# UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## DEVELOPMENT OF PLANT MOISTURE MONITORING SYSTEM USING ARDUINO

This report is submitted in accordance with the requirement of the University Technical Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Electronic Industry) with Honours.

by

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FACULTY OF ENGINEERING TECHNOLOGY

2017

# UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **DEVELOPMENT OF PLANT MOISTURE MONITORING SYSTEM USING ARDUINO**

SESI PENGAJIAN: **2016/17 Semester 2**

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# APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Electronic Industry) with Honours. The member of the supervisory is as follow:

……

(PUAN SITI HALMA BT JOHARI)

# ABSTRAK

*Kemudahan penanaman tumbuhan yang berbeza yang akan memerlukan air sebagai keperluan. Setiap pokok mesti menerima jumlah yang betul air. Terlalu banyak air boleh kematian tumbuhan dan apabila terlalu kurang air tumbuhan tidak akan mendapat menyerap vitamin untuk terus hidup. Setiap penanaman pokok mesti memenuhi keperluan air setiap pokok dengan tujuan untuk mengekalkan tahap kesihatan yang tinggi dalam tumbuhan . Walaubagaimana cara sekali pun, sama ada musim terlalu panas dan kering atau terlalu mendung dan lembab, anda mahu dapat untuk mengawal jumlah air . Kajian ini memberi tumpuan kepada bagaimana untuk membangunkan sistem menyiram automatik menggunakan Arduino yang menyiram tumbuhan pada masa yang tepat. Sistem berasaskan rumah adalah untuk memudahkan manusia dalam menyiram tumbuhan tanpa melibatkan mana-mana tenaga manusia. Untuk membangunkan sistem automatik sepenuhnya dengan mengukur kelembapan tanah, pendekatan yang berbeza daripada kaedah yang digunakan yang berbeza-beza telah dikaji. Sistem yang paling sesuai telah dipilih untuk menjadi sumber idea dan bimbingan. Idea sendiri dicadangkan untuk meningkatkan pendekatan kepada sistem yang sedia ada. Akhir sekali,bahan yang diperlukan untuk menyokong sistem penyiraman automatik yang cekap telah diperolehi dengan menganalisis dan menguji prototaip.*

# ABSTRACT

Garden facilities deliver many different plants which will have varying watering needs. each plant must receive the right amount of water. An excessive amount of water may starve the plant's roots of oxygen and motive them to rot; too less water and the plant will now not get hold of the vitamins in wishes to continue to exist. A garden center must cater to each plant's watering needs with a view to maintaining a high level of health in their plant life. No matter whichever weathers it is, either too hot and dry or too cloudy and wet, you want to be able to control the amount of water that reaches your plants.This research focussed on how to develop an auto watering system using Arduino that watering plant at the right time. This home based system is to facilitate human in a 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 to existing systems. The final components and materials needed to support an efficient auto watering system were obtained by analyzing and testing the prototypes.

# DEDICATION

A special thank you to my beloved parents my dad names Abidin Bin Haji Sulaiman and my mom is Siti Zaleha Bt Haji Said for your unconditional support regarding my studies. I am very honoured to have both of you as my parents. Thank you for trusting me and giving me chance to proving my success in study and improving myself through my life.

# ACKNOWLEDGEMENT

I would like to give sincere thanks to my supervisor Madam Siti Halma Bt Johari for her constant guidance as well as for providing necessary information and the direction I am extremely grateful for your assistance and suggestion throughout my project.

Alhamdulillah, I would like to thanks to Allah S.W.T, the Most Merciful, and all praises to Allah for His blessing in completing this thesis. I also would like to express my gratitude my parent and member of University Technical Malaysia Melaka (UTeM) especially to the Department of Electronics & Computer Engineering Technology (JTKEK), Faculty of Engineering Technology (FTK).

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# LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

| | | |
|---|---|---|
| Al AC | - | Alternating Current |
| COM | - | Common |
| DFU | - | Device Firmware Update |
| GUI | - | Graphical User Interface |
| IDE | - | Integrated Development Environment |
| LED | - | Light Emitting Diode |
| NO | - | Normally Open |
| NC | - | Normally Close |
| PWM | - | Pulse with Modulation |
| PCB | - | Printed Circuit Board |
| RTD | - | Resistance Temperature Detector |
| PWM | - | Pulse with Modulation |

# CHAPTER 1
# INTRODUCTION

## 1.0 Introduction

This chapter able an overview of the watering device for the plant. The problem background and problem statement are defined subsequently. That is followed by the useful resource of research objectives and scope which includes the improvement of irrigation tool with a low-fee that may be observed and that easy way to a human.

## 1.1 Project Background

This task about the system irrigation for the plant as an automated system and get the statistics the monitoring system for a user. The technique software will use in this challenge by using the Arduino as a microcontroller. These tasks include a primary input is moisture sensor and temperature sensor when related to the Arduino for delivering the signal to hit upon the soil condition in dry or moist. When the sensor detects the situation of soil, if will discover soil is dry the Arduino will ship the sign and the buzzer can be on and the subsequent relay will contact to give information to the pump for a pump the water to launch it and the soil will moist.

## 1.2 Problem statement

Nowadays, humans surpassed by the growth of technology could appear to be a first-rate aspect sure to people and machines. This reflects the of technology for all of each day existence of the man or woman on the identical time, people become being busy with all things for a complete day and many plants do not awake by a user and as a result, it turns into difficult for them to hold their plants healthy and alive. Despite the fact that, there are other alternatives, along with hiring someone to water the plant periodically, but that is may want to swallow a number of fees. They are worried about their house protection and does no longer believe the worker without any supervise the worker. In addition, the water plant is the responsibility fatigue strength and purpose to man busy. Based totally on the above, we conceive that it is miles important to enforce the automatic machine so as to take care of plant all the exceptional aspects of a home gardening device in addition to large landscape (for the device based on agricultural farms) and facilitates them to grow wholesome. Besides that, typically people are not always able to predict the important quantity of water wished via plant to restore the soil moisture needed by way of a plant. Then, there was a state of affairs in which despite the fact that the plant is watered periodically, the plant still dies. This is happening because the plant may additionally have much less water or over water.

## 1.3 Objective

The main objective of this research in concentrated on aspect as listed below:

i. To develop a system farming for people by using an Arduino.
ii. To implement an auto watering system using soil moisture and temperature sensors.
iii. To analyse the performance plant moisture monitoring system using Arduino to watering the soil.

## 1.4 Scope of Project

There are important sensors that have been select to use which can be moisture sensor and temperature sensor. The temperature sensors will measure the temperature of the soil. Next, layout a prototype of the farming model, using a moisture sensor to measure on the situation of the soil. Lastly, the appearances of the GUI will be appearing for the reference user.

## 1.5 Thesis Outline

There are 5 chapters in this thesis which are included of introduction, literature review, methodology, result and discussion and subsequently an end and recommendation. Each chapter will discuss personal elements that associated with the project.

In chapter one is the introduction to the project or observe. There are their own statements, object and scope of the along had been discussed and presented in this chapter.

Next, chapter two, in this chapter previous research are reviewed. This chapter is discussing the methods and techniques used in previous research. The evaluation of power and weakness can be used because the suggestions to expand a green automatic watering system. The own concept also proposed and justified in this chapter.

Chapter three focuses on the methodology and processes on the task. This consists of the software program implementation and hardware development of the task.

Results and discussion are provided in chapter four. Finally, is the chapter five that presents a complete conclusion of the task. The suggestion and recommendation for future improvement inside the functional also referred to.

## 1.6 Project Significant

This project will useful to the society mainly for those are busy with tight schedule whose do no longer have time to watering their plant, the humans that generally overlook to water the plant, the humans that often pass traveling and outstation. Except that, this project proposed a solution via imparting a way and system to facilitate human in a watering plant.

Similarly, studies on the system's techniques and technique can be used to develop in order that relevant in the wide areas consisting of watering the plantation with a massive variety of plants. This assignment also contributes ideas for researchers to develop watering and irrigation system the usage of Arduino system.

# CHAPTER 2
# LITERATURE REVIEW

## 2.0 Introduction

This section, the discussion about the study and informed after that made a great contribution in the scope of this reflection, auto watering system or systems delivered. Further discussion on the related past studies and information that make significant contributions in this location of study, auto watering system or closely related machine. There is a huge source of information of the associated areas published on the web about a watering system. The collected information gives recommendations at the approach and samples current opinion. Consequently, the idea supported and justified with significant past studies.

## 2.1 Software

### 2.1.1 **Arduino Software IDE**

The Arduino included development environment of Arduino software (IDE) which contains a textual content editor for writing code, a message location, a textual content console, a toolbar with buttons for common features and a series of menus. It connects to the Arduino and Genuino hardware to

upload applications and speak with them. Then executed on the chip from the code maximum 3D-printer electronics are Arduino compatible, they make use of the Atmega chip and empower the person to transfer their code utilizing Arduino (Meijer 2014). In other words, programs written the usage of Arduino software (IDE) are referred to as sketches. These sketches are written inside the text editor and are stored with the document extension. ino. The editor has features for cutting or pasting and for looking or replacing text. The message region offers feedback even as saving and exporting and also displays errors. The console displays textual content output by using the Arduino software program (IDE), together with complete blunders messages and other records. The lowest right-hand nook of the window presentations the configured board and serial port. The toolbar buttons allow you to confirm and add programs, create, open, and keep sketches, and open the serial monitor. Included development surroundings of Arduino software program (IDE) have some instructions inside the five menus together with the file, Edit, sketch, tools, and help. The menus are context sensitive, which means most effective those items applicable to the work presently being performed are available. The determine beneath shown fundamental coding c language for Arduino. Figure 2.1 below shown the Arduino software IDE.

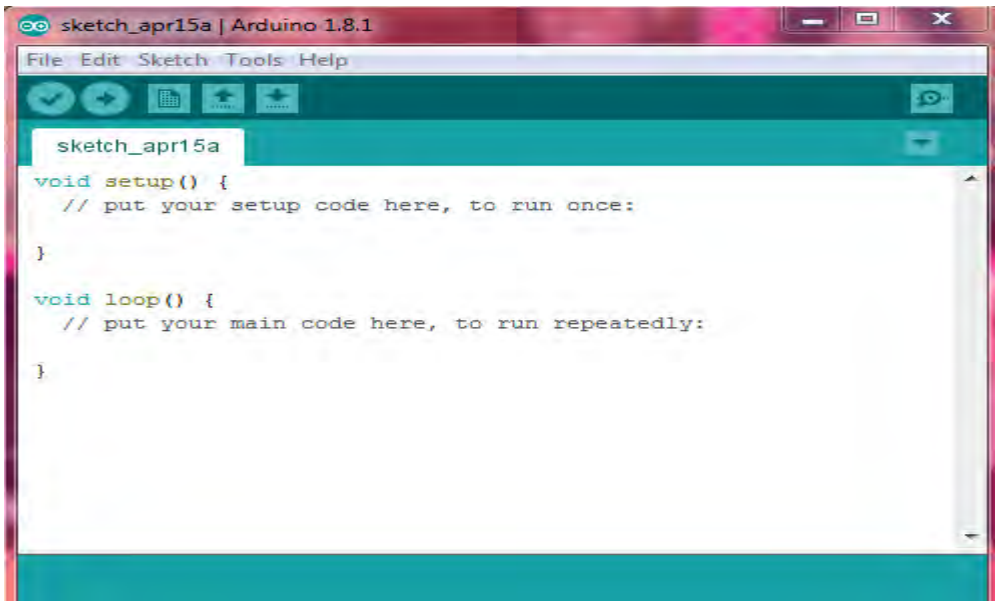


**Figure 2.1: Arduino Software IDE**

### 2.1.2 LabVIEW

LabVIEW, quick for Laboratory digital instrument Engineering Workbench, is a programming environment in that you create applications using a graphical notation (connecting useful nodes via wires via which facts flow); in this regard, it differs from conventional programming languages like C, C++, or Java, in that your software with textual content. But, LabVIEW is an awful lot more than a programming language. It's far an interactive program development and execution machine designed for humans, like scientists and engineers, who need to software as a part of their jobs. The LabVIEW development surroundings work on computers running Windows, Mac OS X, or Linux. LabVIEW can create packages that run on those systems, as well as Microsoft Pocket pc, Microsoft Windows CE, Palm OS, and a ramification of embedded platforms. The Figure 2.2 below show the LabVIEW Software interface.

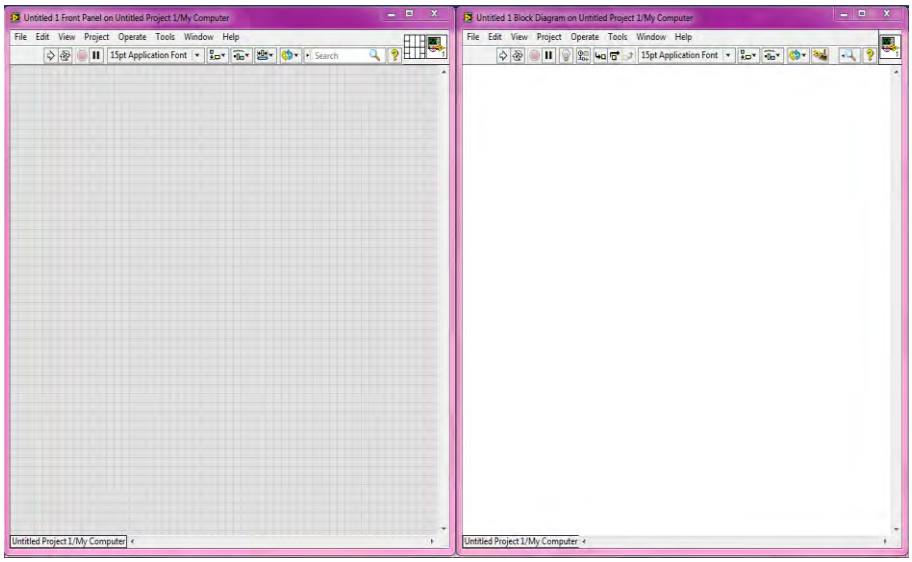


**Figure 2.2: LabVIEW Software**

### 2.1.3 Proteus

Proteus combines ease of use with effective functions to help layout, take a look at and layout professional PCBs like in no way before. Proteus

combines ease of use with effective features to assist design, check and format professional PCBs like by no means before. With nearly 800 microcontroller variants ready for simulation straight from the schematic, one of the maximum intuitive expert PCB layout packages available on the market and a global class form based auto router included as standard, Proteus design Suite eight offers the complete software bundle The Figure 2.3 below shown the Proteus Software interface.

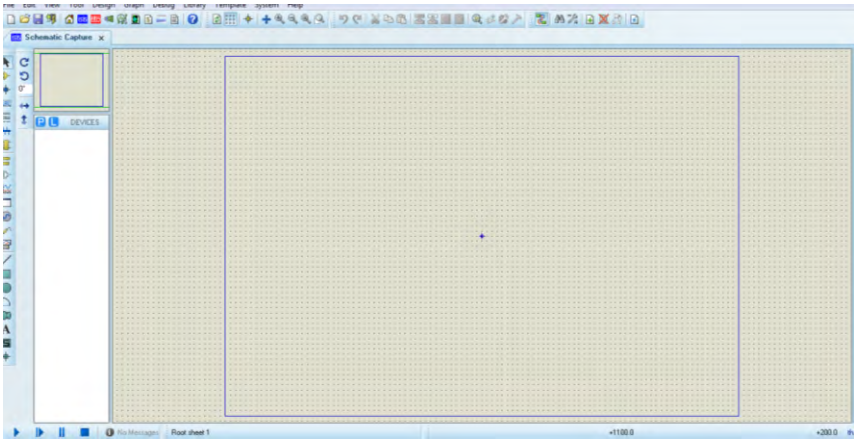

**Figure 2.3: Proteus Software**

## 2.2 Hardware

### 2.2.1 Arduino

The Arduino is an open-source electronics platform based on easy-to-use hardware and software. By sending a set of instructions to the microcontroller on the board can accept the instruction by a user. Based on wiring and the Arduino Software (IDE), based on Processing. There are a wide variety of shields plug-in boards adding functionality. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, 16 MHz ceramic resonators, USB connection, power jack, ICSP plug, and a

reset button. It contains everything needed to support the microcontroller; simply use the USB cable or power it with an AC-to-DC adapter or battery is connected to a computer begins. The latest version is Revision 3 (r3) which is Revision 2 added a pull-down resistor to resistor to the 8U2 HWB line, making it less demanding to put into DFU mode and Revision 3 added contain SDA and SCL pins are presently conveyed out to the header close to the AREF pin. SDA and SCL are for the I2C interface, IOREF pin that permits shields to adjust to the voltage provided and have another pin not connected reserved for future used. The USB connector usually can up to 500mA for all electronics including shield, or from the 2.1mm barrel, jack using a separate power supply when cannot connect the board (Revision 2014). The Figure 2.4 below shown hardware microcontroller of Arduino Uno.


**Figure 2.4: Arduino Uno Board**

### 2.2.2 Comparison Between Arduino Uno with Raspberry Pi

These two processor boards are both excellent components microcontroller. Both of this microcontroller has their own character which is an Arduino microcontroller motherboard. A microcontroller is an easy laptop which could run one software at a time, again and again once more. it is very

easy to use compared to the Raspberry Pi is a standard-reason laptop, typically with a Linux running system, and the capability to run a more than one of programs. It is more complex to use than an Arduino. The Figure 2.5 and Table 2.1 below shown comparison of Arduino Uno and Raspberry Pi.

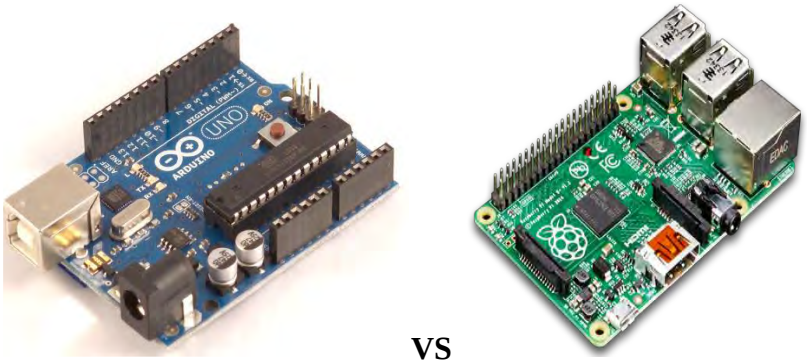


**Figure 2.5: Arduino Uno VS Raspberry Pi**

**Table 2.1: Comparison between Arduino Uno with Raspberry Pi**

| Feature | Arduino Uno | Raspberry Pi |
|---|---|---|
| Model Tested | R3 | Model B |
| Processor | ATMega 328 | ARM11 |
| Clock Speed | 16 MHz | 700 MHz |
| Flash | 32 KB | External SD card |
| RAM | 2 KB | 512 MB (shared with GPU) |
| EEPROM | 1 KB | N/a |
| Minimum Power | 42 mA (0.3W) | 700 mA (3.5 W) |
| Input Voltage | 5 to 12 volts | 5 volts |
| Analog Input | 6 10-bit inputs | None |
| Digital GPIO | 14 | 8 |
| PWM | 6 | None |
| TWI/I2C | 2 | 1 |
| UART | 1 | 1 |
| SPI | 1 | 1 |