



DEVELOPMENT OF RESISTOR SORTING MACHINE PROTOTYPE BY USING ARDUINO



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**BACHELOR OF ELECTRICAL ENGINEERING TECHNOLOGY
(INDUSTRIAL AUTOMATION & ROBOTICS) WITH
HONOURS**

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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BY USING ARDUINO**

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

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: DEVELOPMENT OF RESISTOR SORTING MACHINE PROTOTYPE BY
USING ARDUINO

Sesi Pengajian: 2020

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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Automation and Robotic) with Honours. The member of the supervisory is as follow:



ABSTRAK

Perintang adalah komponen yang paling biasa digunakan dalam litar elektronik semasa sesi makmal. Walau bagaimanapun, perintang ini sering berada dalam keadaan tidak betul dan bercampur dengan nilai yang berbeza. Oleh kerana itu, pelajar dan pembantu makmal perlu memeriksa terlebih dahulu nilai perintang yang diperlukan sebelum memulakan sesi makmal. Masalah ini meningkatkan masa dan beban kepada semua orang yang terlibat. Oleh itu, projek ini mencadangkan untuk mengembangkan prototaip mesin pengasingan perintang untuk menyusun perintang secara automatik dengan mengukur nilai perintang menggunakan Arduino. Untuk memenuhi kehendak projek, kaedah Ohm meter digunakan dalam projek ini dengan menggunakan tiga servo untuk memeriksa nilai perintang dan mengatur perintang dalam bekas yang betul secara automatik. Nilai perintang yang diletakkan di pemegang akan dibandingkan dengan nilai yang ditetapkan dalam Arduino IDE untuk mendapatkan hasilnya dan memastikan perintang jatuh ke bekas yang betul dengan memutar bekas menggunakan servo tiga untuk berhenti di bawah pemegang dan servo satu yang dibuka untuk pastikan perintang jatuh. Servo dua sentiasa bergerak untuk menahan perintang dengan kuat untuk memastikan nilai yang diukur tepat dengan nilai sebenar. Hasilnya menunjukkan bahawa projek ini berjaya menyusun perintang tetapi mesin ini harus menggunakan perintang yang diketahui paling hampir dengan nilai perintang yang perlu disusun. Sistem ini akan memberikan kecekapan dan kebolehpercayaan yang akan memainkan peranan penting untuk penjagaan yang lebih baik.

ABSTRACT

Resistors are the most commonly used components in electronic circuit during laboratories session. However, these resistors are often in an improper state and mix up with different values. Due to this, student and lab assistant need to check first the required resistor value before start lab session. This problem increases the time and burden to all people involve. Hence this project proposed to develop a resistor sorting machine prototype to sort resistor automatically by measuring resistor range using Arduino. To fulfill the requirement of the project, Ohm meter method are use in this project by using three servos to check the value of the resistor and arrange the resistor in the correct container automatically. The value of the resistor placed on the handle will be compared to the value set in the Arduino IDE to get the result and ensure the resistor falls to the correct container by rotating the container using servo three to stop under the handle and servo one opens to ensure the resistor falls. Servo two is constantly moving to hold the resistor tightly to ensure the measured value is accurate to the actual value. The result show that this project manages to sort the resistor but this machine have to use the known resistor closest to the value of resistor that need to be sort. This system will provide efficiency and reliability that will play an important role for better care.

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LIST OF ABBREVIATIONS

3D	3 Dimension
DC	Direct Current
ICSP	In Circuit Serial Programming
IDE	Integrated Development Environment
IR	Infrared
LCD	Liquid Crystal Display
LED	Light Emitting Diode
PLC	Programmable Logic Controller
PWM	Pulse Width Modulated
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus

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CHAPTER 1

INTRODUCTION

1.0 Introduction

The content of the project is described generally regarding resistor sorting system including problem statement, objective, and scope. The things that need to be achieved to solve the problem arise is the objective while the problem statement is related to how the problem that you want to solve occur. However, there will be a limitation in completing this project which is discussed in the chapter.

1.1 Project Background

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits. There are a lot of type of resistor and value of resistor such as 4 band type and 5 band type and for the value the range differ from 10 Ohm until 10K Ohm that usually used in lab experiment.

Usually, lab assistance will prepare the equipment needed for lab experiment that will be handle by student later and after used sometime student return the equipment not in the correct place and this will affect the next group experiment. The lab assistance needs to do other job as well, but it will take a lot of time and energy if they need to rearrange the resistor every time different student used the lab. The fastest way for them is by using color code, however it will restrain the eyes and this process take a lot of time to finish up. Other than that, even though the lab assistance does rearrange the resistor they still do not check

the functionality of the resistor. Some time student receive resistor that are out of range or can be used anymore and this will cost the student to find suitable resistor and waste their time to do the lab. In Faculty of Electrical and Electronic Engineering Technology, there are a lot of lab that used resistor as part of their lab experiment and this lab is used by a lot of classes everyday where one session takes until three hours of time.

The main purpose of this project is to develop a resistor sorting machine using Arduino to reduce time and labour wastage that have been practice right now. This machine will sort the resistor according to it range and if they are any that out of range, we will put it in reject container. For this prototype, this system will sort three type of resistor which are 100 Ohm, 500 Ohm, and 1k Ohm. The value of resistor will have measured by multimeter than compare with data that have been set in Arduino with acceptable range of each resistor and sort to it respectable container based on its value. Therefore, a resistor sorting machine should be a good solution to help lab assistance do this job frequently. Arduino Mega has been chosen as the main controller in the system and it will control all the hardware used in this system by programming it accordingly. This develops system will providing efficiency and reliability which will play a vital role for better improvement in daily work.

1.2 Problem Statement

This resistor sorting system idea comes from real situation at lab where after student use the resistor, they just put the entire resistor together without sorting by its value. This will cause problem for next group as they must check the value and sort it before starting their lab. This problem will waste the time for them to do their lab. Other than that, lab assistance also needs to waste their time to sort this and sometimes it needs a lot of people to help sort it quickly. The main purpose of this project is to develop a resistor sorting machine using Arduino to reduce time and labour wastage that have been practice right now.

In short, I want to develop a prototype for this project that can reduce time, labour, and labour error. The target of this project is to design and develop sorting machine prototype by using Arduino and measured the resistor value by using multimeter. The expected outcome are the resistors manage to be sorted in it respective container and any resistor that out of range will be put in reject container.

1.3 Objective

1. To develop resistor sorting machine prototype using arduino.
2. To design sorting system for respective resistor by measuring resistor value range
3. To analyze the effectiveness of the proposed system for sorting purpose.

1.4 Scopes of Work

This project will develop a prototype sorting machine that will sort three type of resistor which are 100 Ohm, 500 Ohm and 1K Ohm with 4 band type and one other bin for out-of-range resistor from other three type. This system uses common resistor measures about 9.2mm across and the leg of resistor must in straight manner parallel with the body. Arduino Mega is the main controller used in this experiment together with multimeter to measure the value of respective resistor.

1.5 Project Significance

The reason this project is created to help reduce wastage such as time, labor and labor error that have been practice right now and improve the efficiency of sorting by detecting if the resistor out of range or not. The novelty of this project is sorting the resistor based on its value to its respective container and put all the reject resistor in other container by using

Arduino and multimeter. Lastly, the target of this project is to help lab assistance, student, and lecture to do lab experiment in shorter time with better equipment preparation.

1.6 Report Outline

This report holds five chapter that were discussing the concept of the implementation of resistor sorting system. The explanation of each section will be in the paragraph as follow, in chapter 1 this report will cover the introduction, study background, problem statement, objective and scope project. This chapter describe the necessary information about the whole project. Next, chapter 2 will discuss on the literature review comparing previous project and research that relates to the project. This chapter is also considering the hardware and software part that involve in this project. Then, chapter 3 represent all the method or ways how the project implemented. The section holds most of the project's resistor sorting system and information about its development. Chapter 4 documented data and result that are necessary for next progress in this project research. Lastly chapter 5, consist of the recommendation and conclusion which states whether the objectives are achieved or not.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter discussed on the overview of resistor sorting machine and the past research which related to sorting system. In this study, the advantages and disadvantages of the previous research are also presented and compared. Other than that, research on the hardware components that have been used in other researched is also studied. By analyzing the previous projects, the possibilities that affect the quality in their project can be analyzed and reviewed. Lastly, some recommendations have been made to overcome the problem exist in the previous study.

2.1 Overview of Sorting Machine

Sorting is any process of arranging items in some sequence or in different sets. It has two common distinct meanings such as ordering and categorizing. Ordering is arranging items of the same kind, class, or nature in some ordered sequence while categorizing is grouping and labelling items with similar properties together by sorts. Sorting machine is a system to sort goods to reduce human energy and time.

2.1.1 Human Power

Hand sorting is worth spending a few lines on the origin of hand picking although it has now been almost superseded (Salter and Wyatt, 1991). Hand sorting is the simplest and most effective method of concentration. Based on paper written by Maeda (2001), the first period of the small machine typed sorting system was during 1908 until 1945. The small

sorting machine for oranges as shown in Figure 2.1 was the major sorting machines at that time. In addition, the thin-skinned fruits such as apple, peach or pear were sorted and hand packed. Despite long history, hand sorting became impractical, impossible and too expensive due to decreasing of ore grades and liberation sizes, changing the scale and economics of processing plants as well as introducing new technologies. By the late 1960s and early 1970s, hand sorting was abandoned.



Figure 2.1: Human powered type sorting (Maeda, 2001)

2.1.2 Semi-Automated

Semi-automated sorting is the system where the sorting can be done but still with help of human to place the goods manually before sort by the system. Prakash and Prakash (2015) designed an automated sorting machine using conveyor belt as shown in Figure 2.2 that has ability to sort the object of different sizes.