# AUTOMATIC CONTROLLING CONVEYOR

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FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

**BORANG PENGESAHAN STATUS LAPORAN**
**PROJEK SARJANA MUDA II**

**Tajuk Projek** : AUTOMATIC CONTROLLING CONVEYOR

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# ABSTRACT

This project is proposed about the design and implementation of automatic controlling conveyor by using PLC (Programmable Logic Controller). This project is divided by 2 sections; the packaging section and sorting section, where the whole sections is controlled by PLC. Furthermore, the combination of hardware and software is performing in a one system. For the hardware are such as conveyor, sensor, and motor and for the software that is used is PLC. Therefore, a program will be designed in by using CX-Programmer in the ladder diagram form and it is applied to the PLC to control the whole operation of the project. The processes involved are such as movement, counting and sorting process of a conveyor. Usually, this application is used widely in industry especially in Small and Medium Industries (SMIs). The advantages of this project are, it helps the user in saving time in packaging the product and also reduce the area used for packaging and sorting process. Besides, it is also can decrease the cost in using manpower for the both process. This project involved a low in cost because the maintenance cost is low and for the long-term use, it is thrifty.

# ABSTRAK

Projek ini direka bertujuan bagi menghasilkan satu rekabentuk dan aplikasi "Automatic Controlling Conveyor" yang dikawal menggunakan perisian PLC (Programmable Logic Controller). Projek ini di bahagikan kepada dua bahagian iaitu bahagian pembungkusan dan bahagian pengasingan di mana kedua-dua bahagian ini dikawal sepenuhnya oleh PLC. Selain daripada itu, kombinasi perisian dan perkakasan digabungkan di dalam satu sistem. Bagi perkakasan adalah seperti konveyor, sensor dan motor. Bagi perisian, PLC telah digunakan. Oleh yang demikian, satu program direka menggunakan program CX-Programmer di dalam bentuk "ladder diagram" bagi mengawal keseluruhan operasi projek. Proses yang terlibat di dalam projek ini adalah meliputi gerakan, pengiraan dan juga pengasingan oleh konveyor. Aplikasi bagi projek ini biasanya digunakan secara meluas di dalam industri terutamanya untuk kegunaan Industri Kecil dan Sederhana (IKS). Kebaikan bagi projek ini ialah dapat menjimatkan masa umtuk membungkus produk dan mengurangkan penggunaan ruang yang besar untuk menempatkan mesin. Selain itu, projek ini dapat mengurangkan penggunaan tenaga manusia di bahagian tersebut di samping dapat mengurangkan kos bagi menampung penggunaan tenaga manusia. Projek ini juga melibatkan penggunaan kos yang rendah bagi penyelenggaraan dan untuk penggunaan jangka masa yang panjang.

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# TABLE OF FIGURE

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# GLOSSARY

| | | |
|---|---|---|
| CNT | - | Counter |
| CPU | - | Central Processing Unit |
| DC | - | Direct Current |
| EEPROM | - | Electrically Erasable Programmable Read-Only Memory |
| EPROM | - | Erasable Programmable Read Only Memory |
| FBD | - | Function Block Diagram |
| IC | - | Integrated Circuit |
| IL | - | Instruction List |
| I/O | - | Input / Output |
| IR | - | Infra Red |
| LED | - | Light Emitting Diode |
| LD | - | Load |
| NC | - | Normally Close |
| NO | - | Normally Open |
| OR LD | - | Or Load |
| PLC | - | Programmable Logic Controller |
| PV | - | Present Value |
| RAM | - | Random Access Memory |
| ROM | - | Read-Only Memory |
| SFC | - | Sequential Function Chart |
| SMI | - | Small & Medium Industries |
| ST | - | Structured Text |
| SV | - | Set Value |
| TIM | - | Timer |

# LIST OF APPENDIX

# CHAPTER I

# INTRODUCTION

## 1.1 Introduction

The "Automatic Controlling Conveyor" is a combination of hardware and software. The hardware are such as conveyor, sensor, and motor and for the software, PLC (Programmable Logic Controller) is use in controlling the process. Therefore, a program will be designed by using CX-Programmer in a ladder diagram form and it is applied to the PLC to control the whole operation of the project.

This project is divided into 2 sections. Section A is Packaging Area and in Section B is Sorting Area. In Section A, the processes involved are such as movement, detecting and counting while in Section B, the process involved is sorting process of a conveyor. Here, a selector arm has been added for the sorting process shown as in the Figure 1.1 as below.

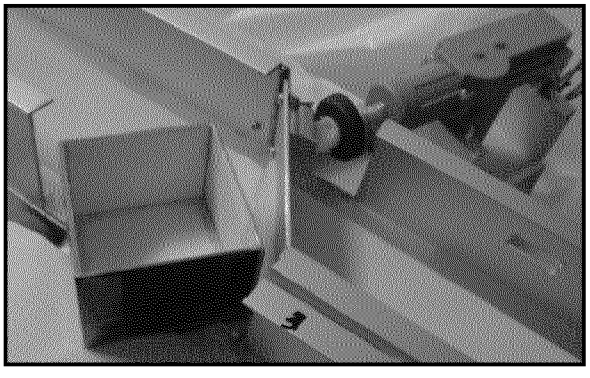

Figure 1.1: Single Arm Selector.

As a transport system, conveyor has been used in handling the boxes and the product. The conveyor has been used as a connecting link between the Packaging Area and Sorting Area. The type of conveyor used is belt type as shown as in the Figure 1.2 as below.

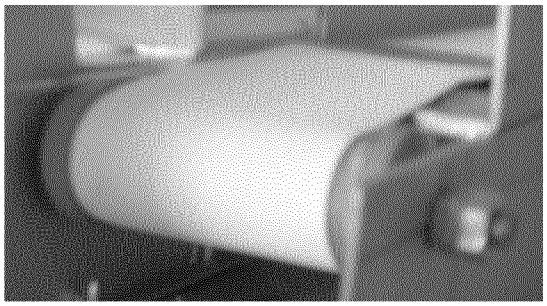

Figure 1.2: Conveyor Belt.

Usually, this application is used widely in industry especially in factory and it is also can be applied in the airport. The advantages of this project are, it helps the user in saving time in packaging the product and also reduce the area used for packaging and sorting process. Besides, it is also can decrease the cost in using manpower for the process and for the maintenance.

## 1.2 Objectives of the Project

The objective of project is to ensure the positive progress of the development system and also to ensure that the main objective will be realized. Below are the objectives of the project:

i. To develop a systematic conveyor system with packaging, counting and sorting process.
ii. To increase the productivity, reduce human error and save time.
iii. To reduce the usage of a large area in placing the machine.

## 1. 3 Problem Statements

This machine is designed to fulfill the industrial needs. Nowadays, in industrial, time is money. Therefore, this project will reduce the usage of man power because all of the work will be done by machine. Hence, the cost for mans power also decrease. If all the process is done manually, it will cost lot of time to complete the task. Since the process is done by automatically, it will help in increasing the productivity and save time. In the Packaging process, the program will be set again as the boxes size changed. Hence, this machine need no changes in the programming as the sensor used to detect the box size and will set the quantity of the counting. Nevertheless, this machine will also reduce the human error while doing this process manually and the maintenance is also lower. Besides, some of the machines need a large area to place it. This machine has two functions which for packaging and for sorting process and this will reduce the usage of a large area in placing the machine.

## 1.4 Scope of the Project

All projects have their own scope or limitation as a guideline throughout the completion of the project. The scopes of this project are making a research about the conveyor, motor, sensor and PLC programming. After research and finding, the program will be design in controlling the conveyors by using PLC. Type of conveyor that will be used a belt conveyor. At one of the conveyor, arm will be added for the sorting process and stepper motor will be used to move the arm. Two types of the sensor will be used which is infrared and limit switch. Infrared sensor is used for counting while, limit switch is used to determine which detecting the boxes and will determine the counting based on the box level. For the sorting process, limit switch will be used to active the selector in box selection based on the box level. Finally, all the hardware and software will be combining and connected to the PLC.

## 1.5 Methodology Briefing.

### 1.5.1 Block Diagram

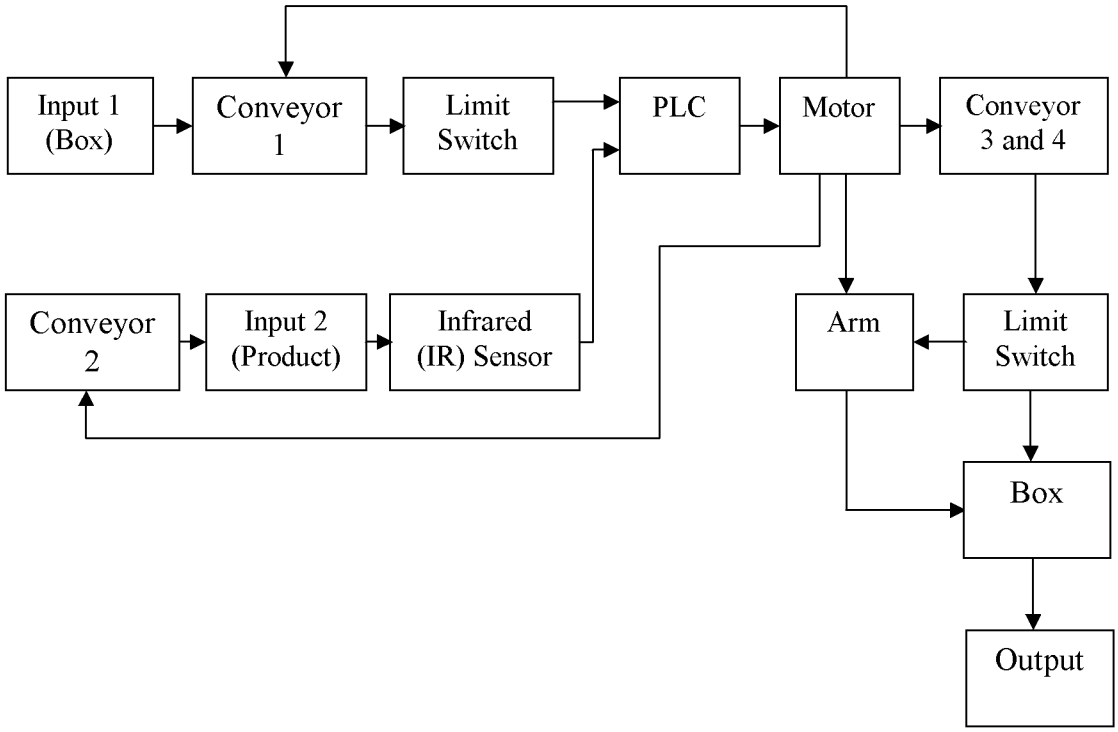


Figure 1.3: Block Diagram of the whole processes.

### 1.5.2 Flow Chart of Project Methodology

#### 1.5.2.1 Main Flowchart.

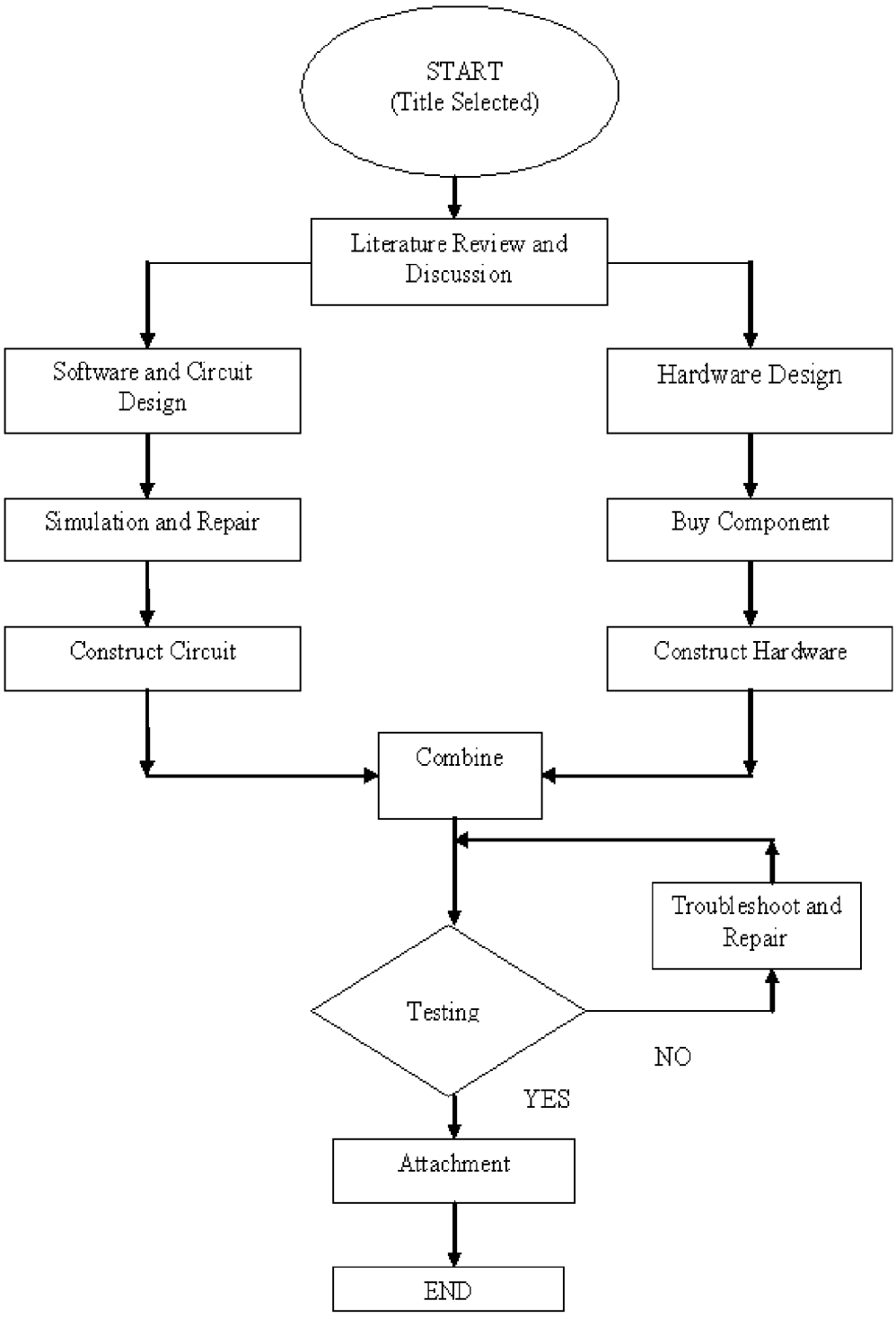


Figure 1.4: Main flow chart of the project.

### 1.5.2.2 Hardware Development

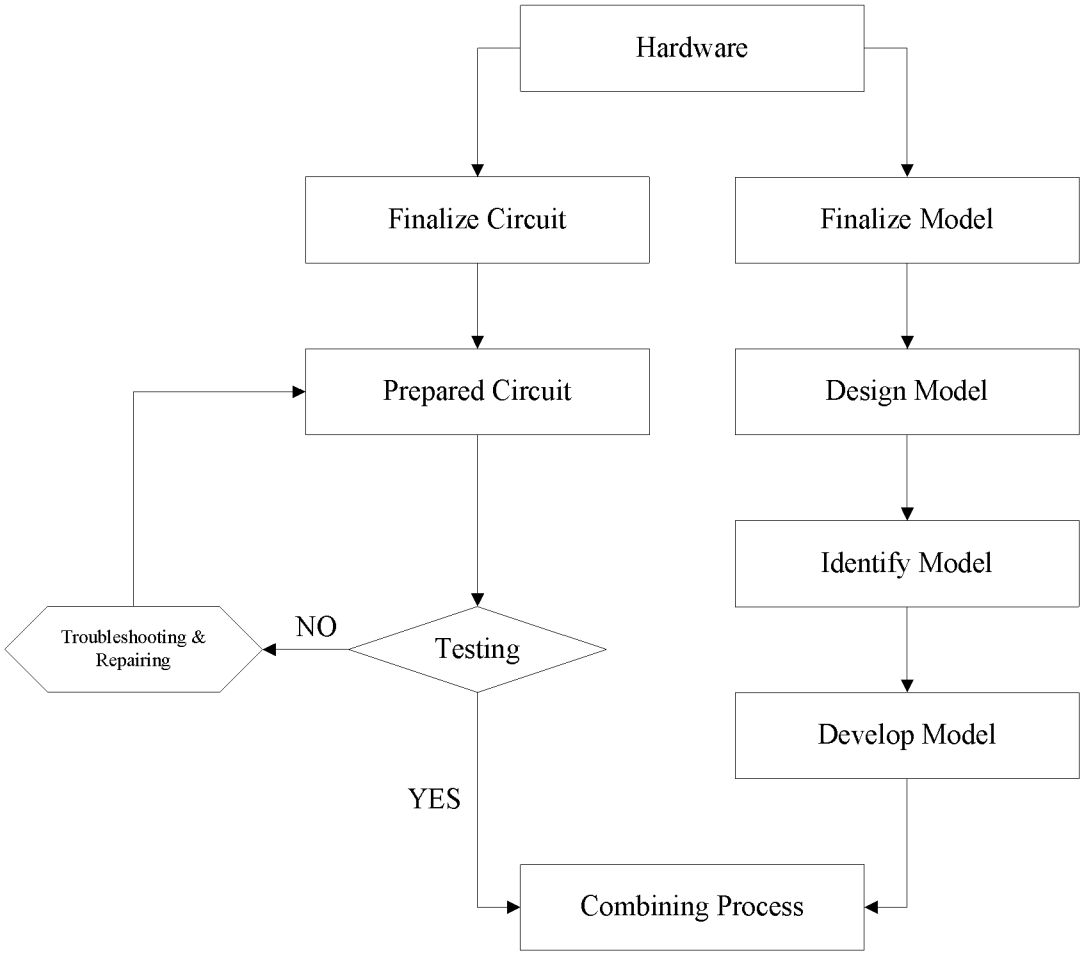


Figure 1.5: Flow chart of the hardware development.

### 1.5.2.3 Software Development.

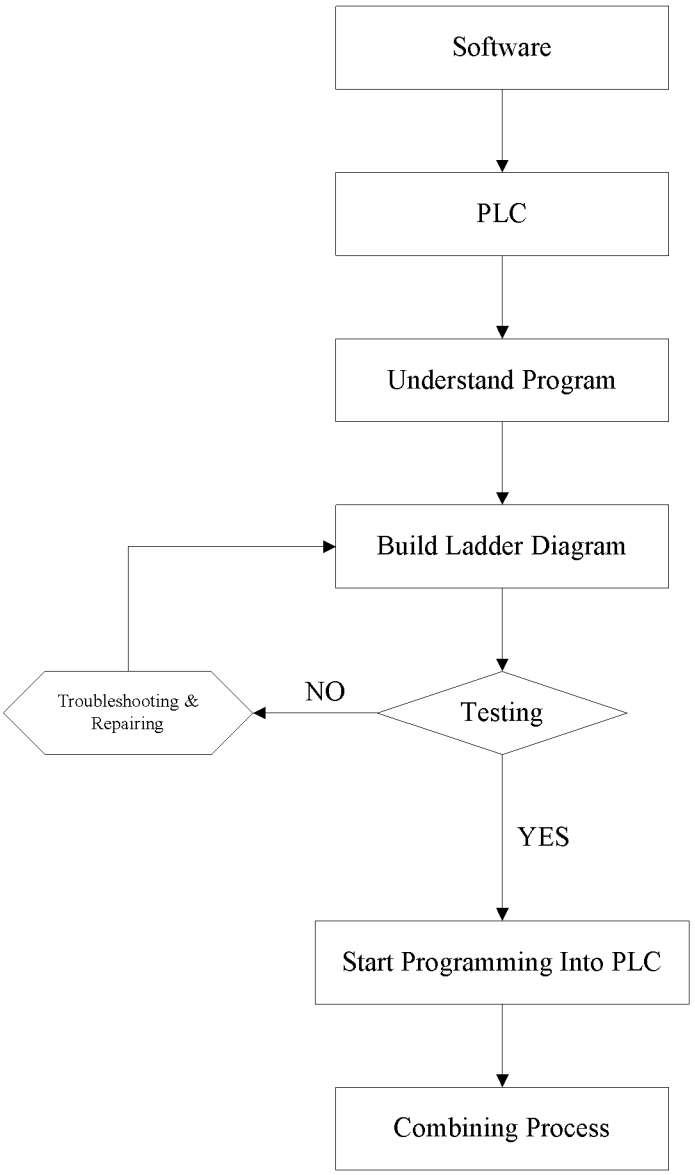


Figure 1.6: Flow chart of the software development.

# CHAPTER II

# LITERATURE REVIEW

## 2.1 Introduction

This chapter will explains and discusses the source or article that related to the project. It is consist of the products that have been appeared in the market nowadays. The main perspective of this chapter is discussed the method that has been used in the past project and survey how far this project were related to the theory that already used. In understanding the project theory and studies about project is very important as guidance for this project. This chapter also contained the theory of the components, equipments and programming languages that is used in the project.

## 2.2 Programmable Logic Controller (PLC)

A programmable logic controller (PLC) or programmable controller is a digital computer used for automation of industrial processes, such as control of machinery on factory assembly lines. PLC is used in many different industries and machines such as packaging and semiconductor machines. Unlike general-purpose computers, the PLC is designed for multiple inputs and output arrangements, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact.[1]

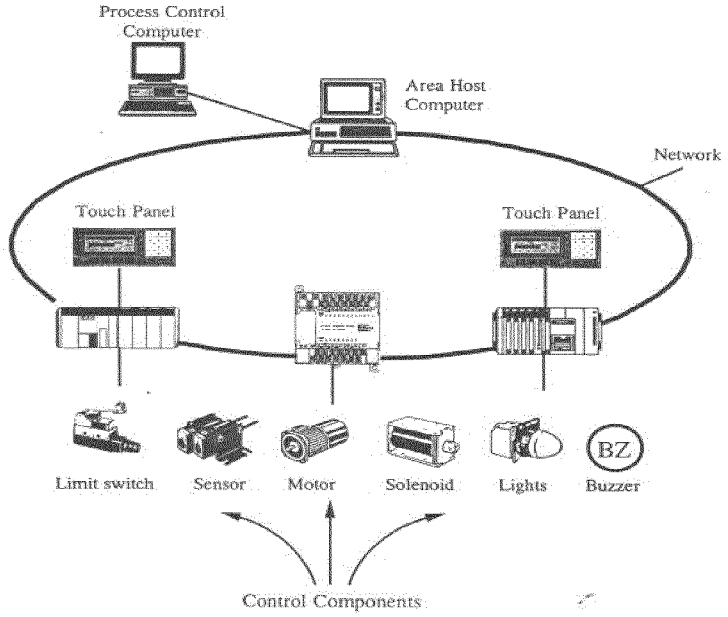


Figure 2.1: Single PLC controlling a single or some output service

The main difference from other computers is that PLC is armored for severe conditions (dust, moisture, heat, cold, etc) and has the facility for extensive input/output (I/O) arrangements. As in the Figure 2.1 above, it show the connection between the PLC with the other devices in controlling either single input or some output services. These connect the PLC to sensors and actuators. PLC read limit switches, analog process variables (such as temperature and pressure), and the positions of complex positioning