



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOPMENT OF IOT STREET LAMP MONITORING
SYSTEM FOR LAMP PRODUCTION FACTORIES**

This report submitted in accordance with the requirement of the Universiti Teknikal
Malaysia Melaka (UTeM) for the Bachelor's Degree in Electronic Engineering
Technology (Electronics Industry) with Honours

by

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ABSTRACT

Monitoring is the standard observation and recording of a system or programme's behaviours. It is a mechanism in which information on all aspects of the system is gathered routinely. Monitoring system defined as a significant number of protected applications deal with environmental monitoring (Mason, 2018). A monitoring system was very important aspect especially for industrial to analyse and identify the problem facing by their product and determining the solution to solve it. Monitoring systems are responsible for controlling a company's technology to analyse its operation and performance, as well as detecting and alerting potential errors.

The purpose of this project is to develop system for monitoring a functional of street lamp during the testing session. The finished product of street lamp will need to undergo a testing session by a quality control department to ensure their product give the best experiences to their customers. This process was giving challenges to the worker because the testing session was manually done including monitoring and recording specific parameters to ensure the product at their best condition before supply to the customers. So this system was developed to overcome the problem and ease the workload of the worker.

This system will use Pixy camera module as the input for the system. The camera will captures the video of testing session and the video can be monitored by designed Graphical User Interphase (GUI). The system also using Raspberry Pi 3 model B+ as a platform to transmits data from the camera to the server. When the camera detect any change during video recording, the system will alert the worker and provide some simple report for future works.

ABSTRAK

Pemantauan adalah penelitian dan rakaman tingkah laku sesuatu sistem atau program. Ia adalah mekanisme dimana maklumat dalam segala aspek didalam sistem dikumpulkan secara rutin. Sistem pemantauan ditakrifkan sebagai sebilangan besar aplikasi yang dilindungi dalam menangani pemantauan alam sekitar(Mason, 2018). Sistem pemantauan adalah aspek yang sangat penting terutamanya bagi industri untuk menganalisis dan mengenal pasti masalah yang dihadapi oleh produk mereka dan menentukan penyelesaian untuk menanganinya. Sistem pemantauan bertanggungjawab untuk mengawal teknologi syarikat untuk menganalisis operasi dan prestasinya, serta mengesan dan memberi amaran akan kesilapan yang mungkin berlaku.

Tujuan projek ini adalah untuk membangunkan sistem untuk memantau fungsi lampu jalan semasa sesi ujian. Produk siap lampu jalan perlu menjalani sesi ujian oleh jabatan kawalan mutu untuk memastikan produk mereka memberi pengalaman terbaik kepada pelanggan mereka. Proses ini memberi cabaran kepada pekerja kerana sesi ujian dilakukan secara manual termasuk pemantauan dan rakaman parameter khusus untuk memastikan produk berada pada keadaan terbaik sebelum membekalkan kepada pelanggan. Jadi sistem ini dibangunkan untuk mengatasi masalah ini dan memudahkan beban kerja pekerja

Sistem ini akan menggunakan modul kamera Pixy sebagai input untuk sistem. Kamera akan menangkap video sesi ujian dan video boleh dipantau dengan menggunakan Interphase User Graphical (GUI) yang direka. Sistem ini juga menggunakan model Raspberry Pi 3 B + sebagai platform untuk menghantar data dari kamera ke pelayar. Apabila kamera mengesan apa-apa perubahan semasa rakaman video, sistem akan memberi amaran kepada pekerja dan menyediakan beberapa laporan ringkas untuk kerja-kerja masa depan.

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TABLE OF CONTENTS

CHAPTER 1	1
INTRODUCTION.....	1
1.0 Overview	1
1.1 Background	1
1.2 Problem Statement.....	2
1.3 Objectives.....	3
1.4 Project Scope	3
1.5 Report Structure	3
CHAPTER 2	5
LITERATURE REVIEW	5
2.0 Introduction	5
2.1 Background History.....	5
2.2 Related Research	8
2.2.1 A Road Sign Detection and Recognition Robot using Raspberry Pi	9
2.2.2 Industrial Vision Robot with Raspberry Pi using PIXY Camera.....	12
2.2.3 Smart Surveillance Monitoring System Using Raspberry PI and PIR Sensor..	14
2.2.4 Remote Video Monitoring System Using Raspberry Pi 3 and GPRS Module .	16
2.3 Comparison Table	18
2.3.1 Camera module.....	19
2.3.2 Processor module	20
2.3.3 Data Streaming Program.....	21
2.3.4 Programming Language	21
2.4 Proposed Method	24
2.4.1 Raspberry Pi 3 model B+	24
2.4.2 CMUcam5 Pixy Camera.....	26
2.4.3 Python	28
CHAPTER 3	29
METHODOLOGY	29

3.0	Introduction	29
3.1	Project Block Diagram	30
3.2	Project Flowchart	31
3.2.1	Overall Flowchart	31
3.2.2	Flowchart for Program	33
CHAPTER 4	37
RESULT & DISCUSSION	37
4.0	Introduction	37
4.1	Raspberry Pi Configuration	37
4.1.1	Installing 'Libusb'	37
4.1.2	Installing 'Libboost'	38
4.1.3	Installing 'cmake'	39
4.1.4	Scanning the Program	40
4.1.5	Run the Program	40
4.2	Coding CMUcam5 Pixy Camera	41
4.3	Installing PixyMon	42
4.3.1	Install Dependencies for Building PixyMon.	42
4.3.2	Building PixyMon	43
4.3.3	Add Permission for Pixy USB Interface	43
4.4	Testing PixyMon	44
4.4.1	Pixy Raspberry Pi connection	44
4.4.2	Run the PixyMon	45
4.5	Train Pixy Identify Light Source	45
4.6	Compiling System Code	46
4.7	System Result	47
4.8	Analysis.	48
4.8.1	Colour Detection.	48
4.8.2	Distance of Detection	50
4.8.3	Time for Detection	52
CHAPTER 5	54
CONCLUSION & FUTURE WORK	54
5.0	Introduction	54
5.1	Conclusion	54

5.2	Future Work	55
REFERENCES		56
APPENDICES		57

LIST OF FIGURES

Figure 2 1: Channing’s Fire-alarm System	6
Figure 2 2: Pandora FMS GUI.....	7
Figure 2 3: Block Diagram of System	10
Figure 2 4: Road Sign Detection Robot	11
Figure 2 5: Forward movement of robot.....	11
Figure 2 6: CMUcam5 Pixy camera layout	13
Figure 2 7: Industrial Vision System main components	13
Figure 2 8: System Design	14
Figure 2 9: Final Image/Video	15
Figure 2 10: Interfacing of USB camera and GPRS module to Raspberry Pi	16
Figure 2 11: streaming of video at receiver side using MJPG Streamer.....	17
Figure 2 12: The Raspberry Pi 3 Model B+	24
Figure 2 13: CMUcam5 Pixy Camera.....	27
Figure 2 14: Example of python coding.....	28
Figure 3 1: General Block Diagram for Street Light Monitoring System	30
Figure 3 2: Project Flowchart for Street Light Monitoring System	31
Figure 3 3: Program Flowchart for Planning Street Light Monitoring System	33
Figure 4 1: Installing the Libusb	38
Figure 4 2: Installing the Libboost	39
Figure 4 3: Installing the cmake.....	39
Figure 4 4: Scanning the dependency of program	40
Figure 4 5: Running the installed program	40
Figure 4 6: Installing libusb-1.0-0-dev.....	42
Figure 4 7: Installing the ‘g++’ compiler.....	43
Figure 4 8: Download the Pixy source code.	43
Figure 4 9: Setting permission over USB	44
Figure 4 10: Connection between Raspberry Pi and Pixy.....	44
Figure 4 11: Image from CMUcam5 Pixy Camera.....	45
Figure 4 12: Setting the configuration for light detection.....	45
Figure 4 13: Pixy was able to recognize the white light colour.	46
Figure 4 14: An array named ‘_field_’ was used.	46
Figure 4 15: ‘if’ condition to differentiate the condition.	47
Figure 4 16: starting the system	47
Figure 4 17: System detect the present of light.....	47

Figure 4 18: Push button for training purpose.	48
Figure 4 19: Distance of object detection.	51
Figure 4 20: Time taken for one loop	52
Figure 4 21: Latency Graph	53

LIST OF TABLES

Table 2 1: Comparison between research papers	18
Table 2 2: Advantages and disadvantages between research papers	22
Table 2 3: Specification Raspberry Pi 3 Model B+	25
Table 2 4: Specifications for CMUcam5 Pixy Camera.....	27
Table 3 1: Gantt chart project PSM 1	35
Table 3 2: Gantt chart project PSM 2	36
Table 4 1: Image detection test	49
Table 4 2: Distance of detection experiment.....	51
Table 4 3: Latency test for various distances	52

CHAPTER 1

INTRODUCTION

1.0 Overview

This part will give some explanation about the project that supposed to carry out. This chapter also provided information about the background of the project, objectives, problem statement, and scope of work and structure of the report.

1.1 Background

Monitoring system was the important element that provides a monitoring over a set of system or equipment to ensure the system running or working as usual. The monitoring system used in various field especially in industry. The factories used monitoring system to watch over their equipment and the system can give a feedback if there are errors in the manufacturing lines. The monitoring system also used to minimize the error done by human during monitoring caused by lack of concentration or experiences. This system also can give protection to the worker by alert the alarm system of the monitoring system after detect the harmful behaviour of equipment to the human.

The project is “Development of IoT Street Lamp Monitoring System for Muarlite Industries Sdn Bhd”. This project supposed to help in monitoring the functional of street lamp that will be tested at Muarlite Control room in real time and can be monitored online. The Pixy camera module will act as an input of the system

which used to monitor a row of tested street lamp inside the control room. So the camera module will monitor the functional of street lamp that hang together by the wall inside the quality control room and send the image to the designed Graphical User Interphase (GUI) for monitoring purpose.

1.2 Problem Statement

The growing competition on the current global market is an issue that leads into a large need for the industry to continue develop. Therefore, the industries try to find a competitive way to survive according to customers demand. Quality plays a crucial role in the entire organization's business process to become more efficient and effective on the global market, thus improving productivity and customer satisfaction as well as increasing market share(Sharma and Suri, 2017). So, the quality control department was built in every industry in order to improving quality of their product.

This project statement is based on the problem that has been faced by Muarlite Industries Sdn Bhd. The worker or engineer in the company need to monitor and record the data of the testing sessions themselves. The problem comes when the worker making mistakes during monitoring and recording session lead to inconsistency testing result because of their tired body. Tiredness of fatigue will dull the memory of workers and reduce the concentration that leads to forgetting to do something while performing the job that can lead to human error(Mariana, Sahroni and Gustiyana, 2018).

This situation can give a big impact to the production quality. When the testing session begin the street lamps will turn on for several days and the worker need to keep monitoring the lamps manually for every hour at the room. It so ineffective for the worker to walks into the testing room every hour just to record the behaviour and parameters of each street lamp. Therefore, this project used to minimize the error from the worker and improve the working atmosphere.

1.3 Objectives

The objectives of this project are:

1. To study the related research regarding the monitoring system.
2. To develop a Quality Control Light Monitoring System based on IoT which help to monitor the behaviour of lamp functionality in real time and generates output or feedback online.
3. To analyse performance and the result obtain from the developed monitoring system.

1.4 Project Scope

This project intended to monitor the functional of tested street lamps inside the quality control room in order to minimize the error made by worker and making the working environment more efficient. The monitoring system supposed to display the image of monitored street lamp online. The system will be tested following to the setup environment inside the quality control room. The pixy camera used as the input of the system to capture the desired image inside the quality control room and send the data to the raspberry Pi to process the data and give feedback in real-time. The raspberry Pi will process the image and uploaded the processed data to the designed GUI. Any change (on/off) of street lamp can be monitored and data will be stored to be analysed in order to improve the quality of the product.

1.5 Report Structure

In order to give a clear picture of this project, the paper was divided into four parts which is Introduction, Literature review, Methodology, and Expected result. These four arts used to understand the whole project and sequence steps to produce the prototype of this project.

Chapter 1: Firstly, this chapter will introduce the brief idea of the project and it also covers the overview of the whole project. This chapter also contains the background of the project, problem statement, objectives and project scope.

Chapter 2: Secondly, this part used to study the previous paper done by other researchers that related to this project in order to gain some information to carry out the project. All the information comes from research paper, journal and some relevant sources.

Chapter 3: Next, this chapter will cover the methodology used and implemented into this project. This chapter also will introduce the software and hardware technical detail that used to build the project prototype. It also contains the block diagram and flowchart of the project.

Chapter 4: Lastly, this part will give some idea of expected result or outcome from this project.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter will discuss about finding and analysis of previous project that related with monitoring system used in various field. All the detail is taken from resources such as journal, thesis, book and valid websites. It also contains related research using Pixy camera module and raspberry Pi for monitoring purposed. All the useful information is collected and will be used as a guide to complete this project.

2.1 Background History

The monitoring system has been used for a long time in industries especially in order to monitor their running machine and also for safety precaution. The first workable telegraph-based fire detection systems were created in U. S. in 1852 by Dr William Channing and Moses G. Farmer. Then the patent for was applied for his electromagnetic telegraph fire protection system for use in towns (Bistrović, 2017). They spoke to Boston authorities about funding a citywide fire alarm system construction. At 21 Court Square, the first central office was located. The building was owned by the town. The system started testing on April 28, 1852.

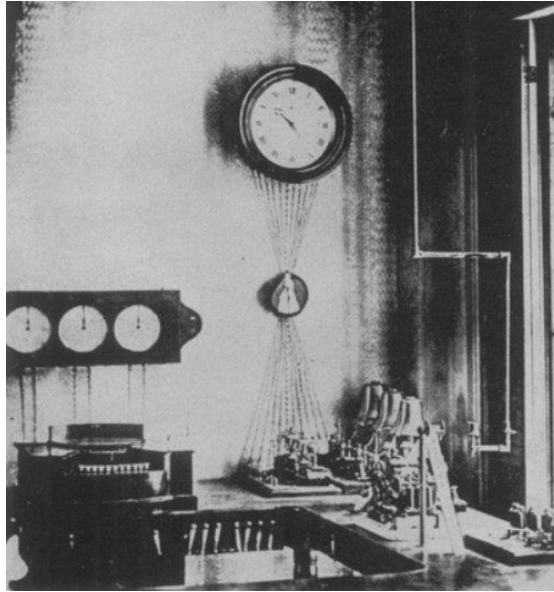


Figure 2 1: Channing's Fire-alarm System

Then the industries start to implement the fire alarm system to their factories to protect the workers and the properties. The industries more rely on monitoring system based on machine rather than ask their worker to monitor a set of system testing session for entire day. A worker tend to lost their attention and concentration due to tired body after monitoring for an hours and can lead to miss some importance behaviour during that time. By implementing the monitoring system, this problem can be solved to minimize the possibility of error and maximize the quality of the product. It also can increase the efficiency of the working environment.

A monitoring system was used widely in industries to detect and prevent failures; it is very convenient to have a good monitoring tool. Monitoring systems are responsible for controlling the technology used by the industry in order to analyse their operation and performance, and to detect and alert about possible errors. A good monitoring system is able to monitor devices, infrastructures, applications, services, and helps to increase productivity. It improves the use of the hardware of the company, through the control of its good operation. It also prevents incidents and when these incidents happen; they are detected faster, which saves time and money. This monitoring system plays big roles in industries especially in manufacturing lines if it used in a correct places. By implementing the monitoring system in

manufacturing lines, the engineers can monitor their machine and take immediate precaution if the machine broke down. The other purpose is to keep worker safe during stand in manufacturing lines.

The most popular monitoring system nowadays is Pandora FMS. Pandora FMS is a versatile monitoring system that can be used for any use within IT environments: networks, servers, applications, databases. Its use transcends the purely technical as it allows the business layers to obtain information in real time of what worries them, visualizing the data in a direct way from a single tool. Pandora FMS allows monitoring in a visual way the status and performance of several parameters from different operating systems, servers, applications and hardware systems such as firewalls, proxies, databases, web servers or routers.

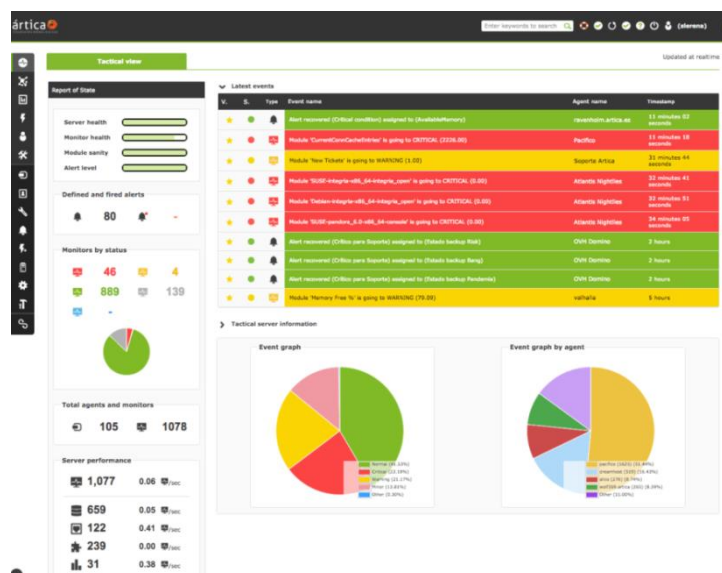


Figure 2 2: Pandora FMS GUI

In Pandora FMS architecture, servers are the core of the system because they are the recipients of bundles of information. They also generate monitoring alerts. It is possible to have different modular configurations for the servers: several servers for very big systems, or just a single server. Servers are also responsible for inserting the gathered data into Pandora's database. It is possible to have several Pandora Servers connected to a single Database.

The other part that contributes the success in industries was quality control department. In 1950 and 1951, W. Edwards Deming visited Japan to give a series of lectures on statistical methods for quality control, namely the Statistical Quality Control (SQC) method. Later, his SQC method was called Total Quality Control (TQC) for all of the company's operations, including management. Following the lectures, some of the contestants chose to use Deming's business management method and made efforts to improve the quality of their products to satisfy the international standards demanded by other countries, especially the United States.(Sato, 1950)

The specialist insides the department repeats the testing and records the results of each test. After the specialist has performed several tests, he reviews the results and looks for any trends in quality. If the quality declines, he increases the amount of testing performed in that area. If the quality maintains or improves, he decreases the amount of testing performed in that area. The quality control specialist continues to monitor the trending of the results.

Quality control is a process through which an industries seeks to ensure that product quality is maintained or improved with either reduced or zero errors. Quality control requires the industries to create an environment in which both management and employees strive for perfection. To aid the department, the monitoring system also can be placed at quality control room in order to monitor the testing session that may takes several days. The system capable to do the task without having tired or loss it inconsistence of taking data from the testing session and give a best results for monitoring purpose.

2.2 Related Research

The related projects are about references of application or system in used that related with the Street Light Monitoring System. This project used camera module as an input, a raspberry Pi as processing unit and web application as monitoring module.

2.2.1 A Road Sign Detection and Recognition Robot using Raspberry Pi

The main goal of this system is to automatically detect the road sign while driving and controlling the speed or making the turn according to the road sign.(Kharkar, 2018) Recognition of road signs is used to warn the distracted driver and to prevent his / her actions which could lead to an accident. The goal is to avoid accidents based on the detected road signs through both manual and automation processes in which all actions will be carried out. Automatic detection and recognition of road signs in real time can help the driver significantly enhance his / her safety. In general, road signs are placed near curved areas, hospital zones, crosswalks etc. to avoid accidents and heavy traffic. Driver might see the signs of the road and control the speed or make the turn accordingly.

This system will always trying to determine between the lower and upper range of the red colour and a rectangle be formed on the red signals. The rectangle formed on the red light signal has a fixed area creating a signal that controls the raspberry pi's GPIO pins. For the detection of the stop board sign system used cascade classifier in which it compare the xml file of different size of stop word with the input available from real world of traffic signboards using camera. After match found it generates a signal so the raspberry pi sends a control signal to the L298 to control the motors of the chassis. The 2 wheels of chassis connected with two motors. Thus the Raspberry pi gives the motor driver IC input and the motor driver IC output pins are connected to the chassis motor.

The basic idea is to recognize and classify the traffic signs from an input image. The image processing technique used in this system is based on the SURF algorithm. Finally, the recognition and classification of these potential road signs is performed in accordance with a road sign pattern database and the speed is controlled accordingly. The performance of this

idea depends on the quality of the input image, in relation to its size, contrast and the way the signs appear in the image. This system is fully based on automation process which replaces the existing manual operation. Automation process, in turn decreases the human error, increases the accuracy, processing speed and reliability. In this project, the Open CV software was introduced.

It stands for Open Source Computer Vision .It has a library of programming function mainly for real time computer visions. It has over more than 2500 optimize algorithms for set of classical algorithm as well as for the state of art algorithms in the computer visions is basically used for image processing in which we used it for the face detection, object detections, image recognition, traces and also for other functions. Camera is used to take the continuous images to get the traffic signs and signals from the real world. According to the images available through the camera we can send these images to the raspberry pi to perform car's control action.

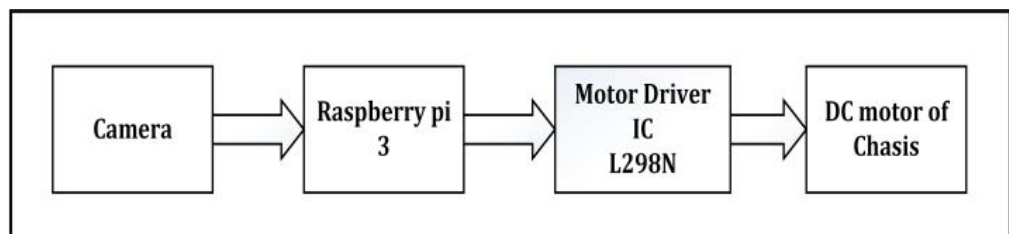


Figure 2 3: Block Diagram of System



Figure 2 4: Road Sign Detection Robot

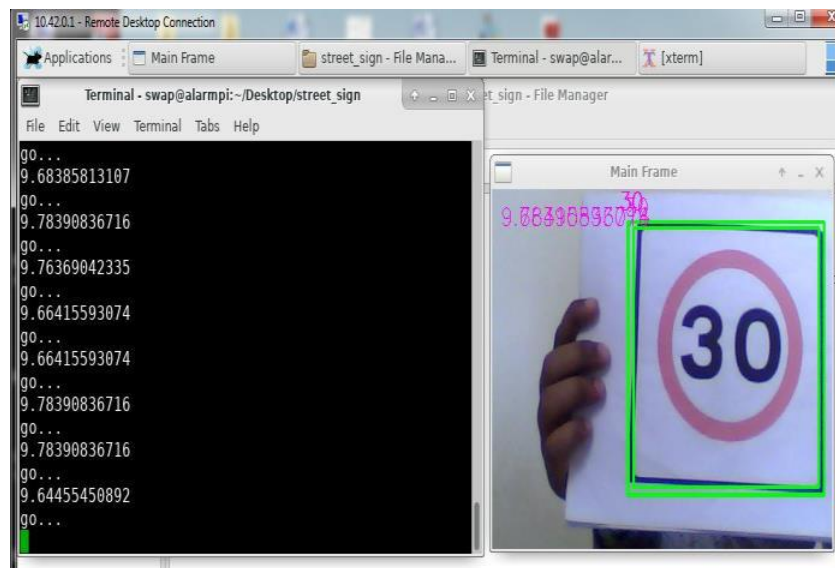


Figure 2 5: Forward movement of robot