global System for Mobile communications was a standard used in long distance data transfer with the use of cell network. (Firdaus bin Haji Sidek, 2010) Each network uses elevated tower that consists of transceivers which relays the data from one tower to another tower until it reaches the network provider. It is chosen as the medium for the transfer of location information. The simple and inexpensive Short Message Service (SMS) allows users to send up to 160 characters. It can be linked to a computer using DB9 header and simple RS232 board with the Hyper Terminal software. It uses AT command for SIM900A GSM/GPRS to configure the module as shown Figure 2.7 and as shown Table 2.8 is pin description.

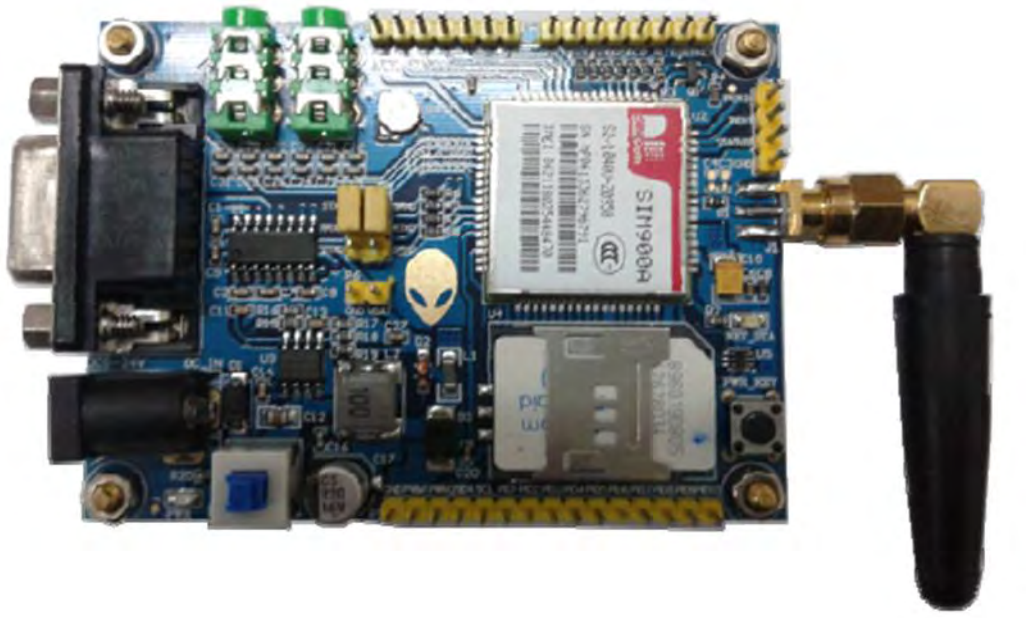

Figure 2.7: SIM900A GSM/GPRS

Table 2.8: Pin description

Hardware Items	Description
Power Main Switch	Module‟s power switch
Power Input	For power input, support DC5V – DC24V
Power Indicator	Indicator for power. LED lit when the power main switch is on.
SIM Card Socket	For insert SIM Card
On/Off Switch	Press for 1 second, the module will turn – on; press for another 1 second, the module will turn – off.
Serial Port Selection	i. STXD and SRXD are serial port from SIM900A. LVTTL level (3.3V/5V) ii. RTXD and RRXD are serial port for RS232 after IC SP3232 level conversion. iii. DTXD and DRXD are debug port for SIM900A.
RS232	Connect to PC through RS232 communication.

2.1.5.1 How to connect GSM Module with USB converter

This module is designed in a way so that user can connect this module without Serial cable, this module can be connected to any of Serial to USB converter module or cable. Here we have shown Figure 2.9 demo how to connect this interfacing board with CP2102 Serial to USB converter Module through RXD, TXD and GND. Connect CP2102 Serial to USB converter module to PC through USB

cable, connect one end of the USB cable to PC‟s USB connector and connect the other end of USB to CP2102 module‟s USB connector.

Figure 2.9: Connection GSM Module with USB converter

Therefore, the connect three Single Berg Wires to CP2102 module‟s RXD, TXD and GND pin as shown Figure 2.10. Then connect RXD wire to TXD of GSM module and TXD wire to RXD of GSM module. Make GND common by connecting the GND wire to GND pin of GSM module.

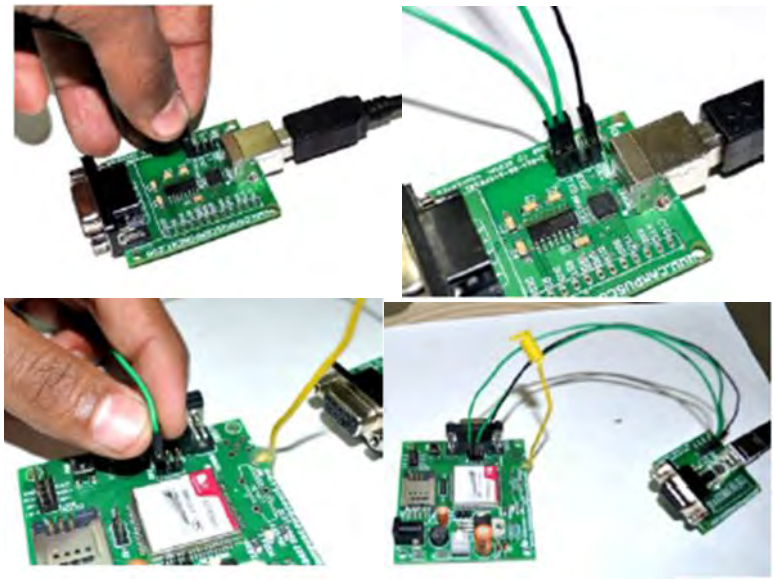

Figure 2.10: Connection Single Berg Wires to CP2102 modules