COUNTER FOR CAR PARKING SYSTEM

Oleh

NARMADHA A/P NAGARAJOO

PUSHPAKUMAR A/L PALANIVELLOO

Penghantaran Laporan Ini Adalah Untuk Memenuhi Keperluan Untuk Penganugerahan Diploma Kejuruteraan Elektronik (KOMUNIKASI) di Jabatan Kejuruteraan Elektrik Politeknik Seberang Perai

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This project report titled "Counter For Car Paking System" has been submitted,reviewed and confirmed as meeting the conditions and requirement of writing projects as required.

Reviewed and approved by:

Name of supervisor:Pn Azlina Binti Abdul Aziz

Signature of supervisor:

Date:

AZLINA BINTI ABDUL AZIZ
Pensyarah
Jabatan Kejuruteraan Elektrik
Politeknik Seberang Perai
Pulau Pinang

21/10/2016

"We declare that this is the result of our own except for each of which we have explained the source"

Signature:

....

Name:(NARMADHA A/P NAGARAJOO)

Matric No:10DEP14F1039

Date:

Signature:

....

Name: (PUSHPAKUMAR A/L PALANIVELLOO)

Matric No:10DEP14F1089

Date:

ABSTRACT

Counter for Car Parking System is a system that provides the number of available car parking spaces. This system can help the driver to know whether the car parking area is still vacant or not. Infrared LED sensors are used as the sensor to detect cars. The information of available car parking spaces will be shown at a display of Liquid Crystal Display (LCD). This project is generally about circuit designing which is use Arduino Uno programming and infrared sensor and display unit in order to detect cars going into the parking area and count the cars in the parking area. The main heart of this project is arduino programmable board .its where make aconnection between various components such as lcd display , ir sensor and extra to stay connects to run a counter system.

ABSTRAK

Counter for Car Parking System adalah satu sistem di mana ia boleh menyediakan maklumat mengenai jumlah kekosongan tempat letak kereta. Pemandu dapat mengetahui samada kawasan letak kereta masih kosong atau tidak melalui sistem ini. Pengesan infra merah *LED* digunakan sebagai *sensor* untuk mengesan kereta. Jumlah kekosongan tempat letak kereta dipaparkan pada paparan *LCD*.Secara umumnya, projek ini merangkumi reka bentuk litar elektronik, pengatucaraan komputer dan perlaksanaan reka bentuk litar untuk *sensor* dan unit paparan yang bertujuan mengesan kereta yang memasuki kawasan tempat letak kereta dan kereta yang keluar daripada kawasan tempat letak kereta itu.

APPRECIATION

First and foremost, I wish to express we sincere appreciation to my supervisor, Pn Azlina Binti Abdul Aziz for encouragement, guidance, critics and supports given throughout the progress of this project. Without their continued support and interest, this project would not have been the same as presented here. In preparing this report, I was in contact with many people, researchers, academicians and practitioners. They have contributed towards my understanding and thoughts. Our sincere appreciation also extends to family members who has been so tolerant and supports us all these years. Thanks for their encouragement, love and emotional supports that they had given to us. We grateful to friend Teh Chia Chin and also Mr Hussaini Aza,lecturer from Polytechnic Kulim who had supported and helped us to complete this project. Their ideas, views and tips are useful indeed.

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CHAPTER 1

INTRODUCTION

1.0 Introduction of Project

Counter for Car Parking System a system that provides the number of available car parking spaces. This system can help the driver to know whether the car parking area is still vacant or not. Infrared LED sensors are used as the sensor to detect cars. The information of available car parking spaces will be shown at a display of Liquid Crystal Display (LCD). This project is generally about circuit designing which is use Arduino Uno programming and infrared sensor and display unit in order to detect cars going into and going out from the parking area.

1.1 Objectives of the Project

There are three objectives to be achieved in this project such as:

i. To build a car parking system by using IR sensors.

ii. To ease the manpower for company.

1.2 Problem Statement

The problems experienced by a driver when searching for car parking is the availability of the parking spaces. Therefore when the drivers enter the car parking area without knowing that car park is empty or not, it will lead to time and fuel wastage. By developing this project, the problems that most probably can be solved are listed below:

i. Consume long hours while searching for empty car parking spaces.

ii. Doesn't have a count of cars going in and out of the parking area.

iii. Doesn't have an easier way for exit if parking spaces are full.

1.3 Project Scope

This project was done with some limitation and scopes too. The main parts were take place in this project is Arduino UNO board which consists of 5volts voltage regulator with USB connectors. This regulates whatever voltage (between 7V and 12V) is supplied from the DC power socket into a constant 5V.The Liquid Crystal display(LCD) is 2x16 which involve putting the data that form the letters and numbers of what we want to display into the data registers, then putting instructions in the instruction register.

Limitation of the project

The main part of the project is an Arduino Uno programmable board which will send the programming instruction to the other components.

- The IR sensor detection distance to the car will be 1-2 cm only.
- This project made only for 10 parking lots.

CHAPTER 2

LITERATURE RESEARCH

2.1 Introduction

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. **Arduino boards** are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board.

2.2 The Main Component were used are :

a) Arduino Uno
b) Liquate Crystal Display (LCD)
c) Infrared sensor (IR)
d) Servo Motor
e) Resistor

2.2.1 Arduino

I. Introduction To Arduino

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. **Arduino boards** are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board.

II. Why Arduino?

The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows, and Linux. Teachers and students use it to build low cost scientific instruments, to prove chemistry and physics principles, or to get started with programming and robotics.

There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:

- **Inexpensive** - Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than RM50.
- **Cross-platform** - The Arduino Software (IDE) runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.
- **Simple, clear programming environment** - The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with how the Arduino IDE works.

- **Open source and extensible software** - The Arduino software is published as open source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs if you want to.
- **Open source and extensible hardware** - The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it.

III. Arduino Boards

The Uno is one of the more popular boards in the Arduino family and a great choice for beginners. We'll talk about what's on it and what it can do later in the tutorial.

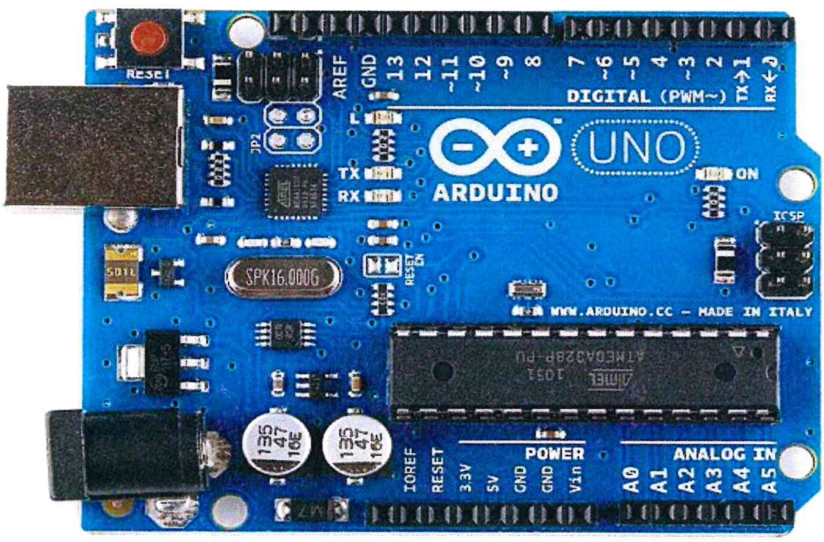

Figure 2.1: Arduino UNO

IV. Arduino IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

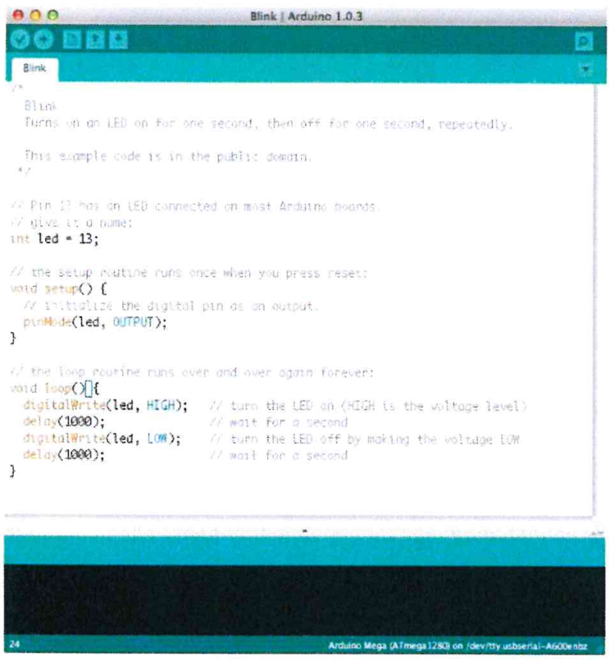

Figure 2.2: This is a screenshot of the Arduino IDE

V. What's on the board?

There are many varieties of Arduino boards that can be used for different purposes. Some boards look a bit different from the one below, but most Arduinos have the majority of these components in common:

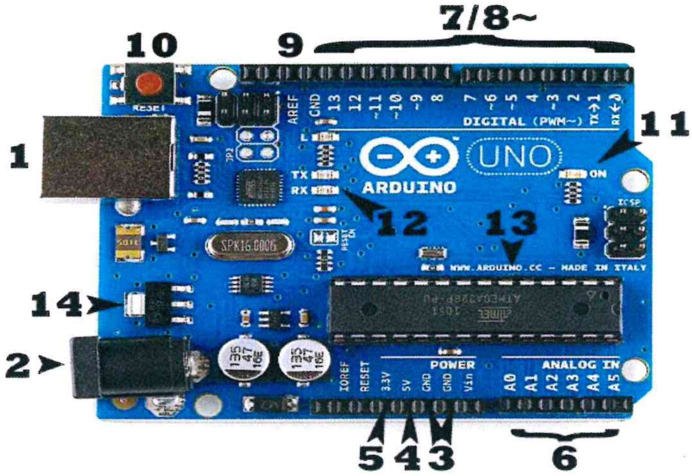

Figure 2.3: Power (USB / Barrel Jack)

Every Arduino board needs a way to be connected to a power source. The Arduino UNO can be powered from a USB cable coming from your computer or a wall power supply that is terminated in a barrel jack. In the picture above the USB connection is labeled **(1)** and the barrel jack is labeled **(2)**.

The USB connection is also how you will load code onto your Arduino board.

NOTE: Do NOT use a power supply greater than 20 Volts as you will overpower (and thereby destroy) your Arduino. The recommended voltage for most Arduino models is between 6 and 12 Volts.

Pins (5V, 3.3V, GND, Analog, Digital, PWM, AREF)

The pins on your Arduino are the places where you connect wires to construct a circuit (probably in conjunction with a **breadboard** and some **wire**). They usually have black plastic 'headers' that allow you to just plug a wire right into the board. The Arduino has several different kinds of pins, each of which is labeled on the board and used for different functions.

- **GND (3)**: Short for 'Ground'. There are several GND pins on the Arduino, any of which can be used to ground your circuit.

- **5V (4) & 3.3V (5)**: As you might guess, the 5V pin supplies 5 volts of power, and the 3.3V pin supplies 3.3 volts of power. Most of the simple components used with the Arduino run happily off of 5 or 3.3 volts.
- **Analog (6)**: The area of pins under the 'Analog In' label (A0 through A5 on the UNO) is Analog In pins. These pins can read the signal from an analog sensor (like a **temperature sensor**) and convert it into a digital value that we can read.
- **Digital (7)**: Across from the analog pins are the digital pins (0 through 13 on the UNO). These pins can be used for both digital input (like telling if a button is pushed) and digital output (like powering an LED).
- **PWM (8)**: You may have noticed the tilde (~) next to some of the digital pins (3, 5, 6, 9, 10, and 11 on the UNO). These pins act as normal digital pins, but can also be used for something called Pulse-Width Modulation (PWM). We have a tutorial on PWM, but for now, think of these pins as being able to simulate analog output (like fading an LED in and out).
- **AREF (9)**: Stands for Analog Reference. Most of the time you can leave this pin alone. It is sometimes used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input pins.

Reset Button

Just like the original Nintendo, the Arduino has a reset button **(10)**. Pushing it will temporarily connect the reset pin to ground and restart any code that is loaded on the Arduino. This can be very useful if your code doesn't repeat, but you want to test it multiple times. Unlike the original Nintendo however, blowing on the Arduino doesn't usually fix any problems.

Power LED Indicator

Just beneath and to the right of the word "UNO" on your circuit board, there's a tiny LED next to the word 'ON' **(11)**. This LED should light up whenever you plug your Arduino into a power source. If this light doesn't turn on, there's a good chance something is wrong. Time to re-check your circuit!

TX RX LEDs

TX is short for transmit, RX is short for receive. These markings appear quite a bit in electronics to indicate the pins responsible for **serial communication**. In our case, there are two places on the Arduino UNO where TX and RX appear – once by digital pins 0 and 1, and a second time next to the TX and RX indicator LEDs **(12)**. These LEDs will give us some nice visual indications whenever our Arduino is receiving or transmitting data (like when we're loading a new program onto the board).

Main IC

The black thing with all the metal legs is an IC, or Integrated Circuit **(13)**. Think of it as the brains of our Arduino. The main IC on the Arduino is slightly different from board type to board type, but is usually from the ATmega line of IC's from the ATMEL company. This can be important, as you may need to know the IC type (along with your board type) before loading up a new program from the Arduino software. This information can usually be found in writing on the top side of the IC. If you want to know more about the difference between various IC's, reading the datasheets is often a good idea

Voltage Regulator

The voltage regulator **(14)** is not actually something you can (or should) interact with on the Arduino. But it is potentially useful to know that it is there and what it's for. The voltage regulator does exactly what it says – it controls the amount of voltage that is let into the Arduino board. Think of it as a kind of gatekeeper; it will turn away an extra voltage that might harm the circuit. Of course, it has its limits, so don't hook up your Arduino to anything greater than 20 volts.

In this project 'Arduino UNO' selected based on its low cost, cross-platform, simple and clear programmimg. Although open source and extensible software and hardware but it was chosen because of easily available.

2.2.2 Liquid Cristal Display (LCD)

A Liquid Crystal Display (LCD) is a thin and flat electronic visual display that uses the light modulating properties of liquid crystals. The LCD is usually more compact, lightweight, portable, less expensive, more reliable and easier on the eyes 2x16 LCD is commonly used for the electronic system design and also used for this project to display the output. The display types of 2x16 LCD are segment/alphanumeric or dot matrix character.

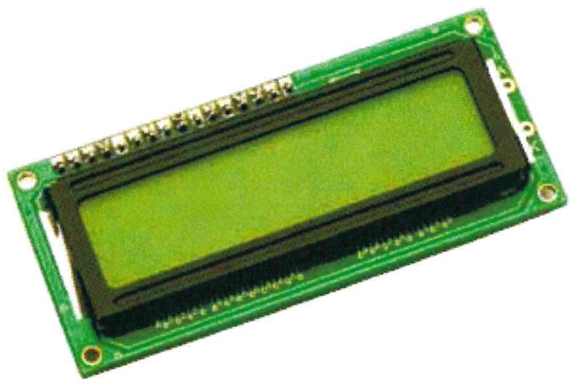

Figure 2.4 2x16 LCD display

2.2.3 Infrared Sensors

An infrared sensor (IR) is an optical device that transmits and detects infrared radiation in order to sense some aspect of its surroundings. Infrared sensors can measure the heat of an object, as well as detect motion. There are many types of infrared sensor that are commonly used such as passive infrared sensor, infrared motion sensor, infrared temperature sensor, infrared sensor alarm, infrared LED and so on. The simplest one act as an infrared sensor is an infrared LED. This infrared transmitter and receiver are called as IR Tx-Rx pair. It can be obtained from any decent electronics component shop and the following Figure shows 3mm and 5mm infrared transmitter and receiver pairs. The color of infrared transmitter and receiver is different.

This Infrared sensor offers simple, user friendly and fast obstacle detection using infrared; it is non-contact detection. The implementations of modulated IR signal Immune the sensor to the interferences caused by the normal light of a light bulb or the sunlight. The sensing distance can be adjusted manually.

The product features include:

• **5V powered**, low current consumption, **less than 10mA.**

• 4 pin interface which are **output, analog, GND** and **5V**.

• Small **LED as indicator** for detection status.

• Small size makes it easy to assembly.

• **Dimension:** 1cm x 2cm

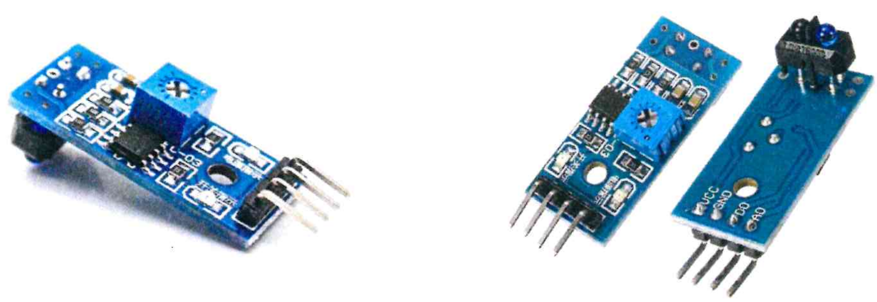

Figure2.5 Infrared Sensors

Advantages

i. Low power requirements

ii. Blocked by common materials for example people, walls and plants.

iii. Small in size and it is also portable.

Disadvantages

i. The speed of data rate transmission is lower than typical wired transmission

ii. Light, weather sensitive where direct sunlight, rain, fog, dust, pollution can affect transmission

Basic Operational Principle of Infrared LED

The basic operational principle is to send infrared light through infrared LEDs, which is then reflected by any object in front of the sensor. Infrared LED emits infrared radiation. This radiation illuminates the surface in front of LED. When the signal is transmitted by the infrared transmitter, the lights will travel to the empty spaces in a line. If there is any object somewhere near the infrared sensor, the light will hit that object and light will be reflected back to its receiver. This reflected light is made incident on reverse biased infrared sensor.

2.2.4. Servo Motor

A servomotor, or servo for short, is a self-contained motor, controller, and reduction gear system in a box. Rather than turning continuously, most of them have a limited range of movement, and are normally configured to move a lever from side to side and hold it in position. If this sounds a lot like the kind of stall-motor we've been using to throw turnouts on model railroads for decades, that's because in some ways it is very similar. There are differences, and two of the most important are economy of scale and how they are controlled.

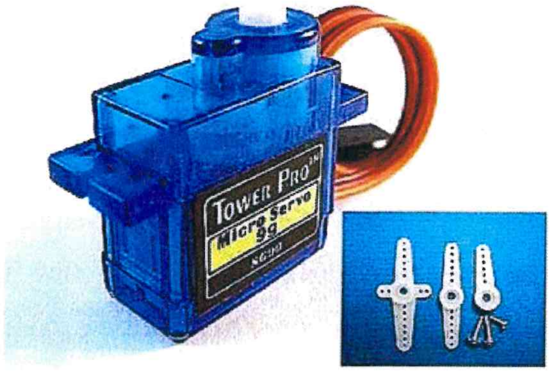

Figure 2.6: Example of Servo Motor

The newer micro servers are particularly interesting, because they are very compact compared to current motor-based turnout controls, and are thus suitable for more space-constrained environments. And yet they have sufficient power for throwing typical turnouts, as well as being applied for other purposes such as crossing gates (or semaphore signals for that matter). They are also potentially less expensive (if you are willing to work on your own control system; commercial systems are still somewhat expensive).

They do, however, require specialized controllers. You can't just wire a switch up to one to make it work. A simple analog timer circuit can be used, but in recent years with the rise of inexpensive embedded-processing computers, like the Arduino, new options for control have opened up. The Arduino software comes with a built-in servo control library, and there are external shields and circuit boards for powering servos while controlling them from the Arduino.

A servo is not a stall motor though, and treating one as if it is can destroy it. Like any device they have their strengths and weaknesses, and to best use them, these need to be understood.

Uses in model railroading include throwing turnouts, raising and lowering crossing gates, positioning turntables, creating animated scenes by operating things like doors or moving spouts on steam railroad water tanks, etc. Turnout control tends to be the most common application, due to potential cost savings and because it is relatively easy to do.

Most servos have a limited range of motion. While 180° (+/- 90° from a center point) is commonplace, many have a shorter range (90° is fairly common, and many will do 180° with specialized controllers and 90° with normal ones). There are some than can rotate continuously (such as for operating wheels on a robot), but these are designed somewhat differently from normal ones. It is also possible to modify many limited-range servos to be continuously-rotating ones, although some trade-offs have to be accepted when doing this since the servo isn't likely to have been designed for that purpose.

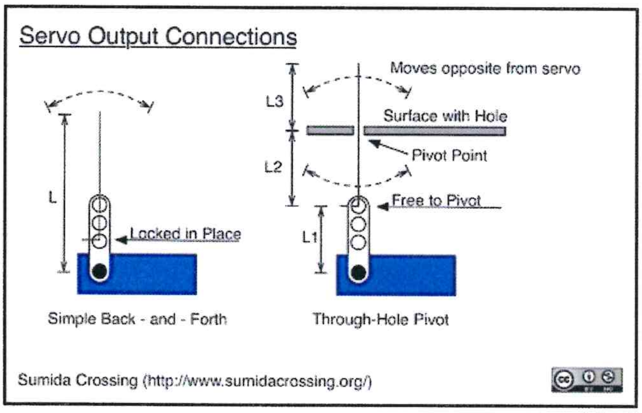

Figure 2.7 : Motion Of Servo Motor SG90

Servos almost always operate on 5 volt power, since this is a good fit for modern control systems using digital circuitry. They are rated for a range from about 3 to 6 volts, and many will work on typical 7.2 volt L-Ion batteries, even if technically overloaded. The three wires are + (usually +5V), ground, and a control line. The use of 5V power means they need a special power supply (you can't wire them up to the 12 or more volts used for typical railroad accessory power).

Normally the ground wire will be black or brown, and +5V wire will be red, and the control wire will be orange, white or blue (but other colors may be used, consult the documentation for the specific servo if in doubt).

Servos do not draw continuous power, but instead use a series of short pulses 1 - 2 milliseconds (ms) in length spaced about 20 ms apart. This means that their average power draw is considerably less than their peak power draw. And the peak current for even small servos can approach (or exceed) 1 Amp.

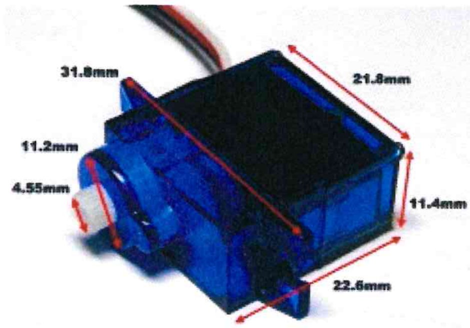

Figure 2.8: Size of Servo Motor SG90

A servo at these limits will also tend to be more noisy than one in motion, because it is continuously stopping and restarting to push against full load, causing the internal gears to engage and disengage dozens to hundreds of times per second.

Servos move very quickly, going their full side-to-side range as quickly as 0.3 seconds, although the controller could be designed to slow them down to a more realistic speed for railroad use. This is normally given as a rating for motion through 60°, so one that can move 180° in 0.3 seconds would be rated as "0.1s/60°".

2.2.5 Resistors

A resistor is a two-terminal electronic component designed to oppose an electric current by producing a voltage drop between its terminals in proportion to the current, that is, in accordance with Ohm's law:

$$V = IR$$

Resistors are used as part of electrical networks and electronic circuits. They are extremely commonplace in most electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made of a high-resistivity alloy, such as nickel/chrome).

Figure2.8 Example of Resistor

The primary characteristics of resistors are their resistance and the power they can dissipate. Other characteristics include temperature coefficient, noise, and inductance. Less well-known is critical resistance, the value below which power dissipation limits the maximum permitted current flow, and above which the limit is applied voltage. Critical resistance depends upon the materials constituting the resistor as well as its physical dimensions; it's determined by design.

Theory of operation

Ohm's law

The behaviour of an ideal resistor is dictated by the relationship specified in Ohm's law:

$$V = I \cdot R$$

Ohm's law states that the voltage (V) across a resistor is proportional to the current (I) passing through it, where the constant of proportionality is the resistance (R).

Equivalently, Ohm's law can be stated:

$$I = \frac{V}{R}$$

This formulation of Ohm's law states that, when a voltage (V) is present across a resistance (R), a current (I) will flow through the resistance. This is directly used in practical computations. For example, if a 300 ohm resistor is attached across the terminals of a 12 volt battery, then a current of 12 / 300 = 0.04 amperes (or 40 milliamperes) will flow through that resistor.

Power dissipation

The power P dissipated by a resistor (or the equivalent resistance of a resistor network) is calculated as: $P = I^2 R = IV = \frac{V^2}{R}$

The first form is a restatement of Joule's first law. Using Ohm's law, the two other forms can be derived.

CHAPTER 3

METHODOLOGY

3.1 Introduction

Methodology can be the 'analysis of the principles of methods, rules, and postulates employed by a discipline', 'the systematic study of methods that are, can be, or have been applied within a discipline' or 'a particular procedure or set of procedures'.

Methodology includes a philosophically coherent collection of theories, concepts or ideas as they relate to a particular discipline or field of inquiry. Methodology refers to more than a simple set of methods; rather it refers to the rationale and the philosophical assumptions that underlie a particular study relative to the scientific method. This is why scholarly literature often includes a section on the methodology of the researchers.

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.

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

3.2 Flow Chart

While doing work for the completion of this project, we have done some advance planning before doing this project. Flow chart below shows some of the plans for this project. A flow chart is designed for smooth running of this project as well as helps solve problems step by step. The flow chart was used in analysing, designing, documenting or managing a process or program.

Among the items listed are looking for ideas to design the project is a set the title of the project, designing the circuits and circuit analysis. Furthermore, we also estimated the cost of the project, buying the components used, install components and perform soldering circuit. Circuit testing is also performed to ensure that the system functions properly.

3.3 Draw Schematic Diagram of circuit using Proteus

Proteus 7 is a powerful package for designing single-sided and double-sided printed circuit boards(PCBs).It provides a comprehensive range of tools covering all the traditional steps in PCB production, including schematic drawing, schematic capture, component placement, automatic routing, and Bill of Materials reporting and file generation for manufacturing.

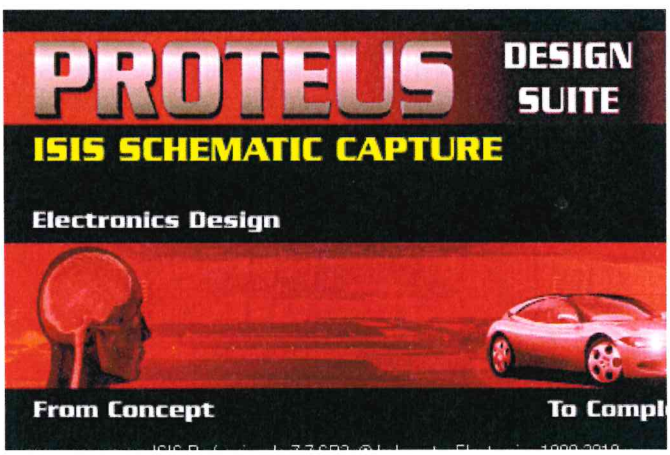

Figure 3.3.1: Proteus 7 software

3.4 Process Of The Circuit Designing

3.4.1 Design The Circuit Diagram

After decide what kind of project that we want to build. We need to make a research about the circuit, electronic component that we need to used, hardware and so on. These things actually can help us to make a better in designing circuit. For example, we need to know the size, foot of component, polarity of the component, the component method compilation and etc to make a circuit diagram.

In the first step in Circuit Designing process is make a circuit diagram that can be used in the next process. Among steps in the circuit diagram are:-

i. Before the circuit is produced, the things that we need to be emphasized are the position of symbols and components used in the Schematic circuit. Once we know the entire production circuit, the circuit can be drawn using special software, namely Proteus ISIS Professional.

ii. Then, make sure that the connection of the component is correct.

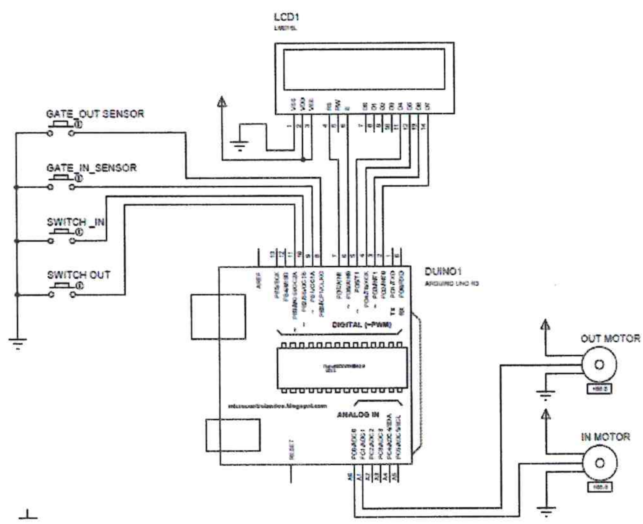

Figure 3.4.1 Schematic diagrams for circuit