AUTOMATIC SPRINKLER

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DIPLOMA KEJURUTERAAN ELEKTRONIK(KOMPUTER)

POLITEKNIK SEBERANG PERAI

JUNE 2016

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

JUNE 2016

DECLARATIONS

"We hereby declare that this report entitle "Automotic sprinkler" is the result of my own expect for quotes as cited in the references."

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Signature : 

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Date : 1 October 2016

Special thanks to my beloved father and mother, my siblings, project supervisor and friends thank for their motivation and their sacrifice

ACKNOWLEDGEMENT

I would like to express my deepest gratitude to the All Mighty for His goodness and grace that sustained my performance level at the crucial times of completing this Final Year Project entitled automatic sprinkle using Arduino Uno.

Besides that, I would like to extend my appreciation to those who contributed their time, concern and efforts to lend their hand thus allow me to gain a very valuable knowledge about this project. Then, I want like to reserve a special thanks to my supervisor, for his guidance and excellence in mentoring. All their comments and constructive criticism played a pivotal role throughout my project development.

Next, I would to thank to the countless individuals who had contributed their constant views and evaluations in accessing my progress at all time. Finally, I would also like to express my endless appreciation to my friends who had provided plenty of fruitful discussion with the critical inputs from time to time. It would not have been possible to complete a project without theirs supports. Last but not least, I wish to thank my family for their valuable support and motivations.

ABSTRAK

Tanaman memerlukan sumber air yang mencukupi untuk menjadi sihat dan subur. Jumlah lebihan air dan jumlah kurang air yang dibekalkan kepada tumbuhan boleh menyebabkan tumbuhan layu dan mati. Penyelidikan yang lepas telah memberi tumpuan kepada kaedah bagaimana untuk menyiram air tanaman pada masa yang sesuai dengan jumlah air yang betul. Kajian ini tertumpu kepada bagaimana untuk membangunkan sistem penyiraman automatik menggunakan Arduino supaya tumbuhan disiram pada masa yang sesuai dengan jumlah yang betul. Sistem berasaskan rumah adalah untuk memudahkan manusia dalam menyiram tumbuhan tanpa melibatkan mana-mana tenaga manusia. Untuk membangunkan sistem automatik sepenuhnya yang secara pintar mengukur kelembapan tanah, pendekatan yang berbeza daripada kaedah yang digunakan dalam bidang berbeza telah dikaji semula. Sistem yang paling sesuai telah dipilih untuk menjadi sumber idea dan bimbingan. Idea sendiri dicadangkan untuk meningkatkan pendekatan sistem yang sedia ada. Komponen akhir dan bahan-bahan yang diperlukan untuk menyokong sistem penyiraman automatik yang cekap telah didapati dengan menganalisis dan menguji prototaip. Sistem penyiraman auto tumbuhan menggunakan Arduino adalah satu sistem yang memudahkan manusia dalam menyiram tumbuhan.

ABSTRACT

Plants need sufficient water resources to be healthy and fertile. Excess amount of water and less amount of water supplied to plant may cause the plant to wither and die. Past research has focused on the method on how to watering the plant water on the right time with the right amount of water. This research focussed on how to develop an auto watering system using Arduino that watering plant at the right time with the right amount. This home based system is to facilitate human in watering plant without involving any manpower. To develop a fully automated system that intelligently measures the soil moisture, different approaches of methods used in varying fields were reviewed. The most suitable system had been selected to be a source of ideas and guidance. An own idea proposed to improve the approaches of existing systems. The final components and materials needed to support an efficient auto watering system was obtained by analyzing and testing the prototypes. A plant auto watering system using Arduino is a system that facilitates human in watering the plant.

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CHAPTER 1

INRODUCTION

1.1 Project introduction

In the plantation, watering the plant is one of important aspect. It an easier job if we can construct an automatic watering plant in our own plants that can be work efficiently to improve our plantation growth. It is a simple system, by using Arduino to automate the irrigation and watering of small potted plants that we want. This system does the control of soil moisture to provide the needed requirement of a plant. In case the soil is dry, sensor will activate the irrigation system pumping water for watering plants. By using Arduino product, we can construct this automatic water sprinkler to ensure the good plantation plan especially for gardening. For some industries that need large and fast plantation to growth, this system is very suitable for the industries which can help them to improve their productivity of work by reducing cost and short time work. Beside that, it also good for the gardener lover to have their plant growth in good condition with good amount of water to create necessary soil moisture. It also make human work more easier because sometime some people forget to watering their own plant because of the busy work. This automatic watering plant also good to save water cost because if rain condition happen that cause the siol to humid, therefore, the sprinkler will not functioning and then also can reduce the cost of electricity.

1.2 Problem Statement

The plant requires the owner to always sensitive with it needs. Watering plants at the appropriate rate for the plant is important. However, many people forget this watering routine. Busy people always forget to water the plants due to tight schedule. For those who possess a tight daily schedule and always travelled, they cause to forget the desire to have indoor planting for fear bound by watering schedule and thought it was a tiring and burdensome task. People also tend to forget to nurture their plant. Even though, there are other alternative, such as hired someone to watering the plant periodically, but this is could swallow a lot of cost. Besides that, they also may have some issue regarding letting other people to enter their house when they are absence. They are concerned about their house security and does not trust the worker without any supervise the worker. Additionally, watering plants are tedious repetitive tasks and may cause exhaustion to busy people.

Besides that, usually people is not able to predict the essential amount of water needed by plant to restore the soil moisture needed by plants. Then, there was a situation where even though the plant is watered periodically, the plant still dies. This is happening because the plant may have less water or over water. People that do not have experiences always have a problem with the watering routines.

1.3 Objective of project

The objective of this project is:

To identify the suitable components needed for supporting auto watering system, besides that, able to design and implement an auto watering system using soil moisture sensors and to develop an auto watering system that facilitates human in the watering task

1.4 Scope of project

This project is an improvement of conventional method of watering plants to the auto watering system. The auto watering system development is divided into software and hardware implementation. There are two functional components in this project. They are the moisture sensors and the motor/water pump. Thus the Arduino Board is programmed using the Arduino IDE software. The function of the moisture sensor is to sense the level of moisture in the soil. The motor/water pump supplies water to the plants. This project uses Arduino Uno to controls the motor. Follow the schematic to connect the Arduino to the motor driver, and the driver to the water pump. The motor can be driven by a 9 volt battery, and current measurements show us that battery life. The Arduino Board is programmed using the Arduino IDE software. The moisture sensor measures the level of moisture in the soil and sends the signal to the Arduino if watering is required. The motor/water pump supplies water to the plants until the desired moisture level is reached.

CHAPTER II

PROJECT BACKGROUND

2.1 System Overview

The figure 2.1 below is demonstrates the block diagram of the system overview.

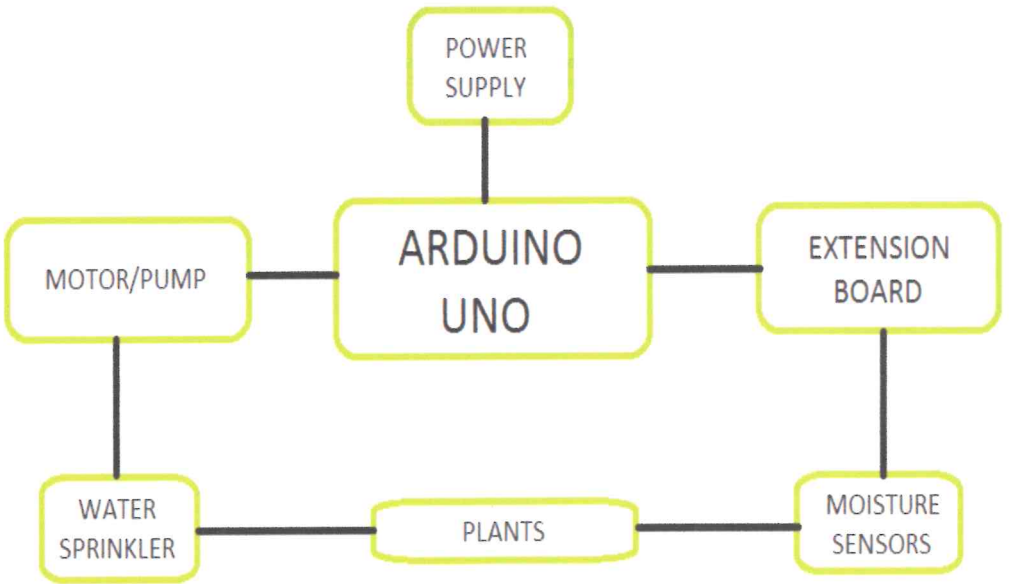

Figure 2.1: system Overview

2.2 General Description

This project here is all about a automatic sprinkler watering. In this project, system that controls the flow of water in watering channel. The system Then, the system will trigger the water supplier to start the watering and send interrupt to stop the water supplies.

2.3 Major components

The component of this project are motor pump and servo The tools that have used is Arduino Uno and arduino sensor shield.

2.3.1 Arduino Uno

The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few Ringgit and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage **(recommended)**	7-12V
Input Voltage (limit)	6-20V
Digital I/O pins	14 (of which 6 provide PWM output)
PWM Digital I/O pins	6
Analog Input Pins	6
DC Current per I/O Pin	20mA
DC Current for 3.3V pin	50mA
Flash memory	32 KB (ATmega328P) Of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm
Weight	25 g

Table 2.1: Characteristics of Arduino UNO

The Uno board can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the GND and Vin pin headers of the POWER connector.

The board can operate on an external supply from 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may become unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows:

- Vin. The input voltage to the Uno board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V.This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it.
- 3V3. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND. Ground pins.

- IOREF. This pin on the Uno board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.

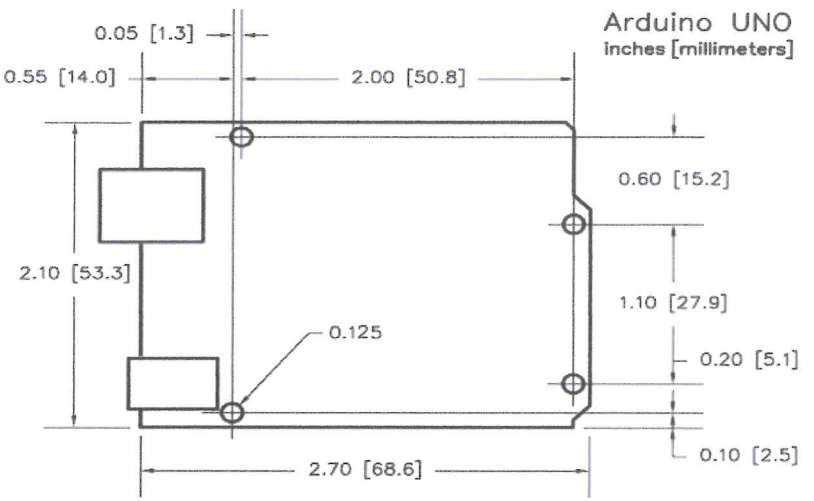

Figure 2.2: Product dimension

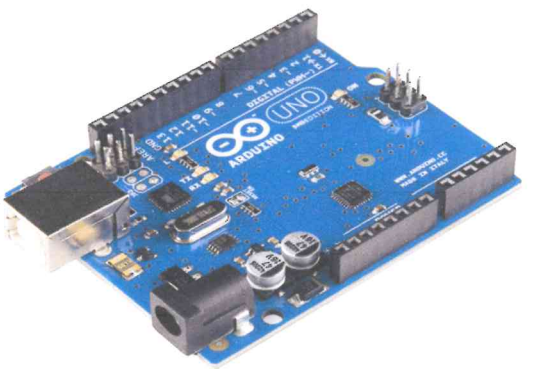

Figure 2.3: Arduino UNO

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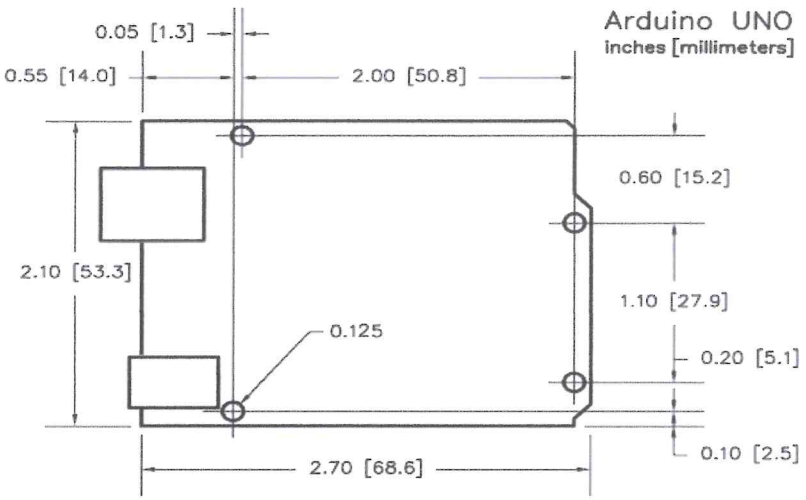

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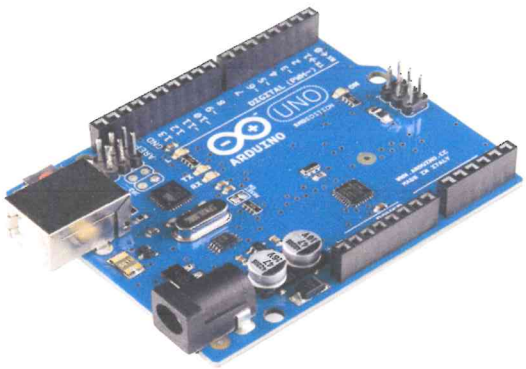

Figure 2.3: Arduino UNO

2.3.2 Arduino sensor shield

The Arduino Uno sensor shield is very useful as a connection point for the many interfaces you can plug into the Arduino. Using just the Arduino, you very quickly run out 0V and +5V connections for your sensors. Using a sensor shield gives you one +5V (Vcc) and one 0V (Gnd) for every Arduino signal pin. As these can be obtained for under £2.00 I think they are a good investment. There are 2 versions of the Sensor Shield commonly available, the earlier V4 & the newer V5. While they look different, the important connectors are the same on both versions.

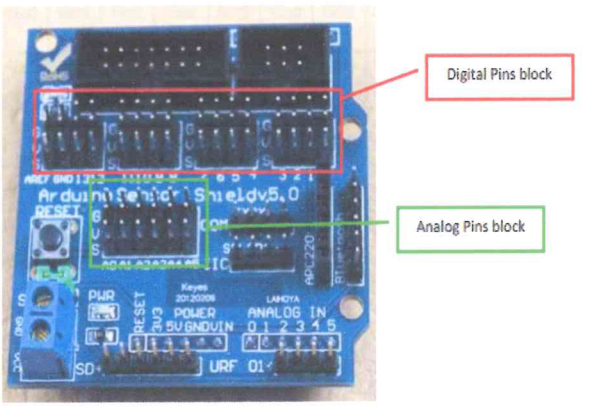

Figure 2.4: Arduino sensor shield

Digital Pins

The pins are arranged in stacks of 3:

1. Top = Gnd (0V)
2. Middle = Vcc(+5V)
3. Bottom = Signal (Arduino Digital Signal Pin No.) When the yellow *status* LED turns on, it means the modem is powered, and you can try connecting to the network.

G			Gnd	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd
V			Vcc	Vcc	Vcc	Vcc	Vcc	Vcc	Vcc	Vcc	Vcc	Vcc	Vcc	Vcc	Vcc	Vcc
S	Aref	Gnd	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Analog Pins

The pins are arranged in stacks of 3:

1. Top = Gnd (0V)
2. Middle = Vcc(+5V)
3. Bottom = Signal (Arduino Analog Signal Pin No.)

The pins are sequenced from left to right clearly marked on the board:

G	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd
V	Vcc	Vcc	Vcc	Vcc	Vcc	Vcc
S	A0	A1	A2	A3	A4	A5

Connecting Sensors & Output-Devices

When connecting sensors & output-devices to the Sensor Shield you must make sure to get the power pins the correct way round:

G goes to G or Gnd or GND or 0V on the sensor

V goes to V or Vcc or VCC or +5V on the sensor

S goes to the signal pin - OUT or IN etc..

Some sensors & output-devices will have 2 signal pins (or more) as well as 0V & +5V. For these you just choose one of the signal pins to connect the Signal, 0V and +5V to (on the S, G and V pins) and use just the S pins of another port for the other signal connections. Some simple sensors e.g. "Photo-resistor Sensor (4-wire)" use 2 wires for power, as above, but have two signal pins, one marked "A0" one marked "D0". These are two versions of the same signal:

• The D0 signal is a digital representation of the light level, but it can only be two different states, logic-high (+5V) or logic-low (0V). The switchover level is set by the variable resistor on the sensor module. This can be adjusted to set the light to dark switchover point. This signal can be connected to a Digital Input on the Sensor Shield/Arduino. This can be read by a digitalRead instruction. The signal is 0 for light and 1 for dark. The LED monitor on the module is on for light and off for dark.

• The A0 signal is an analog representation of the light level, this is a voltage anywhere between 0V - maximum light, and 5V - dark. This signal can be connected to an Analog Input on the Sensor Shield/Arduino.

2.3.3 L298N H-bridge

An electrical circuit or other electronic component used to control another circuit or component. They are usually used to regulate current flowing through a circuit or is used to control the other factors such as other components, some devices in the circuit. A driver is to provide enough current for the pump, my application needs a spray distance about one meter.

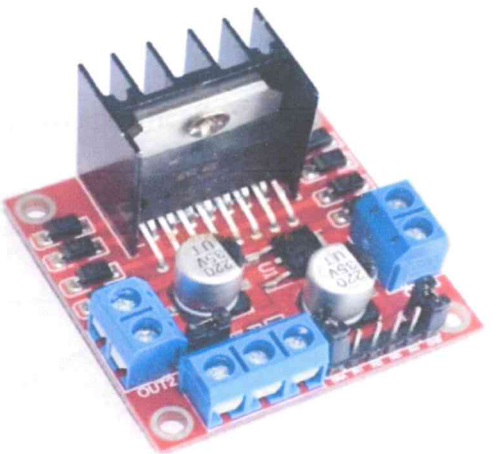

Figure 2.5: L298N H-bridge module

H bridges are available as integrated circuits , or can be built from discrete components .The term H bridge is derived from the typical graphical representation of such a circuit. An H bridge is built with four switches (solid-state or mechanical). When the switches S1 and S4 (according to the first figure) are closed (and S2 and S3 are open) a positive voltage will be applied across the motor. By opening S1 and S4 switches and closing S2 and S3 switches, this voltage is reversed, allowing reverse operation of the motor.

Using the nomenclature above, the switches S1 and S2 should never be closed at the same time, as this would cause a short circuit on the input voltage source. The same applies to the switches S3 and S4. This condition is known as shoot-through.

2.3.4 Servo

A servo is a rotary actuator that allows for precise control of angular position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

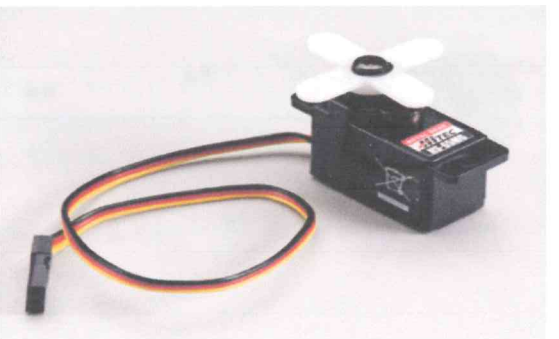

Figure 2.6: servo

2.3.5 RS-360SH Mini water pump

The water pump is used to artificially supply water for a particular task. It can be electronically controlled by interfacing it to a microcontroller. It can be triggered ON/OFF by sending signals as required. The process of artificially supplying water is known as pumping. The pumping of water is a basic and practical technique, far more practical than scooping it up with one's hands or lifting it in a hand-held bucket. Regardless of the outcome, the energy required to pump water is an extremely demanding component of water consumption.

Figure 2.7: mini water pump

CHAPTER III

METHODOLOGY

3.1 Overview

First of all, this chapter will explain the flow chart which explains the overall method taken along the project carry out. Besides that, it also has been introduced the construction which involves hardware development and software development. The hardware development of this project started by connecting all the components required and build a prototype for the water sprinkler. Then we implement the coding into the Arduino program to make it run.

3.2 System Operation

The system has been tested to function automatically. The moisture sensors measure the moisture level (water content) of the different plants. If the moisture level is found to be below the desired level , the moisture sensor sends the signal to the Arduino board which triggers the Water Pump to turn ON and supply the water to respective plant using the Rotating Platform/Sprinkler. When the desired moisture level is reached , the system halts on its own and the Water Pump is turned OFF. Thus, the functionality of the entire system has been tested thoroughly and it is said to function successfully.

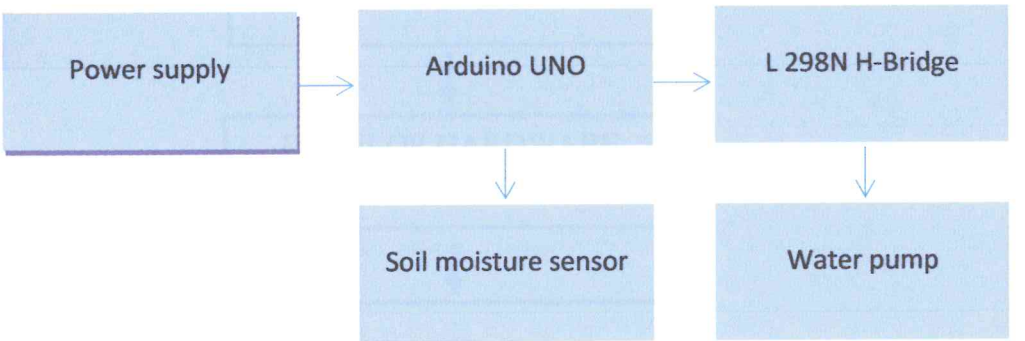

Figure 3: Block diagram of the system operation

3.3 Flow Chart

This project flow is used as a guide to complete the project. First of all, the started with do a literature view and followed by software and hardware development. After simulate, the project need to test and troubleshooting before continue with presentation.

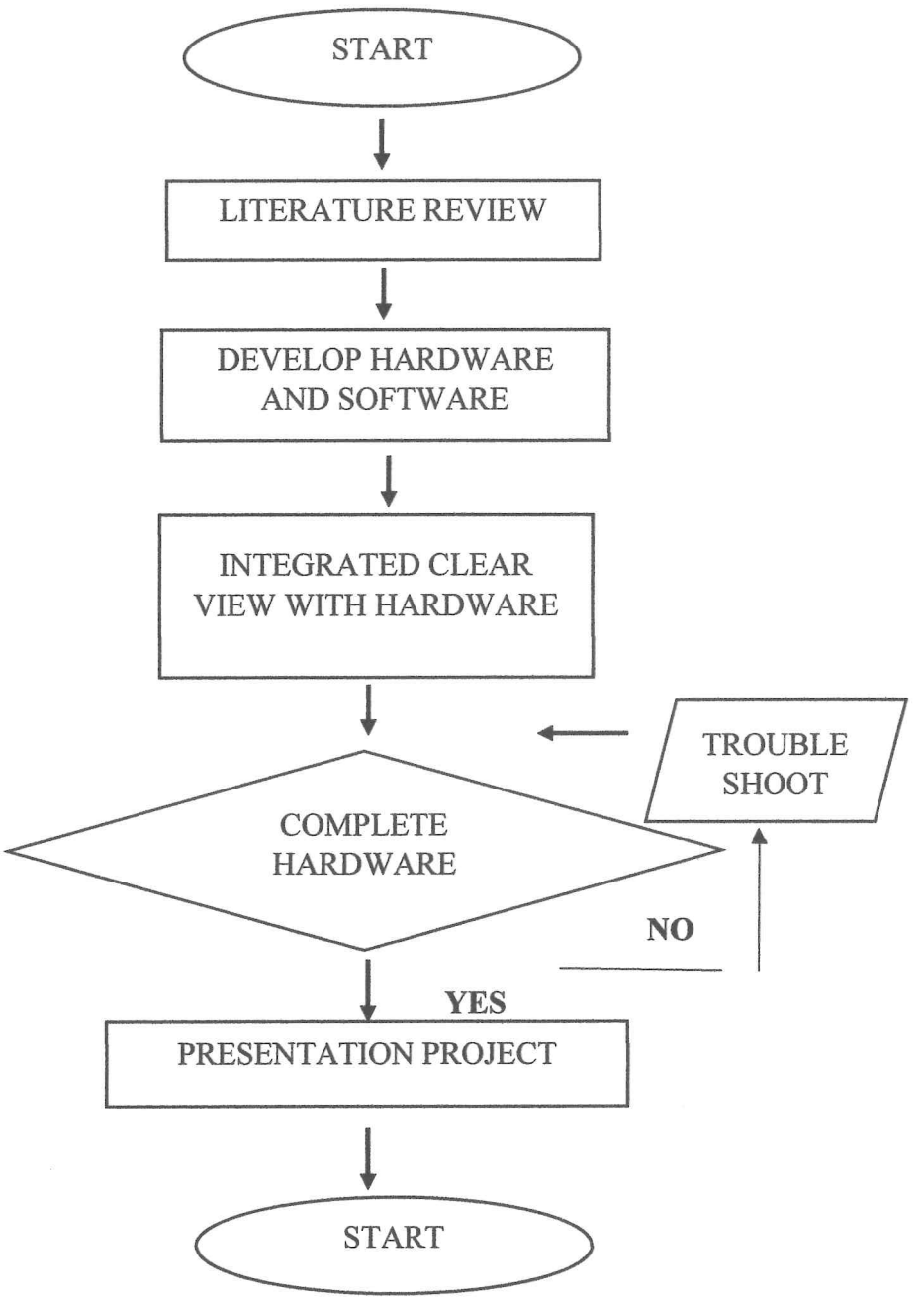

Figure 3.1: Flow chart

3.4 Description of Project Flow

3.4.1 Research

Research I very important before we start any type of works such as project, games and others. The information is collected based on the internet, journal, books and others.

The purpose of research is to analyze the suitability of components to be implement in this project. For instance, if the soil moisture sensor detect the condition of dry soil it will notify the Arduino the moisture level and it will trigger the water pump to sprinkle the water to the plant.