



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**SOIL CONDITION SENSOR DEVELOPMENT AND WIRELESS
MONITORING USING ESPRESSO**

This report is submitted in partial fulfilment of the requirements for the Bachelor's Degree of Electronic (Telecommunication) Technology Engineering with Honours

by

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DEDICATION

Every challenging work needs self-efforts as well as guidance of elders especially those who were very close to our heart. This humble effort specially dedicated to my sweet and loving parents and family.

Special dedicated to my family;

Mohd Saipudin Bin Yunus

Norhayati Binti Alias

Which has a lot of encouragement and education and inspiration in success, prays of day and night and always love this self with sincerely heart.

Along wish all hard working and respected to lecturers;

Puan Aziean Binti Azize

Puan Siti Asma Binti Che Aziz

They are always be my side, they are a great help during difficult and easy, feel confident, guidance, and advise you on which motivated to myself.

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I would like to console my deepest apologies to my lovely parents. I am sorry for not being able to making it back home for the past few months. I just want them to know, I am working at my very best to ensure their smile when they see me succeed. And when that day comes, I would like to dedicate the success to them. I will give my very best, to ensure that they will get a better living once I have reached my goals. There's nothing more that I wanted to achieve in my entire life. But to see my parents, looking back at me and say "That's my son over there, we are so proud of him".

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ABSTRACT

A plantation is a where plants are developed. Ranches are normally utilized for developing blossoms, vegetables, organic products, and tobacco plant. Most manor framework still uses the manual framework in observing the temperature and dampness in the estate, a considerable measure of issue can happened not for laborer but rather likewise influenced generation rate in light of the fact that the temperature and mugginess of ranch must be always checked to guarantee ideal conditions. The remote sensor system can be utilized to assemble the information from indicate follow down the neighborhood atmosphere parameters in various parts of the huge estate to make the ranch robotization framework work appropriately. The point venture is building up a manor checking framework to screen an estate temperature and moistness parameters by applying the IoT a remote gadget as the remote sensor arrange framework. In this venture, IoT is utilized as a remote gadget and the temperature and mugginess sensor will be utilized for gather information of temperature and moistness in the estate. This venture is blend of equipment, for example, ESPresso, Computer and IoT as the fundamental equipment segments and Arduino IDE and MP Lab IDE for the principle of programming components that could bolster up to 100 meters. The information from the estate will be measured by the sensor and the information that are gathered will send to the collector. The information that has been perused will be shown on the diagram on the PC. By utilizing this framework, the way toward checking is less demanding and it is additionally less expensive for establishment and support handle.

ABSTRAK

Pemantauan tanaman adalah di mana proses tanaman itu dipantau dari aspek suhu dan kelembapan tanah. Ia sering digunakan untuk memantau tumbuhan seperti tanaman-tanaman yang berada di kawasan sekeliling. Kebanyakan pemantauan tanaman masih menggunakan sistem manual untuk memantau suhu dan kelembapan dalam system tanaman di mana banyak masalah boleh berlaku bukan sahaja untuk pekerja tetapi juga kadar pengeluaran terjejas kerana suhu dan kelembapan tanaman mesti sentiasa dipantau untuk memastikan keadaan yang optimum. Rangkaian pengesan tanpa wayar boleh digunakan untuk mengumpul data dari titik ke titik untuk mengesan di bawah parameter iklim tempatan di bahagian yang berlainan tanaman yang besar untuk membuat sistem automasi ini berfungsi dengan baik. Tujuan projek adalah pembangunan sistem pemantauan tanaman untuk memantau suhu dan kelembapan tanaman dengan menggunakan IoT peranti wayarles sebagai pengesan tanpa wayar. Dalam projek ini, IoT akan digunakan sebagai peranti wayarles manakala pengesan suhu dan kelembapan akan digunakan untuk mengumpul data suhu dan kelembapan di dalam sesebuah tanaman itu. Projek ini adalah gabungan perkakasan seperti Arduino, komputer dan IoT sebagai komponen utama dan Arduino dan MP Lab IDE untuk elemen perisian yang boleh menyokong jarak sehingga 100 meter. Data dari tanaman itu akan diukur oleh pengesan dan data yang dikumpul akan menghantar kepada penerima. Data-data yang telah dibaca akan dipaparkan dalam bentuk graf yang dipaparkan di dalam komputer. Dengan menggunakan sistem ini, proses pemantauan adalah lebih mudah dan ia juga lebih murah untuk pemasangan dan penyelenggaraan proses.

TABLE OF CONTENTS

DECLARATION	iii
APPROVAL	iv
DEDICATION	v
ACKNOWLEDGEMENTS	vi
ABSTRACT	vii
ABSTRAK	viii
TABLE OF CONTENTS	ix
LIST OF TABLES	xii
LIST OF FIGURES	xiii
LIST OF SYMBOLS AND ABBREVIATIONS	xiv
CHAPTER I INTRODUCTION	1
1.1. Introduction	1
1.1.1. Wireless Sensor Network Concept	2
1.1.2. Factors of the Plantaion Network	2
1.2. Problem Statement	4
1.4. Project Objectives	5
1.5. Project Scope	6
CHAPTER II LITERATURE REVIEW	7
2.0. Introduction	7
2.1. Soil Sensor Monitor	8
2.2. Arduino	9
2.3. Wireless System Network	9
2.4. Routing Strategies Topology	11
2.4.1 One Hop Routing (STAR)	11
2.4.2 Multi Hop Routing (MESH)	12
2.4.3 Cluster Based Routing	14
2.5. Soil Moisture Monitoring Software	16
2.6. Humidity Sensor	16
2.7 Internet of Things (IoT)	18
CHAPTER III METHODOLOGY	20
3.0. Introduction	20
3.1. Flow of Project Methodology	20
	ix

3.1.1 Title Finding	22
3.1.2. Literature Review	22
3.1.3. Raw Material	22
3.1.4. Build Sensor	23
3.1.5. Testing Sensor	23
3.1.6. Analyze Result	23
3.1.7. Writing Formal Project	24
3.2. Flow Chart of Project	24
3.3. Hardware Development	26
3.3.1. ESPresso Lite V2.0	26
3.3.1.1 Power USB	26
3.3.1.2 Pins	27
3.3.1.3 Reset Button	27
3.3.1.4 Tx & Rx LED	27
3.3.1.5 Power LED Indicator	27
3.3.1.6 Main IC	28
3.3.1.7 Voltage Regulator	28
3.3.1.8 ESP8266	28
3.3.1.9 Soil Moisture Sensor	30
3.4. Software Development	30
3.4.1 Web Server and Connections	31
3.4.2 Coding on the Implements	31
3.4.3. Hardware Testing Performance	32
3.5. Result Expectation	33
CHAPTER IV - RESULT & DISCUSSION	20
4.0. Introduction	34
4.1. Temperature & Humidity Analysis	34
4.2. Hardware Analysis	38
4.3. Software Analysis	39
4.3.1. Interfacing Webserver to the NodeMcu	39
4.3.2. Interfacing weather station to the NodeMcu	40
4.3.3. Interfacing the Relay Module	40
4.4. Result	42
4.5. Analysis the Performance of the System	45

CHAPTER V - CONCLUSION & FUTURE WORK	47
4.0. Conclusion	47
4.1. Future Work	48
REFERENCES	49
APPENDICES	50

LIST OF TABLES

Table 1 Results for three different crops in the time taken in 3 minutes.	35
Table 2 Results for three different crops in the time taken in 3 minutes after watered.	36
Table 3 Results for three different crops in the time taken in 30 minutes after watered.	37

LIST OF FIGURES

Figure 1.1 Soil Sensor	8
Figure 1.2 WSN Network	10
Figure 1.3 One Hop Routing Strategy	12
Figure 1.4 Multi Hop Routing	13
Figure 1.5 Cluster-based Hierarchical Routing Strategy	14
Figure 1.6 Soil Monitor Software	16
Figure 1.7 Humidity Sensor	17
Figure 1.8 IoT	18
Figure 3.1 Step of Project Methodology	21
Figure 3.2 Flowchart of The Project	25
Figure 3.3 ESPresso lite v2.0	26
Figure 3.4 ESP8266	29
Figure 3.5 Soil Moisture Sensor	29
Figure 3.6 Implement of The Sensor	29
Figure 3.7 Pin Description	30
Figure 3.8 Software Implent	31
Figure 3.9 Part of the Coding	31
Figure 3.10 Android UI	32
Figure 3.11 Coding in library Arduino IDE	33
Figure 4.1 Interfacing Relay Module with Hardware System	38
Figure 4.2 Sample Coding to Interface SmartConfig	39
Figure 4.3 Sample Coding to interface Wunderground	40
Figure 4.4 Sample Coding to activate connection relay	41
Figure 4.5 Coding that have different condition that able to be read by the relay	41
Figure 4.6 Result of The monitoring system whih using MobileCofig	42
Figure 4.7 Result of The monitoring system whih using MobileCofig	42
Figure 4.8 Testing of Time Taken	45

LIST OF SYMBOLS AND ABBREVIATIONS

Symbol	
Symbol	
Abbreviation	
Abbreviation	

CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter will discuss briefly the background of the system have been chosen to develop. The plantation monitoring will also discuss the problem statement, main objective and the scope of the project.

An estate is a framework where the plantation will be screen and watch. Light and temperature control enables ranch to hand over arable land into arable land, in this manner enhancing sustenance creation in minor situations. Estate shields crops from an excessive amount of warmth or frosty, shield plants from tidy tempests and snowstorms, and help to keep out nuisances. Since manor enable certain yields to be developed consistently, estates are progressively imperative in the sustenance supply of high scope nations. Manors are typically utilized for developing blooms, vegetables, foods grown from the ground plants.

1.1 Project Background

Plant Monitoring is a project that monitoring the temperature and moisture for plants. It can be used to monitor crops, mainly in pots. The reading can be seen through the display in graphical form sent by Network and Wireless System using a hierarchy of system topology. A computer is used to display the graph.

The main objective of the research is to design a device that can detect the humidity and temperature of certain area and a plant. A couple of sensor is used to obtain the output graph where the graph is plotted. The wireless network that are going to use is Microcontroller as a software to analyze the result. The Wireless Sensor Network are spatially conveyed self-sufficient sensors to screen monitor physical or natural conditions, for example, temperature, sound, weight, and so on and to helpfully go their information through the system to a fundamental area. In this case the IoT or WiFi are one of the Wireless Sensor that are going to use in the project.

Materials that are going to be use are raw plant and crops might be in a pot as a prototype to represent a certain area and plants on those area. So the hardware are not complicated as the project are more focusing on the sensor and the software. Results will display moisture and temperature of the plant and also the crops in the computer via Wireless System Network. The time interval of data sent to the Internet can be set using the push button of 1s up to 200s.

1.1.1 Wireless Sensor Network Concept

Wireless sensor network is another examination field. It can be utilized as a part of multitask work in flag accumulation, handling and transmitting. Remote advances have been quickly created amid late years. Its points of interest incorporate the obligation, straightforwardness, and ease in both establishment and support. Remote sensor or wireless system can frame a helpful piece of the robotization framework engineering in current ranch. Remote correspondence can be utilized to gather the estimation and to convey between the incorporated control and the actuators situated to the diverse parts of the manor.

The Internet of Things can be defined as a worldwide, immersive, undetectable, encompassing organized processing condition worked through the proceeded with multiplication of brilliant sensors, cameras, programming, databases, and enormous server farms in a world-crossing data texture known as the Internet of Things. The

basic idea of the IOT is that virtually every physical thing in this world can also become a computer that is connected to the Internet.

This venture is development from the innovation that we have in now days. In current manor, a few estimation focuses are required to follow down the nearby atmosphere parameters in various parts of the enormous ranch to make the estate robotization framework work legitimately. Cabling would make the estimation framework costly and helpless. In addition, the cabled estimation focuses are hard to move once they are introduced.

1.1.2 Factors of the Plantation Network

Along these lines, a remote sensor organize comprise little size remote sensor hubs furnished with radio and one or a few sensors in an alluring and cost effective choice to assemble the required estimation framework. Remote innovations have been quickly created amid late years. Beginning from the military and mechanical controls, it is presently being generally connected in ecological checking and farming.

There are a couple sort of remote correspondence advances which is IoT, Wi-Fi, Bluetooth and RFID. Wi-Fi, Bluetooth and IoT work at comparative RF frequencies, and their application here and there cover. Web of Things (IoT) plans to stretch out Internet to expansive number of circulated gadgets by characterizing standard, interoperable correspondence conventions. The fundamental idea of IoT is that together with web administrations, for example, Radio Frequency Identification (RFID), infrared sensor, Global Positioning System (GPS), laser scanner, a system of Internet-empowered items associated with the Internet in light of the regular convention, to trade data and impart, keeping in mind the end goal to accomplish astute distinguish, find, track, screen and deal with a system.

At long last, propels in scaling down and nanotechnology imply that littler and littler things will be able to communicate and associate. A blend of these improvements will make an Internet of Things that associates the world's articles in both a tactile and a smart way. Boosted by connected devices, urban farms are getting smarter. Around 58 percent of the total populace dwells in urban territories, inciting an ascent in urban agriculture.¹⁷ And in today's portable and associated world, notwithstanding monitoring your city plants can be as simple as checking its status by means of an application.

The plantation production environment estimation and control framework is comprised of terminal connection, business connection and bolster stage. Wire sensors can join with correspondence terminal straightforwardly, and after that speak with bolster stage. Remote sensors can convey the bolster stage through Radio Frequency. Operation administration is charge of the administration bolster stage, and the farming creation observing framework can get the estate ongoing information which can send to the screen of the PC.

1.2 Problem Statement

Nowadays, most system still uses the manual system in monitoring the temperature and humidity in the certain area. By using the manual system, a lot of problem can occurred not for worker but also affected production system. This all has changed in the modern plantation because size of the plants itself is become bigger than before in order to support the need in market and the plantation facilities provide several options to make local adjustments to the lights, ventilation, heating and other plantation support systems. However, more measurement data is also needed to make this kind of automation system work properly. Increased number of measurement points should not dramatically increase the automation system cost. [J. Ibriq and I. Mahgoub, 2006].

The first problem is if the plantation is far away from the maintenance office, worker or engineer must go on the site to check manually every hour to check if there are any problem occurs. Then, the reading of the temperature and humidity must be checking manually to make sure the plantation is in a normal condition. This project therefore mainly designs to minimize the risk for workers to avoid from hazard in the plantation. Monitoring the temperature and humidity in plantation on the computer can reduce time and problem easier.

The second problem is many plantation system still use the cable to send data from sensor level to monitoring. It is difficult to install the system if the plantation is far away from maintenance office. The data cable are easy to damage if lay in high temperature and danger condition. These projects were upgrade from wired to wireless sensor network to send data from plantation to monitoring on the LCD screen in the maintenance office.

1.3 Objective of Project

The purposes of plantation monitoring using wireless sensor network prototype that is targeted at transmitting and receiving data within the plantation infrastructure. There are 3 main objectives which are:

- To monitor temperature and moisture of the plantation wirelessly using IoT.
- To established communication to receive data from plants with Arduino IDE embedded.
- To develop hardware that able to monitor soil condition using Espresso.

1.4 Scope of Project

Development the Plantation Monitoring Using Wireless Sensor Network is a best project have picked subsequent to doing research from books, web, electronic magazine and different assets and dialog between the involvement in correspondence fields. Manor Monitoring Using Wireless Sensor Network is an advancement of observing the temperature and moistness in the plantation.

The scope of this project consists of hardware and software. The basic idea is to monitor software and the main part of the hardware is the circuit as firstly, student Implement IoT wireless and sensor system to transmit and receive data wirelessly that could support by using 9V battery. Next, the two level sensor components consist to transmit data through monitor system and student use a computer to monitor the graph of the plant. The main processor that controls the whole system is ESPresso lite V2.0. Upon this project to be monitor, the data will be transmit and receive through IoT to the next processor. The data will then be process to monitor the temperature and humidity and the reading will be displayed into the computer directly through Wireless Sensor Network. Arduino IDE is the software used to interface the software with the hardware as we implemented the source code to display the result.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Literature review is an area that being in charge of conferring requires data on the venture which entitled "Soil Condition Sensor Development and Using Wireless Monitoring Using ESPresso". There are a great deal of explores that have been done including plant checking framework. Each piece of the framework has its own particular elements. Some piece of the framework may be accessible available. A portion of the issues that frequently emerge are very costly available. Budgetary elements appear is one of issue or impediment to numerous cultivators or agriculturist who have little scale plants to run the use of this innovation in their automation. Subsequently, this section means to assemble all the data in the outline of easy to use and minimal effort in the programmed monitoring applications. In this part, the matters to be talked about are the outline method and the development of a programmed checking network. This discourse will be into a few subjects with a specific end goal to encourage a superior comprehension of the criteria utilized for this framework.

2.1 Soil Sensor Monitor

Sensor is a gadget which used to quantify a physical amount and change over this data into a flag that can be perused by the spectator or an apparatus. The Sensor changes over one type of vitality into another frame in light of the fact that the sensor is a transducer. Consequently, the sensor is sorted by the kind of vitality exchange that they identified. Soil dampness estimation gives extremely helpful data to agribusiness, for example, horticulture cultivate, soil strength, soil dampness and development exercises. The test determination for sensor is essential. This is on account of the material that utilized as a part of the test. Sensor affectability is relying upon the material that used to develop the test. More often than not, soil dampness sensor alludes to the resistance of the dirt. Water is a decent electric conductance. For the most part in **Figure 1.1**, if the dirt is wet, the resistance between the tests is low and the other way around.



Figure 1.1: Soil Sensor

Gypsum piece is a result of the minimal effort soil dampness observing. Their ease and simplicity of elucidation make this square is especially appropriate for regular products. There are two cathodes installed in the gypsum piece. At the point when gypsum wet, it will transmit electric effortlessly and when gypsum dry, it is a poor conveyor. A couple of anode inside the square will gauge the adjustment in the resistance. It is conceivable straightforwardly utilizing a couple of terminal measure the

resistivity in the dirt yet the estimation will impact by changes in soil conductivity realized by salt and different fixings. The particle gypsum gave a cradle against the impacts of salt and supplements. It is extremely compelling for avoidance of salt particles from achieving the anode and to guarantee the sensor is just reacting to dampness level.

2.2 Arduino

Arduino is an open-source arrange used for building devices wanders. Arduino includes both a physical programmable circuit board (routinely suggested as a microcontroller) and a touch of programming, or IDE (Integrated Development Environment) that continues running on your PC, used to make and exchange PC code to the physical board. The Arduino arrange has ended up being extremely predominant with people basically starting with equipment, and in light of current conditions. Not in the least like most past programmable circuit sheets, the Arduino does not require an alternate piece of gear (called a product build) with a particular ultimate objective to stack new code onto the board – you can essentially use a USB connect. Moreover, the Arduino IDE uses an unraveled type of C++, making it less requesting to make sense of how to program. Finally, Arduino gives a standard shape figure that breaks out the components of the little scale controller into a more accessible package.

2.3 Wireless System Network

A Wireless Sensor Network (WSN) is a framework which is several little, minimal effort hubs that are fitted with restrictions in memory, vitality and preparing limit. In this specific type of systems, a few issues is to take in every hub. Late advances in remote correspondences and hardware have empowered the take off of ease, low-control and multi-useful sensors that are little in measurements and impart more or less separations. Shoddy, keen sensors, arranged through remote connections and conveyed