



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF SMART HYDROPONIC USING ARDUINO

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Robotic and Industrial Automation) with Honours.

By

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APPROVAL

This report is submitted to the Faculty of Engineering Technology Electric and Electronic of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the Bachelor of Electrical Engineering Technology (Industrial Automation and Robotic) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Hidroponik merupakan penanaman tumbuhan tanpa menggunakan tanah yang memudahkan cara penanaman berbanding penanaman konvensional. Dalam sistem penanaman hidroponik, nutrien dan pH air adalah perkara yang amat penting bagi memastikan tumbuhan membesar dengan baik. Kajian ini memberi tumpuan kepada menjadikan urusan penjagaan nutrien dan pH air secara automatik menggunakan Arduino berdasarkan keperluan tumbuhan yang dikaji. Sistem ini mengawal pH air secara automatik dengan menggunakan pengesan pH air. Sistem ini 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 hidroponik yang cekap telah diperolehi dengan menganalisis dan menguji prototaip.

ABSTRACT

Hydroponics is the planting of plants without using soil which facilitates the method of planting versus conventional planting. In hydroponic system, it important to ensure nutrient and pH value is in right value to make sure that plant grow well. This project focuses on the handling of nutrients and water pH automatically using Arduino based on the needs of the plants. This system controls the pH of water automatically by using a pH water sensor. This system the most appropriate system has been chosen to be the source of ideas and guidance. The idea itself is proposed to improve the approach to the existing system. Finally, the materials needed to support the efficient hydroponic system have been obtained by analyzing and testing the prototype.

DEDICATION

A special thank you to my beloved parents my dad names Sa'adon bin Ithnin and my mom is Sharifah binti Kadir for your unconditional support regarding my studies. I am much honored 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.

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Table of Contents

LIST OF TABLES	xii
TABLES OF FIGURE	xiii
CHAPTER 1	1
INTRODUCTION	1
1.1 Introduction	1
1.2 Project Background	1
1.3 Problem statement	2
1.4 Objective	2
1.5 Scope of project	3
1.6 Thesis outline	3
1.7 Project significant	4
CHAPTER 2	5
LITERATURE REVIEW	5
2.1 Introduction	5
2.2 Agriculture	5
2.2.1 Hydroponic	7
2.2.2 Aeroponic	10
2.2.3 Aquaponics	12
2.2.4 Water acidity (pH)	14
2.2.5 Nutrient solution	17
2.2.6 Organic nutrient solution	18
2.2.7 Macro nutrient	19
2.2.8 Micro nutrient	21
2.3 Growing medium	23
2.4 Design	25
2.5 Related project	27
2.5.1 Automated pH controller system for Hydroponic cultivation	28
2.5.2 Microprocessor-Based Instrument for Hydroponic Growth Chambers Used in Ecological Life Support System	29
2.5.3 Nutrient film technique (NFT) hydroponic monitoring system based on wireless sensor network	31
CHAPTER 3	33

METHODOLOGY	33
3.1 Introduction	33
3.2 Flow chart of methodology	33
3.3 Hardware Development	36
3.3.1 Arduino mega 2560.....	36
3.3.2 pH sensor	37
3.3.3 Peristaltic dosing pump.....	38
3.3.4 Water sensor brick.	39
3.3.5 Submersible pump.....	40
3.3.6 Solenoid water valve.....	41
3.3.7 Hydroponic Design	42
3.4 Software development	45
3.3.4 Arduino configurations	48
3.3.5 Proteus	50
CHAPTER 4.....	52
RESULT & DISCUSSION.....	52
4.0 Introduction	52
4.1 hardware development of smart hydroponic using Arduino	52
4.2 project analysis	58
4.3 Problem occur	65
CHAPTER 5.....	66
CONCLUSION & FUTURE WORK	66
5.0 Introduction	66
5.1 Summary	66
5.2 Conclusion	67
5.3 Future Work	67
Reference	68
APPENDIX 1.....	1
.....	2
.....	3

LIST OF TABLES

Table	Title	page
TABLE 2. 1	: HYDROPONIC METHOD	8
TABLE 2. 2	: AQUAPONIC METHOD	13
TABLE 2. 3	: MACRO NUTRIENT	20
TABLE 2. 4	: MICRO NUTRIENT	21
TABLE 4. 1:	SHOWS TIME TAKEN FOR PUMPA, PUMPB, PUMPC AND PUMPD TO PUMP 500ML WATER.	58
TABLE 4. 2 :	SHOWS DELAYS NEEDS TO PUMP 500ML WATER FOR PUMPA, PUMPB, PUMPC AND PUMPD.	59
TABLE 4. 3:	SHOWS THE DATA FOR PERISTALTIC PUMP ACCURACY AND PRECISION.	60
TABLE 4. 4:	SHOW THE DATA OF WATER CONCENTRATION AND PH VALUE.	61

TABLES OF FIGURE

Figure	Title	Page
FIGURE 2. 1	: AEROPONIC SYSTEM	11
FIGURE 2. 2	: COMMON PH VALUES	15
FIGURE 2. 3	: SUITABLE PH VALUES FOR HYDROPONIC ETC.	16
FIGURE 2. 4	: (A) GROWING MEDIUM COCONUT COIR (B) AGRICULTURAL	23
FIGURE 2. 5	: NEW SOLIDWORK DOCUMENT	26
FIGURE 2. 7	: TOP LEVEL BLOCK DIAGRAM	30
FIGURE 2. 8	: ELECTRICAL CONNECTION	32
FIGURE 3. 1	: PROJECT FLOWCHART	35
FIGURE 3. 2	: ARDUINO MEGA 2560	37
FIGURE 3. 3	: PH SENSOR	38
FIGURE 3. 4	: PERISTALTIC PUMP	39
FIGURE 3. 5	: WATER SENSOR BRICK	40
FIGURE 3. 6	: SUBMERSIBLE PUMP	41
FIGURE 3. 7	: SOLENOID WATER VALVES	41
FIGURE 3. 8	: SMART HYDROPONIC USING ARDUINO HARDWARE DESIGN.	43
FIGURE 3. 9	: SOLENOID VALVES	44

FIGURE 3. 10	: OVER FLOW VALVE AND SUBMERSIBLE PUMP	45
FIGURE 3. 11	: PROTOTYPE PROCESS	46
FIGURE 3. 12	: ARDUINO IDE	47
FIGURE 3. 13	: USB CABLE	48
FIGURE 3. 14	: BOARD SELECTION	49
FIGURE 3. 15	: SIMULATION OF HARDWARE	50
FIGURE 4. 1:	SHOWS THE OVERALL PROJECT PICTURE	53
FIGURE 4. 2:	SHOW PROJECT PICTURE FROM FRONT VIEW	54
FIGURE 4. 3:	SHOWS PROJECT PICTURE FROM RIGHT VIEW	54
FIGURE 4. 4:	SHOWS VIEW INSIDE 1 ST TANK.	55
FIGURE 4. 5:	SHOWS VIEW INSIDE 2 ND TANK	55
FIGURE 4. 6:	SHOWS ULN2003 PUMP DRIVER	56
FIGURE 4. 7:	SHOWS 4 CHANNEL RELAY	56
FIGURE 4. 8:	SHOW WATER SENSOR	57
FIGURE 4. 9:	SHOWS pH SENSOR	57
FIGURE 4. 10:	SHOWS ACCURACY AND PRECISION CHART.	61
FIGURE 4. 11:	GRAPH OF AB FERTILIZER VERSUS EC VALUE	62
FIGURE 4.12:	THE GRAPH OF NORMAL WATER pH VALUE VERSUS WATER WITH FERTILIZER	
	pH VALUE	63
FIGURE 4. 13:	RESULT FOR 1 WEEK	64
FIGURE 4. 14:	GROWING MUSTARD SEED	64

CHAPTER 1

INTRODUCTION

1.1 Introduction

Modern day agriculture demand increased production of food to feed the global population. New technology and alternative are being applied in agriculture. This chapter can review about hydroponic system for plant. The problem statement and problem background are defined subsequently. The paper based on a through by the useful of resource of research objectives and scope which includes the improvement of hydroponic system with automation that may be observed and that may easy to grow a plant.

1.2 Project Background

These paper is about hydroponic for plant as an automated system and constantly monitor and analyzes the condition of water and nutrient. The technical software use in this project is Arduino as a microcontroller. pH sensor as a primary input when related to Arduino for delivering the signal to get water pH. When sensor detect the situation of water, if the water pH increase the Arduino will alert the sign and the subsequent relay will contact to give information to the peristaltic pump to pump the pH neutralizer. But this project use difference of nutrient depends on plant user want to grow.

1.3 Problem statement

The importance of agricultural land decrease and the development of hydroponic system technology such as Nutrient Film Technique (NFT), have become immense challenge to the farmers. Hydroponic system depends upon special attention to several parameters such as water temperature, water level, acidity (pH), and the concentration of nutrient (EC/PPM). Nowadays, people become busy with all things for complete day and hardly to sum up their commitment, as result the plant not get enough attention. Based on problems above, it is miles important to demand the automatic machine so as to watch of plant all unique aspect of a home gardening device in addition to large landscape (for the device based on agriculture farms) and facilitates them to grow healthful. Furthermore, typically people are not always being able to predict the important of water quality for plant in hydroponic agriculture. Beside that there a state of case in which despite the fact that the nutrient is given, the plant still dies, this happing because the plant may need additional nutrient and good water ph.

1.4 Objective

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

- a) To develop a prototype of smart hydroponic using Arduino
- b) To program two selection of plants for the hydroponic

1.5 Scope of project

- a) Focus only three types of plant.
- b) Grow one type of plant at one time.
- c) Using only AB concentrated fertilizer as nutrient solution.
- d) This prototype only for outdoor condition.

1.6 Thesis outline

Five chapters in the thesis consist of introduction, literature, review, methodology, result and discussion and last but not least recommendation. Each chapter will discuss personal element that associated with the project

Chapter one, this chapter introduce the project or observe. There are their own statement, object and scope will be discussed and presented in this chapter

Chapter two, past research are reviewed. This part discussing the method and techniques used in previous research. The assessment of power and weakness can be used by virtue of the suggestion to improve smart hydroponic. The particular concept also proposed and justified in this chapter.

Chapter three focuses on the methodology and process on the task. The software program implementation and hardware development will be elaborate more in this part

Chapter four, result and discussion are arranged in this topic. Lastly in chapter 5 will show a complete conclusion of the task. The suggestion and the recommendation for future needs.

1.7 Project significant

This machine will be useful to society primarily for those who are busy with a tight schedule and no longer have time to continuously monitor their plants, the humans who commonly overlook the plants, the humans who always pass travelling and outstation. And then let's consider how average soil agriculture water their plants, commonly everyday farmers swamp huge amounts of water into their soil, to provide a good infiltration into the soil so the roots can adsorb the nutrient. Some of the water flows out of their container or soaks further into the ground. Part of it dehydrates out of the soil. In this project, a recirculating nutrient reservoir takes place. In other words, the roots will only consume the amount of water they need at once at one time and then keep the rest of the water in the tank for later. The tank is covered to prevent dehydration.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This part, the discussion about the study and information after made a great contribution in the scope of this reflection. Relatively describe and explain what agriculture is, what type of agriculture and why is it import to our human life. Next, discuss past studies and information that make significant improvement in this section of study, smart hydroponic or related machine. There magnificent source of information of the related published on the web about a smart hydroponic. The information together gives recommendation on the approach and sample current opinion. Wherefore, the concept supported and justified with justified with significant past studies.

2.2 Agriculture

Horticulture or agriculture begin freely in various part on the planet and give the essential needs of human by creating sustenance, attire, home, solution, and preoccupation. Consequently, agribusiness is the most basic venture on the planet. It is a helpful unit where the unconditional presents of the compelling force of nature to be specific land, light, air, temperature

and rain water are deciphered into source starting unit in a general sense for individuals. Optional gainful units are creatures including domesticated animals, flying creatures and creepy crawlies, feast upon these essential units. Likewise, keep up concentrated items, for example, meat, drain, fleece, eggs, nectar, and silk. Horticulture contribute sustenance, nourish, fiber, fuel, furniture, crude materials.

In addition, materials for and from Industrial facilities are given a free charge and common habitat, abundant sustenance for driving out starvation. Attractive rural generation brings solidarity, success, connection, wellbeing and riches to individual of a country by destroy uncertainty, conflict and turmoil. It backings to lift the group comprising of various request and statements, thus it will prompt a favored social, political, social and financial life.

Farming advancement is multidirectional having dash speed and quick progress as for time and space. After green transformation, ranchers began upgrade social practices and agrarian contributions to in-profound editing frameworks with worker serious customized to develop the creation fundamentally per unit land, time and info. It serves appropriate condition to all these enhanced genotypes to nourish and show their yield potential in more current territory. Horticulture lie of developing plants and breed creatures keeping in mind the end goal to yield, deliver and it keeps up an organic dependability in nature. (Nishimura, Okuyama and Satoh, 2016)

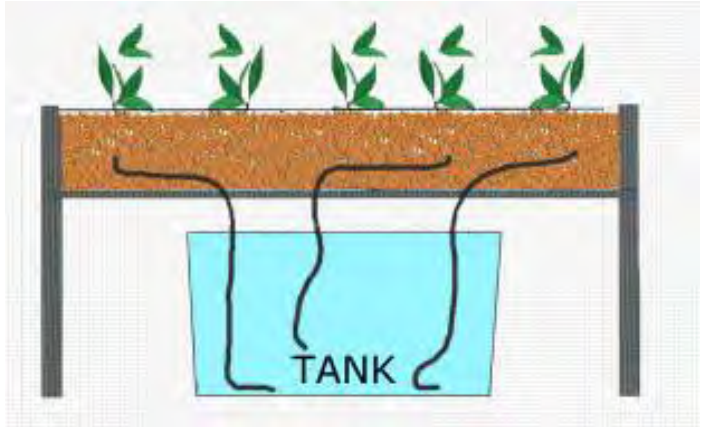
2.2.1 Hydroponic

Hydroponic is a method to grow a plant without soil. Its soilless cultivating of plant where water and manure are utilized as a part of place of soil. The plant establishes are frequently submerged in water, however the plants won't pass on the grounds that the "water" pulls have created space for oxygen reserve in their external cells. Can be isolated into two kinds of tank frequently utilized as a part of hydroponic single and twofold. A solitary tank is just one that is water tight. Glass is the best for a solitary tank since it enables us to screen the water level without exasperating the plants. Water measures can be purchased to screen non-glass tank. However, twofold holders are just two tanks, with the littler, gap one suspended at edge level inside the bigger, watertight one.

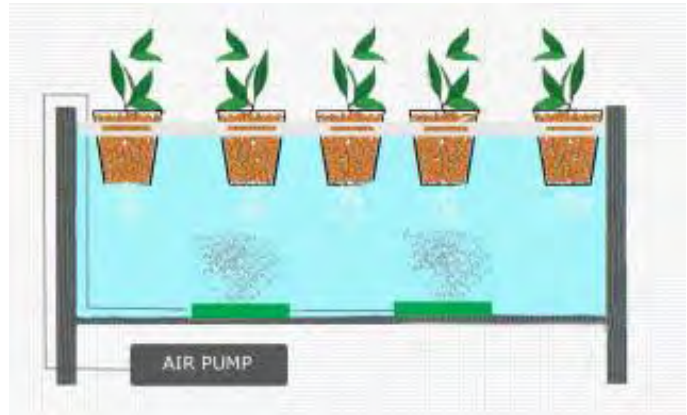
Clay aggregate is ideal for the secure material since it is sufficiently substantial to be a genuine help yet sufficiently light not to smash the plant roots. It must be perfect and ought to be flushed before utilized the first run through. There different strategy or system in hydroponic planting. Present the wick framework, most fundamental hydroponic framework or know as uninvolved framework where no moving part. From base tank the supplement will draw up through into the root straightforwardly. Next, water culture where the framework is dynamic with moving part. On the off chance that dynamic hydroponic go, water culture is the least complex. The root will absolutely sink the water which comprise of supplement. With air pump help the oxygenate water will enable the root to relax.

Flood and drain system, this system will work temporary flooding the grow container. The nutriment from the tank will surround the root before draining back to the tank. This method commonly programmed with timer and water pump. Next, drip system, in this system water pump are controlled by timer which nutriment will through network of elevated water jet. The excess nutriment will be back to the tank by recovery system. Last but not least, N.F.T system also called as nutrient film technique. It purposely a constant flow of your nutrient solution. The solution will be pump from a tank into growing tray.it require no growing medium and pump and electric are important to avoid system failures. Table 2.1 shows hydroponic method table. (Culture and Systems, 2008)

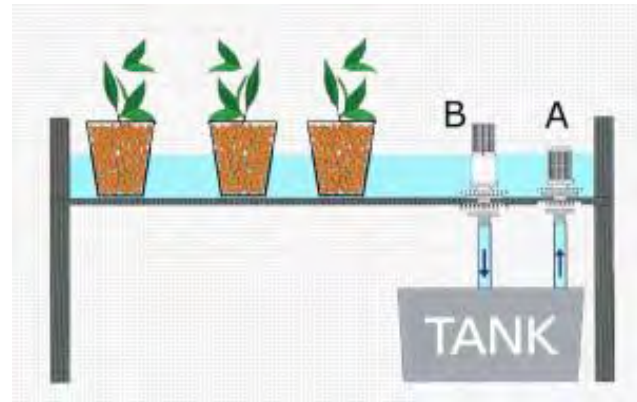
Table 2. 1: Hydroponic Method

Method	Figure
<ul style="list-style-type: none"> Wick method 	

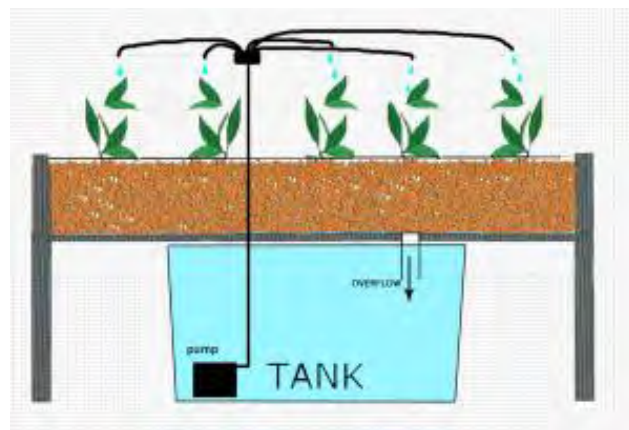
- Water culture



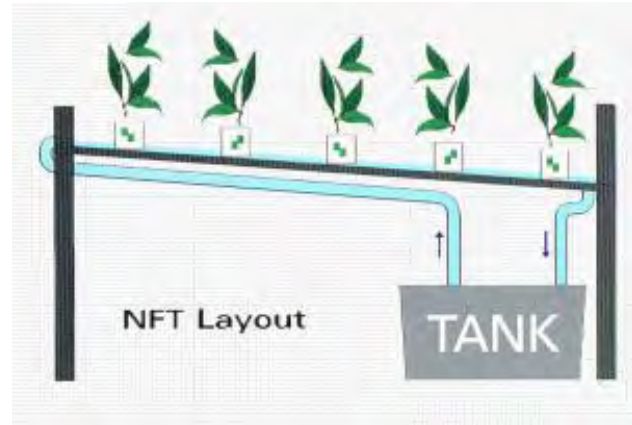
- flood and drain system



- Drip system (recovery or no recovery)



- N.F.T system



2.2.2 Aeroponic

It's one of the method to grow a plant without soil. Precisely plant grow with a mist or air Environment. Contrary hydroponic, this method is operating without growing medium. The plant will hang at a semi close or closed surrounding by sprinkler the stand-alone root using nutrient solution which means there no medium at all. Using this method, we can grow vertically and horizontally.

There three types of aeroponic, the plant root is suspended above a tank of nutrient. A low-pressure pump distributes the nutrient via ultrasonic transducers, which then flow back into the nutrient tank. When plant ready to harvest in these units they keep dry sections of the root systems, which avoid acceptable nutrient. This type of aeroponic called low pressure unit.

High pressure device, eventually using mist generated by high pressure pump. Commonly high crop is involved because of high