POLITEKNIK SEBERANG PERAI

AUTOMATED COIN BOX

NAMA	NO.PENDAFTARAN
NUR SHAZUANI BT MEOR AHMAD TAJUDIN	10DTK13F2018
NOR WAZIRAH BT HASHIM	10DTK13F2048

Laporan ini dikemukakan kepada Jabatan Kejuruteraan Elektrik sebagai memenuhi sebahagian syarat penganugerahan Diploma Kejuruteraan Elektronik (Komputer)

JABATAN KEJURUTERAAN ELEKTRIK

JUN 2016

DECLARATION

We hereby declare that is result for our own investigation, except where otherwise stated. We also declare that is has not been previously or concurrently submitted as a whole for any other projects at Seberang Perai Polytechnic.

NUR SHAZUANI BT MEOR AHMAD TAJUDIN 10DTK13F2018

..... Date: 25 / 10 / 2016

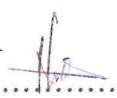
NOR WAZIRAH BT HASHIM 10DTK13F2048

..... Date: 25 / 10 / 2016

APPROVAL PAGE

I certify that I have supervised and read this study and that my option, it conforms to acceptable standard for scholarly presentation and is fully adequate, in scope and quality, as Final Year Project report as partial fulfilment for a diploma of Electronic Engineering (Computer)

SUPERVISOR



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(PN NURHIDAYAH BINTI JAMALUDDIN)

ABSTRACT

The project is called Automated Coin Box. The project was designed to understand the concept of counting and storing the number of coins accurately and easily. We use an opto-isolator as sensors that detect metal objects via infrared radiation and the object will be declared on the LCD. LCD display will play a key role for the current value and the amount of money that is inside the tube.

We chose Unity kindergartens in residential areas Fire regulations to implement the project Coin Box Automated us. Our target is children aged 4 years up to 6 years. This is because in addition to calculating and storing a coin into the tube, they can adapt this process to their learning process.

To complete the circuit, we draw circuit "power supply" circuit "sensor opto-isolator" using proteus software and PCB Wizard 8.0. This allows us to paint because there are components that we use in both this software. In addition, we also use the software to set up the Arduino UNO coding our project. If the project is carried out using the software Arduino Uno, of course we need a skilled and know the functions displayed on the coding.

ABSTRAK

Projek ini dipanggil Automated Coin Box. Projek ini telah direka untuk memahami konsep mengira dan menyimpan jumlah wang syiling dengan tepat dan mudah. Kami menggunakan opto-isolator sebagai sensor yang mengesan objek logam yang melalui sinaran infrared dan objek itu akan diisytiharkan pada LCD. Paparan LCD akan memainkan peranan penting untuk nilai semasa dan jumlah wang yang berada didalam tabung.

Kami memilih Tadika Perpaduan di dalam kawasan perumahan Balai Bomba Perda untuk mengimplementasikan projek Automated Coin Box kami. Target kami merupakan kanak-kanak berusia 4 tahun sehingga 6 tahun. Hal ini kerana selain mengira dan menyimpan duit syiling ke dalam tabung, mereka boleh mengadaptasi proses ini ke dalam proses pembelajaran mereka.

Bagi menyiapkan litar, kami melukis litar "power supply" dan litar "sensor opto-isolator" menggunakan software proteus 8.0 dan PCB Wizard. Hal ini memudahkan kami untuk melukis kerana komponen yang kami gunakan ada didalam kedua-dua software ini. Selain itu, kami juga menggunakan software Arduino uno bagi menyiapkan koding projek kami ini. Sekiranya projek ini dijalankan menggunakan software Arduino Uno, sudah semestinya kami perlu mahir serta mengetahui fungsi-fungsi yang dipaparkan pada koding tersebut.

ACKNOWLEDGMENT

Assalamualaikum WBT. First of all, we would like to thanks to our supervisor, Pn. Nurhidayah Bt Jamaluddin for the guidance and discussion during the project implementation. A lot of appreciation especially to our families, friends and the lecturers that help us directly or indirectly in process of the project production.

Instead, thanks for our parents that not forget to support us during our lesson and studies in Polytechnic of Seberang Perai, especially during our project activities 'Automated Coin Box'. Thanks to all that involved during the making of our final year project 'Automated Coin Box'.

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Chapter 1

1.0 INTRODUCTION

Most of the parents teach their children to start saving money for future from the young age. It is always a good thing. The sound of dropping coins inside the coin box always makes children feels good. But ordinary coin boxs can't count how much money it stores inside. So, this project is produced for educational purposed and at the same time be able to educate children to save money. Moreover, this coin box is more effective because it doesn't need double checking. After all, it is an excellent tool when it comes to putting very small amounts of money aside, generally coins.

This fund is also designed to simplify the user's own children to learn to count and determine the amount of the money they save. Unlike the coin boxs before the average number and value of the coins was jumbled and difficult for users themselves to recalculate the total amount of money they save coins. Not only children, but adults also can use "Automated Coin Box".

1.2 Problem statement

There are several types of problem statement in this project such as It can only detect an old coin because of different size for the new coins. Then, we having trouble to make coding because where the box designed to track the value of coins.

1.3 Objective

Here we include a number of objective related to our projects :

- It's educational: This coin box is an excellent educational tool to help young children perceive the benefits of savings.
- For smaller children, can be a good way to teach about coins and bills in terms of how much each is worth.
- Parents may wish to encourage saving by teaching kids the concept of interest.

1.4 Scope and limitation project

For this project, there is scope and limitation of our project such as this box only can save coins. Besides that, only the old coins that works for the purpose of storage and also the amount of money saved may not be too much as design limited.

1.5 Reporting structure

This report contains several chapters in which each chapter explains the whole project we called " Automated Coin Box " . In the first chapter , we describe the introduction of our sub topics contain problem statement, objective and scope and limitation project. Next , the second chapter describes the literature review which contains articles and sections akbar taken on the internet . Furthermore, the third chapter describes the methodology under which contain small sub topics about the components used , the process of designing a circuit using proteus 8 , the process of etching , drilling and soldering .

Chapter 2

2.1 Introduction

In this part, several researches and analysis from other researchers will be presented in which to serve the readers additional information in order to have a better understanding on the project discussed. It will also enlighten the readers pertaining to the previous and recent discussion in relation of the project as well as the history of the topic. Due to time constraint and limitation of available sources, only several works will be presented in this part. Coins are an essential need in a human life as they are basically used in everyone's daily routin. Apart from that, people are also concerned with the safe storage of it even since the ancient time.

2.2 Literature view

According to an article by Minarovičová, "Conscious hiding of money was most frequently connected with the state of the monetary economy and the situation of the particular time and place" (2002). Minarovičová further explains that "In the course of historical development, the position of the owner was showed in the forms of storing coins" (2002). In the same article, she also denotes that the discovered coin storages from the ancient times are actually sources of primary importance for history and numismatics (2002). According to Griffiths in her online article, such discovered coins are considered as 'a significant find' and could be worth a fortune (2015). Since her article is mainly focusing on the ancient coins dated back from the Romans, she mentions that in the year 2015, "A hoard of silver coins, some of which were issued by Roman general Mark Antony, have been discovered in a Welsh field

more than 2,000 years after they were buried" (2015). The coins were discovered to be kept in a small pot. Thus, it certainly shows that the function of money and coin storage is significant not just throughout the course of history but in today's world as well. Coin storages can be built using several of earthenware such as glass, tin, metal, wood, copper and more. For this project, we have chosen wood as the storage of the coin box. Despite from being structurally strong, wood is also a unique sustainable material.

Apart from the importance of coins and the storage, it is also fundamental for the coins to be stored accurately. As mentioned by Yadav and Sood in their article "*A Comparative Survey on Various Coin Recognition Systems Based on Image Processing*", that it is with great importance that coins can be detected with high accuracy (2013). In contrast with the basic traditional coin box, we have paid extra attention in providing a display to show the amount of the coins that will be inserted inside the coin box. Thus, we have read several articles to help us designing our circuit and what were the best components for us to use. The main component that serves as the microcontroller for the automated coin box is the Arduino Uno. Arduino Uno microcontroller board is chosen for this project because it is easier to program than other microcontroller and the cost is lower. As stated in *"Project238 : Mechanical Pet Feeder with Arduino Uno"* (2012), it is an open-source electronic platform. With the given schematics, anyone is allowed to create their board according to the schematics without paying a cent to Arduino and even name their own board. It also allows the sensors to be linked to it and allow a program to read the reading of the sensors. Thus, with the use of this selected microcontroller board, it is easier for us to load the coding from its software to the Arduino microcontroller.

As stated before, we are focusing on an automated coin box with a display. Therefore, the next component that we have used to complete the circuit is the Liquid Crystal Display (LCD). In many microcontroller-based applications, it is an obligatory to display a message or the value of a variable. For instance, in a temperature-control application, it is required for the value of the temperature to be displayed dynamically. Bolo et al. (2008) further elaborates that "LCDs are alphanumeric displays which are frequently used in microcontroller-based applications." Without the use of the LCD, the value or the amount will not be displayed. The last component that we have utilised in building the circuit of the automated coin box is an Opto Isolater. According to Rouse, an Opto Isolator is basically a semiconductor device that uses "uses a short optical transmission path to transfer an electrical signal between circuits or elements of a circuit, while keeping them electrically isolated from each other" (n.d). When the coins are being inserted inside the box, it will go through the Opto Isolator. Once it manages to capture the value of the coins, the data will be transmitted and transferred to the LCD.

An automated coin box is not just applicable for personal use at homes. It can also be used as a form of education for young toddlers. One of the reasons why we have decided to go through with the idea of creating an automated coin box is that it will serve as a benefit not just adults but younger generations as well. We have decided to use the project at a nearby playschool where the children there could understand the relationship between numbers and quantities. According to an online website "*Finance in the Classroom*" (n.d) which based in Utah, United States, children could learn counting and coins recognition in a lot of ways by using a coin box. For example, children will be able to connect counting to cardinality. Through the automated coin box that we have created, we hope that it could benefit and bring the impact in the people's everyday lives.

2.3 Conclusion

From the article above, can we explain that the tube storing a coin is very important for children as early as age 4 years and older. This is because, they are easy to follow and learn what is delivered at home and in school. The Fund can also help childrens in the learning process instance count and identify numbers.

The circuit automatically count the coin is going through the hole between the sensor. Opto isolator is used to detects the coin. When the sensor detects the coin, LCD will show the amount of the coins.The circuit is powered from standard 0-6v battery. Regulator IC 7805 gives regulated 5v DC to the circuit.

Opto-isolator, also called an optocoupler, photocoupler, or optical isolator, is a component that transfers electrical signals between two isolated circuits by using light. Opto-isolators prevent high voltages from affecting the system receiving the signal.

The circuit consist of a regulated IC (IC 7805) to maintain the exact voltage which is followed by the power supply. A regulator is mainly employed with the capacitor connected in parallel to the input terminal and the output terminal of the IC regulator.Our project also uses the Arduino software , where we require coding to ensure the sensor detects the value of the coin .

CHAPTER 3

3.0 METHODOLOGY

3.1 Introduction

Each step of project is a process to complete the project. Every step must be followed one by one and must be done carefully. If some error occurs it can make a project probably could not operate or do not look neat and perfect.

Before the project finish, various processes need to be done according to proper procedures to ensure that projects do not have any problems. Among the measures the works done in preparing this project are.

- Components used
- Process of designing circuit.
- Circuit board trace
- Soldering process in circuit board.

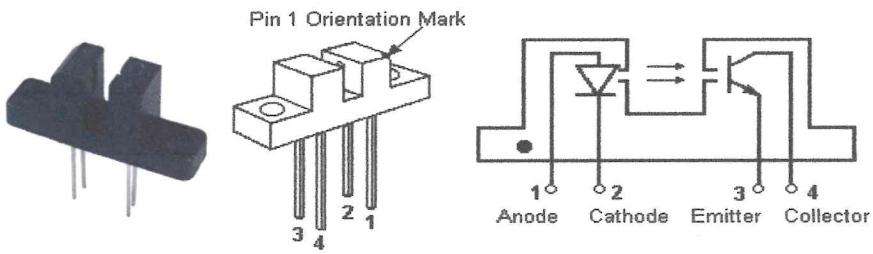
3.2 COMPONENTS USED

3.2.1 Opto Isolator (SLOTTED optocoupler)

In electronics,an opto-isolator, also called an optocoupler, photocoupler, or optical isolator, is a component that transfers electrical signals between two isolated circuits by using light.

The slotted optocoupler is available with photo transistor and photo Darlington photodetectors, with the device package structured to provide an additional element of control.

The package normally has an air gap between its two sections measuring about one-eighth of an inch in width. One section has an infrared LED and the other, a photodetector Slotted optocouplers with wider air gaps are available.



Figured 3.2.1.1 Slotted optocoupler Package and Schematic

3.2.1.1 General Description

A opaque photointerrupts single channel switches consisting of a Gallium Arsenide infrared emitting diode and a NPN silicon photo transistor mounted in a Polycarbonate housing.

The package is designed to optimise the mechanical resolution, coupling efficiency, ambient light rejection, cost and reliability.

3.2.1.2 Features

High Gain
3mm Gap between LED and Detector
Polycarbonate case protected against ambient light
Operating temperature: -25 to 85°C

3.2.1.3 Applications

- DC motor position / velocity control
- Position and velocity servomechanisms
- Factory automation robots
- Numerically controlled machinery

3.3.1 Capacitor

A capacitor (originally known as a condenser) is a passive two-terminal electrical component used to store energy electro statically in an electric field. The forms of practical capacitors vary widely, but all contain at least two electrical conductors (plates) separated by a dielectric. The conductors can be thin films, foils or sintered beads of metal or conductive electrolyte, etc. The non-conducting dielectric acts to increase the capacitor's charge capacity. A dielectric can be glass, ceramic, plastic film, air, vacuums, paper, mica, oxide layer etc. Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike a resistor, an ideal capacitor does not dissipate energy. Instead, a capacitor stores energy in the form of an electrostatic field between its plates.

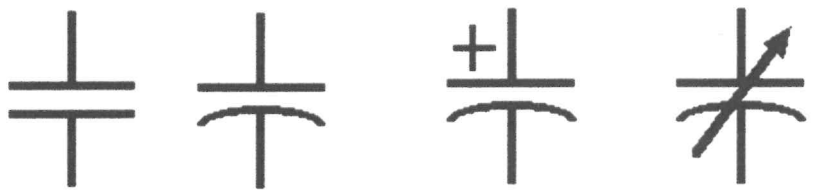


Figure 3.3.1.1 symbol of capacitor

Figure 3.3.1.2 capacitor

3.4.1 Resistor

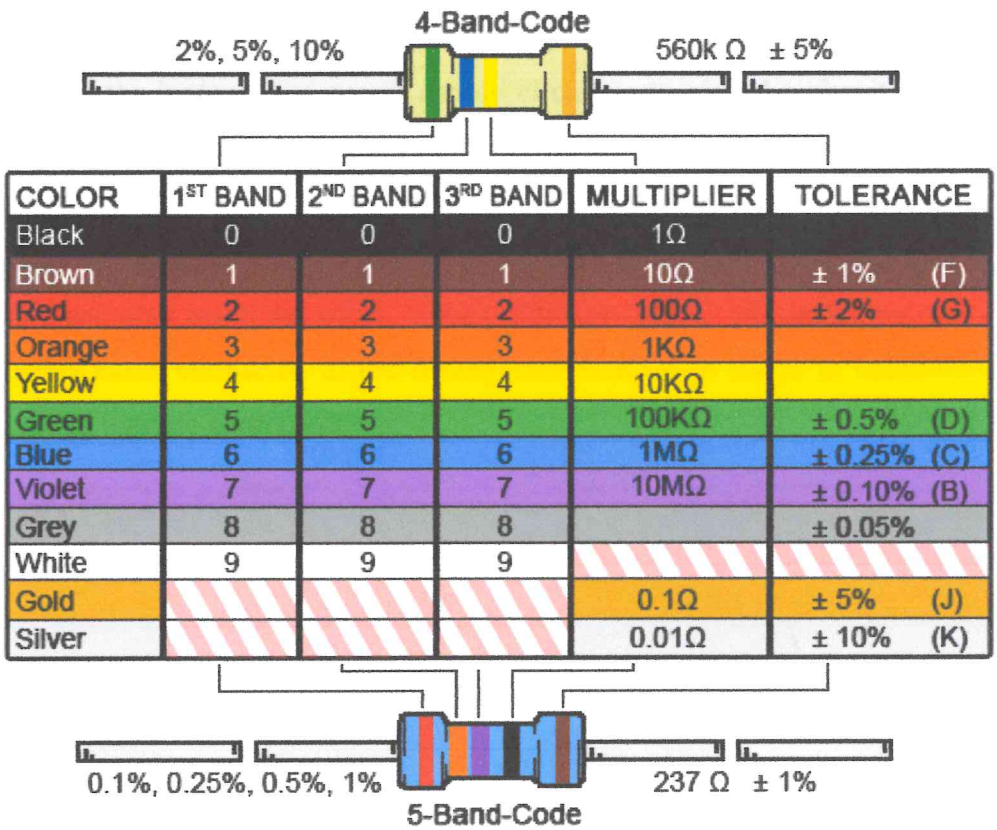
A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. Resistors act to reduce current flow, and, at the same time, act to lower voltage levels within circuits. In electronic circuits, resistors are used to limit current flow, to adjust signal levels, bias active elements, and terminate transmission lines among other uses. High-power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

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.

The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine orders of magnitude. The nominal value of the resistance will fall within a manufacturing tolerance.

Figured 3.4.1.1 schematic diagram of resistor

Figured 3.4.1.2resistor



COLOR	1ST BAND	2ND BAND	3RD BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1Ω	
Brown	1	1	1	10Ω	± 1% (F)
Red	2	2	2	100Ω	± 2% (G)
Orange	3	3	3	1KΩ	
Yellow	4	4	4	10KΩ	
Green	5	5	5	100KΩ	± 0.5% (D)
Blue	6	6	6	1MΩ	± 0.25% (C)
Violet	7	7	7	10MΩ	± 0.10% (B)
Grey	8	8	8		± 0.05%
White	9	9	9		
Gold				0.1Ω	± 5% (J)
Silver				0.01Ω	± 10% (K)

Figured 3.4.1.3 four band code

3.5.1 Battery Triple A (1.5V)

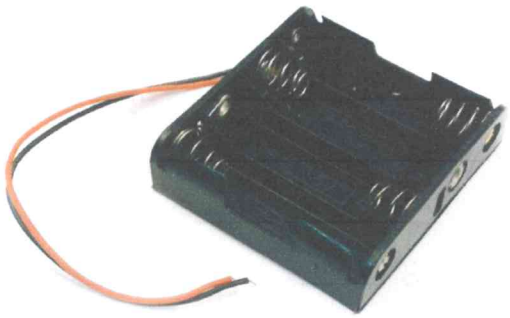


Figure 3.5.1.1 battery and battery holder

Energizer MAX AAA Batteries, Designed to Prevent Damaging Leaks. The purpose of the battery in a power supply circuit is to give the circuit a source of energy. Materials used is Alkaline Manganese Dioxide. The battery type is fromAlkaline. It is used in power supply circuirt. Battery holder is a battery holder is one or more compartments or chambers for holding a battery. For dry cells, the holder must also make electrical contact with the battery terminals. For wet cells, cables are often connected to the battery terminals, as is found in automobiles or emergency lighting equipment.

3.6.1 Voltage Regulator

A voltage regulator is designed to automatically maintain a constant voltage level. A voltage regulator may be a simple "feed-forward" design or may include negative feedback control loops. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages.

Electronic voltage regulators are found in devices such as computer power supplies where they stabilize the DC voltages used by the processor and other elements. In automobile alternators and central power station generator plants, voltage regulators control the output of the plant. In an electric power distribution system, voltage regulators may be installed at a substation or along distribution lines so that all customers receive steady voltage independent of how much power is drawn from the line.

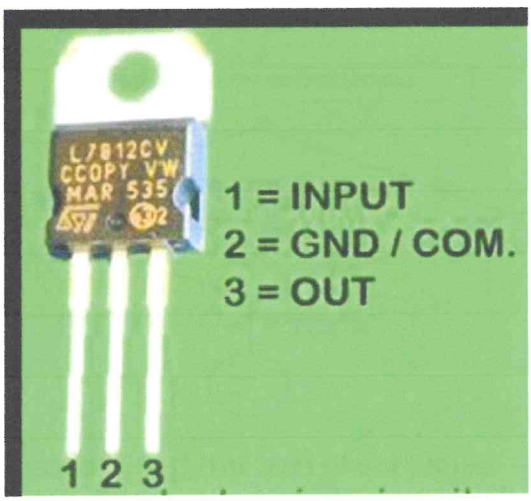
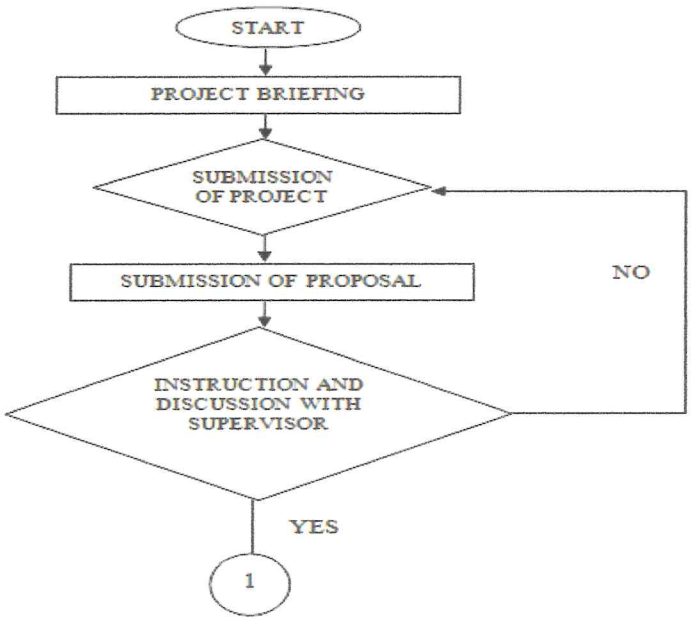


Figure 3.6.1.1 voltage regulator

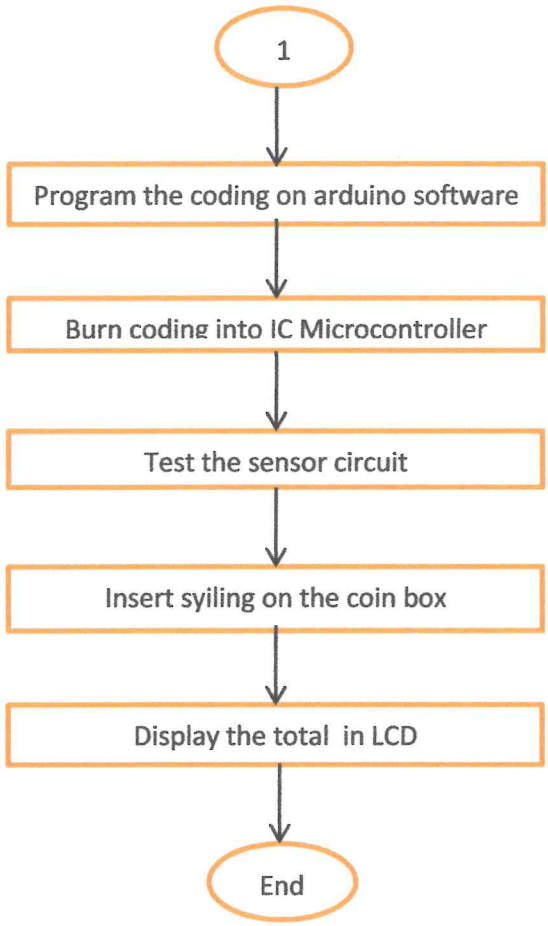
3.3 Flow Chart

At the start of the project we chose the title for the project that we want to produce. We refer to the internet and also our supervisors and also enlightened way to select projects that are appropriate to the given theme. After obtaining approval from our supervisor shadow sensor for selecting projects, we create a study on the circuit and also study each component on the circuit to ensure that we understand the function of the project.

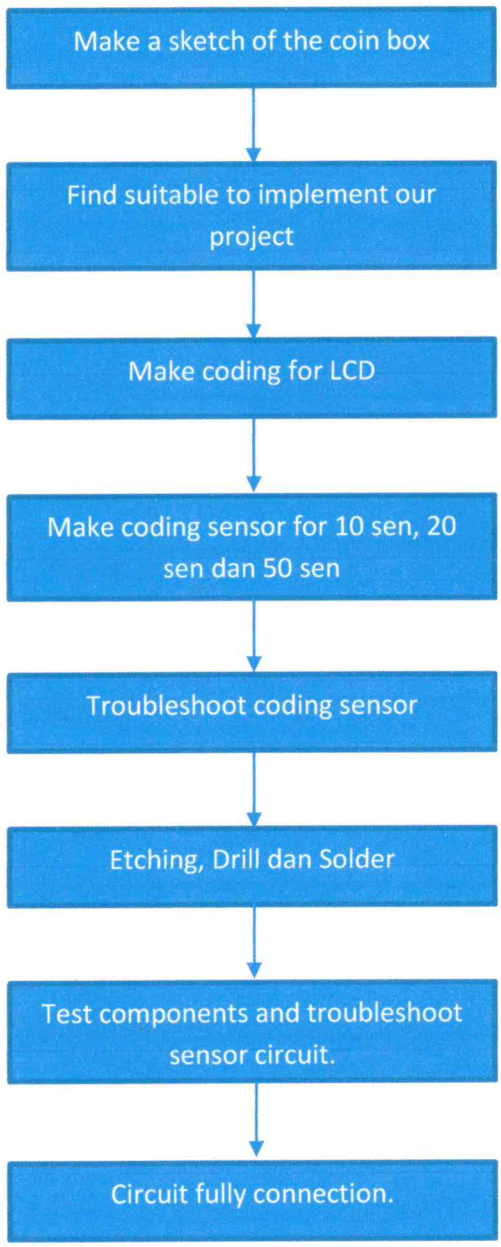
3.3.1 **Flow Chart Plan of Project**



Figured 3.3.1.1 The start of our project



Figured 3.3.1.2 The progress of coding



Figured 3.3.1.3 Project flow chart

Introduction

For the progression of our project we make a gantt chart that reviews our progress week by week along with our supervisor to guide us. The gantt chart is showed how we doing the project for the past fifteen weeks from the bigeninng until the end.

Bil	Progression Of Project	Period	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Briefing of the project	1 day													
2	Meeting with supervisor	every week													
3	Initial proposal	3week													
4	Buys the component	2week													
5	Sketch circuit	3week													
6	Etching and drill	3week													
7	Insert component and soldering	3week													
8	Presentation	1day													

3.3.2 Gantt Chart

3.4 Process of designing circuit

3.4.1 Draw Schematic Diagram Using Proteus 8

Proteus 8 is a single application with many service modules offering different functionality such as PCB layout, Schematic capture, and source code with Virtual simulation. Version 8 is different from its previous version in terms of application framework, common database which allows to run schematic capture and PCB layout with common database and in synchronized way.

3.4.2 Installing the Proteus 8 ISIS:

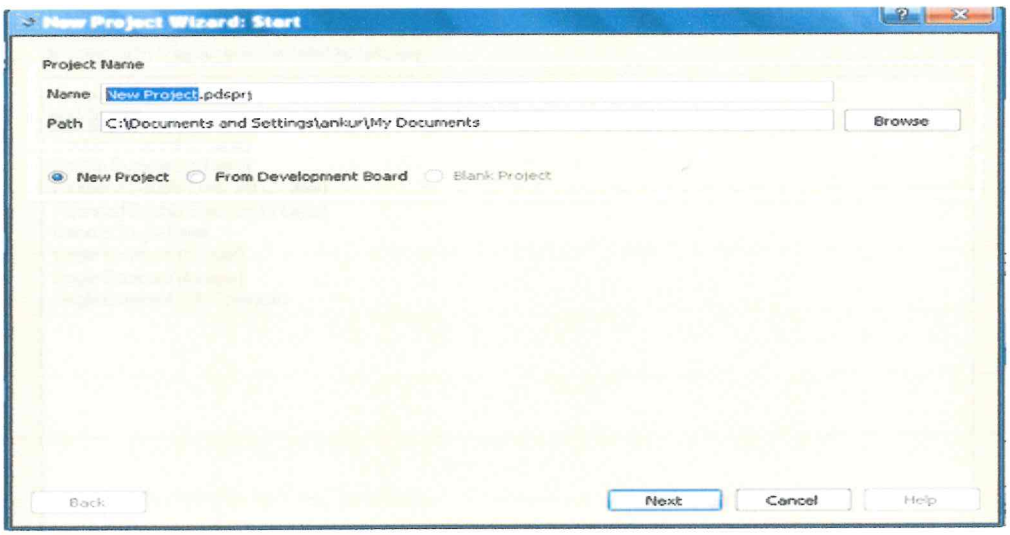
- You can download the Demonstration version of Proteus 8 ISIS from http://labcenter.com many tutorial videos are also provided for free. This demo version has been limited as it does not allow to save the file. So, you can simulate and work like professional in demo version but, can not save the file.
- Installation of Proteus 8 is similar to other software and no registration or key is required.

3.4.3 Getting started with Proteus 8:

1. Click on the desktop icon of Proteus 8 and Open the Home page of Proteus 8. It will be different from its previous version which used to open up directly the schematic layout.

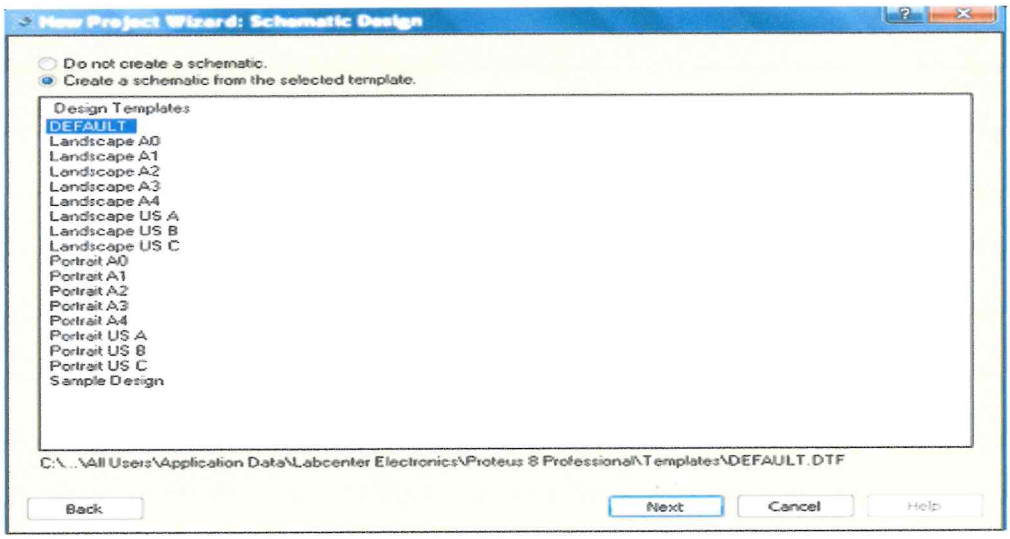
Figured 3.4.3.1 Proteus design suite 8.0

2. Now, click on "New Project" option and then, a pop-up window will be opened up in which you have to name the project and choose the directory to save the project. It will be saved automatically with "*.pdsprj*" extension.



Figured 3.4.3.2 New project

3. The Next step is to select the Schematic layout from the categories and 'Default' will be A4 size. You can select the other layout from the list provided.



Figured 3.4.3.3 Default