UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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DEVELOPMENT OF CLEANING WHITEBOARDS SYSTEM
USING PROGRAMMING LOGIC CONTROLLER (PLC)

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

By

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TAJUK: **Development of Cleaning Whiteboards System using Logic Controller (PLC)**

SESI PENGAJIAN: **2017/18 Semester 2**

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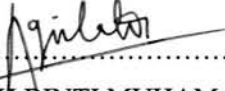Fakulti Teknologi Kejuruteraan
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I hereby, declared this report entitled **"Development of Cleaning Whiteboards System using Programming Logic Controller (PLC)"** is the results of my own research except as cited in references.
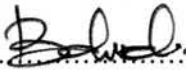
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Date   : 22 / 1 / 2018

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Power) with Honours. The member of the supervisory is as follow:

....

(Puan Nurbahirah Binti Norddin)

ABSTRAK

Boleh dikatakan bahawa setiap hari pengajar akan memadam papan putih selepas habis kuliah. Tiadanya pembaharuan ke atas aktiviti lazim berikut dan kadang kala ia merupakan aktiviti remeh yang terpaksa dilakukan setiap hari terutama sekali kepada golongan pengajar. Projek ini bertujuan merekabentuk alat pemadam papan putih automatik. Oleh itu, projek ini dibangunkan bagi menyelesaikan masalah di atas, rekabentuk litar berkonsepkan pengesan cahaya di mana pemadam papan putih akan berfungsi secara automatik apabila pengajar memadam suis lampu apabila kelas tamat. Laporan projek tahun akhir ini dimulakan dengan pengenalan kepada alat pemadam papan putih automatik. Alat pemadam papan putih automatik ini dibangunkan kerana terdapat beberapa masalah yang timbul semasa penggunaan pemadam lama dan objektif projek ini adalah untuk menyelesaikan masalah -masalah yang timbul semasa penggunaan pemadam lama. Objek dan masalah-masalah tersebut telah dinyatakan pada bab satu iaitu pengenalan. Bagi mencapai objektif sedikit kajian telah dilakukan untuk mejayakan atau mencapai objektif projek ini. Kaedah kerja yang dilakukan akan diterangkan pada bab tiga iaitu metodologi. Carta aliran metodologi telah dibina bertujuan membina satu perjalan kerja yang sistematik. Pada carta aliran tersebut telah diterangkan perjalanan projek langkah demi langkah. Setelah kesemua langkah kerja selesai dijalankan mengikut aliran, alat pemadam papan putih berjaya dibangunkan dan mencapai objektif.

ABSTRACT

It can be said that every teacher will erase whiteboard after the expiration of college. The lack of reform on these common activities, and sometimes it is a frivolous activity that had to be done every day especially for the teachers. This project aims to design automatic extinguisher whiteboard. Therefore, this project is designed to solve the problems mentioned above, the light detector circuit design concept in which the white board eraser will work automatically when the instructor delete a light switch when class ended. Report this final year project was initiated with the introduction of automatic extinguishers whiteboard. Auto white board eraser tool was developed because there are some problems that arise during the use of the old brigade and objective of the project is to solve problems that arise during use - Problem old extinguisher. The object and the problems that have been declared in respect of the recognition. To achieve little research has been done to implement or achieve the objectives of this project. Method of work done will be described in chapter three of the methodology. The flow chart methodology was built to build a systematic way of working. In the flow chart described the project step by step. After all the steps carried out according to the flow of work, a white board eraser tool successfully developed and achieves objectives.

DEDICATION

To my beloved parents,
Muhamad Fadilah Bin Manaf and Ruzanna Raeng Binti Abdullah

Sibling
Khairunnisa, Nurmunirah, Firdaus, Faiz, Hafiz, Saiful, Danial

Supervisor
Puan Nurbahirah Binti Nordin

Mohd Zul Hafiq bin Norhan
Zahin Wazini Bin Rollan Affendy
Mohammad Afis Sah Bin Afasar

Lectures, teachers and friends:

Who educated me and enable me to reach at this level.
Thank you.

ACKNOWLEDGEMENT

First and foremost, I would like to gratitude Allah SWT for His blessing and opportunity that have be given to me in conducting this project. I am also would like to express my deepest appreciation and gratefulness to my family who are always be by my side in giving full supports, motivation, aids and financial during completing this Bachelor Degree Project. Besides that, I would like to express my deepest appreciation to my respected supervisor Puan Nurbahirah Binti Norddin for giving me opportunity to be guided along this project conduct. I have gain a lot of new information as well as experience in completing this project and highest gratitude for his precious advices and supervisions, patience's and aspirations. Nevertheless, I would like to thank my friends that participated and contributed their valuable times, ideas, helps and supports during this Bachelor Degree Project. It will be an unforgettable yet most precious experience and it would be very advantageous for my future work.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURE

LIST ABBREVIATIONS, SYMBOLS AND NOMENCLATURES

RF Module	Radio Frequency Module
LDR	Light Dependent Resistor
ASK	Amplitude modulation
V	Voltage
A	Ampere
W	Watt
dB	Decibel
VDC	Voltage Direct Current
DC	Direct Current
AC	Alternative current
ASR	Angular Rated Sensor
Cds	Cadmium Sulphide
CdSe	Cadmium Selenide
LASCR	Light Activated Silicon Controller Rectifier
PWM	Power Window Motor
R.p.m	Revolution per minute
PLC	programming Logic Control

CHAPTER 1

INTRODUCTION

1.0   Background of Project

The main intention of this project is to design and develop the whiteboard cleaning system that is generally used to clean the whiteboard automatically with the help of duster. The project is come out with an idea that can help to reduce time required and work need to be done to erase the whiteboard so it can ease the problems for the teachers and students. By the used of this automatic system we can save time and energy of human. A system for cleaning the whiteboard where in a duster is connected to a horizontal and vertical shaft. The duster is set at the side section of the whiteboard to diminish time for it to move to any side of the whiteboard effortlessly. This kind of eraser is fully automated with a remote controller and a push buttons control panel on whiteboard which could be used to activate the eraser system. In this project we are using these hardware components; whiteboard, two PWM motor for driver, three different types of supply, a light sensor (LDR) and relays as main components.

1.1   Problem Statement

After a few researches had been done, there are a few problems that arise when the current erasing method is used. The first problems are excessive usage of time in cleaning the board. Thus, the lectures beforehand did not clean the whiteboard after class. And the most critical problem is whiteboard duster keep on missing.

1.2 Objective Project

The general objective of the design project is to improve manual application of doing work to automatic application. The specific objective here is:

1. To reduce the man-power involved in cleaning whiteboards after use.
2. To provide a mechanism in which with only a push of a button the user could set the eraser to move and erase the contents of the board.
3. To condense the stress of cleaning the whiteboard by using automatic duster.

1.3 Scope of Project

The investigation carried out in this project is limited to protection that will focuses in domestic whiteboard board at home, school and office. The project is divided into two parts, the first part is a simulation using software and the second is hardware development. The division of scope is shown in the figure below:
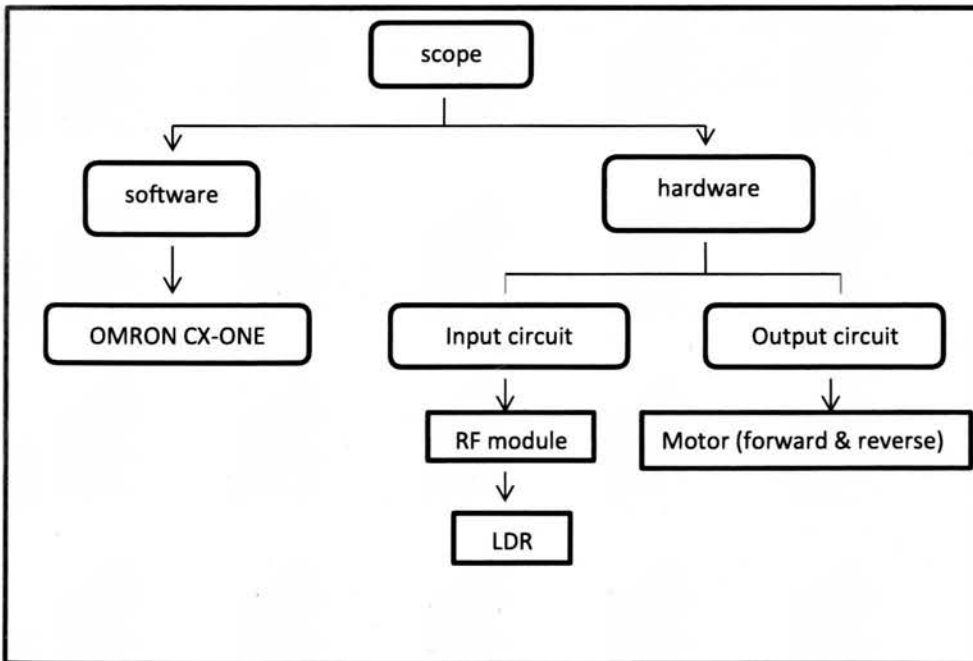

Figure 1.0: Division of Work Scope Project

1.4   Organization of Report

This report consists of five chapters begin with report introduction and end with conclusion. The remainder chapters are literature review, methodology and results as well as discussion. Literature review covers overview and method to provide an idea to make this project. Meanwhile, methodology shows sequence of works in order to develop this project. The results of implementation of this project will be written in chapter four along with its discussion. Besides that any problem occur during the process implementation of this project and the troubleshoot of the problem will be written in chapter four. Chapter five will delivers conclusion and recommendation for future planning. However, results with discussion and conclusion will be continued in Bachelor Degree Project II

1.5   Summary

This chapter covers the background of the project and the problem statement which encouraged this project to be conducted. The goals of this project report also deliberated in this chapter. Furthermore, the scope of this project report also discussed to make sure this project report was conducted systematically and guided according to its objectives.

CHAPTER 2
LITERATURE REVIEW

2.0   Introduction

In this chapter projects-projects related to the white board eraser tool will automatically be reviewed. The study also focused on the selection of project components - the main components and materials-materials to be used. Comparisons are made to increase the need for the project extinguishers automatic white board. Studies that have been made will give some idea of how to operate the automatic white board eraser.

2.1   Erasing Robot Whiteboard

Whiteboard is erasing robot is an autonomous robot type; robot will delete the entire article that was in the whiteboard with an automated way. Without human help, a robot will detect the writing is on the whiteboard are easily by following the instructions that have been programmed. Robots work depends on three steps. The first step is how the robot can detect the writing on the whiteboard. The next step is how robots can delete all posts. The last step is how to direct the robot to start operations department.

In a first step, it is divided into two parts. The first part is the mechanism. For the movement of the x-axis, robot driven by two wheels running on the rails. The robot will be guided on the foundation for the movement of the x-axis. For the y-axis movement of the cylinder also has built robotic arm. The cylinder will move the

4

robot arm robot up and down on the y-axis direction. Fire whiteboard has been added to the cleaning process. The picture below is a detailed overview Whiteboard Erasing Robot.
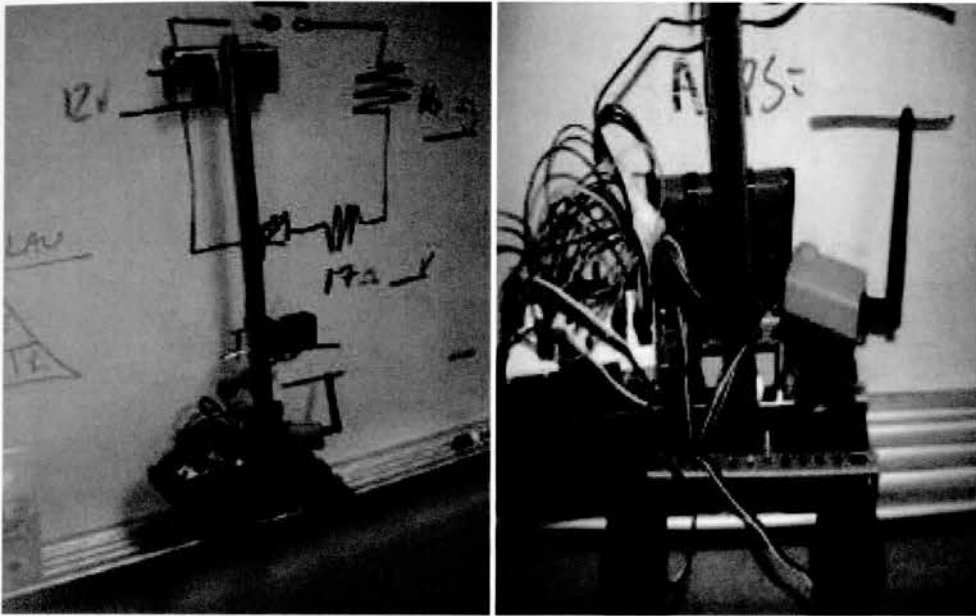
Figure 2.0: Erasing Robot Whiteboard

In the second part is robot vision. The robot uses a webcam and the computer controller which is placed opposite the whiteboard. Vision is used for the purpose of detecting the position of the writing on the white board and make sure the robot is positioned delete. Vision detected by using a webcam next article through software visibility, RobotRealm. The software is used to detect the centre of gravity on the text. Any article that is detected will be converted to a negative image.

5

Figure 2.1: Process Description Robot

In the last step, the centre of gravity has been detected; it will be converted to the format of the coordinate plane. Next, using a mathematical basis, the robot will be taken that the area to be deleted by using the motor direction. In this project Arduino Mega has been used to send commands to Robot Realm software. After the completion of the vision and program, the robot will move to the location that was directed and did the cleaning process.

2.2   Mobile Whiteboard Cleaning Robot

Whiteboard cleaning robot was conceived by Stefan Diewald, VMI, TU Munich. Cleaning concept used is approximately equal to erasing the whiteboard where it operates automatically without human assistance. The differences between the two types of robots are in terms of the mechanism. Figure 2.3 shows the physical description Mobile Whiteboard Cleaning Robot.
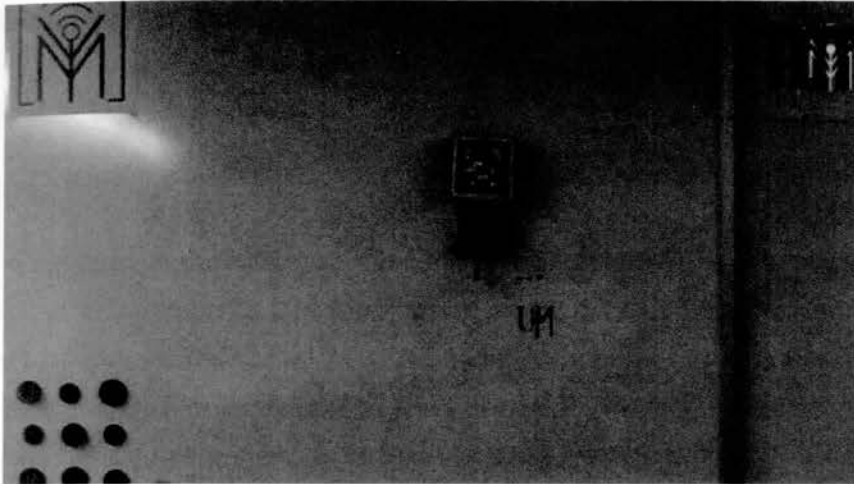
Figure 2.2: Overview of Physical Mobile Whiteboard Cleaning Robot.

Mobile robot using the robot to suck up the stick on a white board, in contrast to erasing the whiteboard where it uses two parts, namely the movement of the x-axis and y-axis. Mechanisms used of Mobile Robot is a simple but inhale concept makes this difficult to implement. The concept of inhaling too much noise when it does its job. In the vision, the concepts used are the same as erasing whiteboard robot but software used is different. The project is using the Robot Operating System as show to the visual process.

2.3   Duster Machine

(Joshibaamali & Priya, 2015) explained that their machine has been designed in three operating modes selected. In the first mode of operation, it clears the left side of the board. In the second mode of operation it is clear the right side. Then in the third mode of operation it is clear the entire board area. Engine they built using two stepper motors to move the duster in the horizontal (x-axis) and vertical (y-axis) direction. To move a washcloth in the up and down direction of the linear motor is used. to help detect the infrared transceivers used on horizontal motor. In

7

addition to the four limit switches are used to detect the boundaries of space. In addition, they use a microcontroller PIC30f401 programmed in C language as the main controller in the machine.

(Chirag Shah, 2005) explained the he attempted to make the blackboard framework with sensors to the engine to start engine development. The component control switches were with the client. The duster moved back and forth to eradicate the writing board. When the engine begins moving the apparatus and counter rigging associated with the strung pole which then moves the pole.

As is known Duster Machines have been used wide in schools and universities. For example JalanPasar.Net and Space Jo Product Corporation of Taiwan has developed Duster Machine but users are not familiar to schools and universities. Figure 2.4 shows the physical description Duster machine.

Figure 2.3: Physical Duster Machine

8

2.4   Motor

The electric motor in principle operates with two magnetic field polarity exchange between the two. The electric motor uses electromagnetic fields to result in power (torque). Selection of a motor plays an important role for the effectiveness of a project. Identify the type of motor to projects not only save costs but also ensure that the project can function properly. There are various types of motors which all have their own pros and cons but the most suitable is a motor that can operate either on a project to be carried out. The type of motor that is comparable alternating current motor, DC and stepper motors.

2.4.1   Alternative current Motor

Ac motor operation of the alternating current power supply. The magnetic field generated by the rotor and stator coils, and the resulting movement of the stator field due to alternating current at the input power supply. These motors are expensive to build and operate, reliable and often operate under the existing power supply. Frequency power supply determines the speed of AC motors, therefore, if only it operates at the power set the lap times are the same.

2.4.2   Direct Current Motor

(Cacace & Luna-ramirez, 2006) describes the design of a project known as "INK-B-Gone" white board eraser mechanically, using a DC motor to drive the fire according to the instruction set. devices needed to show various degrees of freedom of movement. The mechanical devices of

9