Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF SMART HYDROPONIC SYSTEM USING IOT TECHNOLOGY

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Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours

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SRI ARYANI BINTI ABD RAHMAN

A project report submitted
in partial fulfillment of the requirements for the degree of
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I declare that this project report entitled "Development of Smart Hydroponic System Using IOT Technology" is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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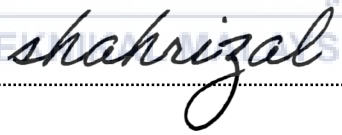
Signature	:	
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DEDICATION

This research is dedicated to my parents, Abd Rahman Bin Ibrahim and Faridah Binti Asmad, who have always encouraged me. They have given me the discipline and motivation I need to approach a task with eagerness and dedication. Without their love and

support, this project would not have been possible

ABSTRACT

Abstract Hydroponic plants have become an important component of everyday life, as technology has advanced and human lives have improved. Not only can hydroponic plants embellish the environment but also bring us happiness. On the other hand, traditional plant cultivation has mainly been carried out in the soil. It is well known that there are a number of disadvantages to this method. As a result, this project aims at introducing arduino in the hydroponic system using hydroponic technology Internet of Things, to enable observations to be made remotely and directly via the internet. Hydroponics is a farming method that uses water as a medium to meet the requirements of plant nutrition. In contrast to a soil-based cultivation method, hydroponic systems more efficiently use water. Water containing mineral nutrients needed by plants continuously flowed into the plants. Another advantage is that it can be used in a small area, for example in urban settings, where there is little space. Urban people spend more time outside their homes, go to work, school, shopping and other activities in their daily lives. The main elements of the project are a water supply system, a method of agriculture that eliminates the need for soil. Plants are supplied with water and nutrients using this automated hydroponic device which is controlled by sensor feedback (DHT 22) and pH monitor and electrical engine conductivity circuit.

ABSTRAK

Tumbuhan hidroponik telah menjadi elemen penting dalam kehidupan seharian kerana teknologi yang maju dan taraf hidup masyarakat bertambah baik. Tumbuhan hidroponik bukan sahaja dapat mencantikkan persekitaran, tetapi juga memberi kita kegembiraan. Penanaman tanaman tradisional, terutamanya dilakukan di tanah. Diakui bahawa kaedah seperti ini mempunyai beberapa kekurangan. Akibatnya, tujuan projek ini adalah untuk menggunakan arduino untuk memperkenalkan sistem hidroponik menggunakan teknologi Internet Pelbagai Benda (IPB) dalam sistem hidroponik agar pengamatan dapat dilakukan dari jauh dan langsung direkodkan melalui internet. Hidroponik adalah kaedah pertanian yang menggunakan air sebagai medium untuk memenuhi keperluan pemakanan tanaman. Berlawanan dengan kaedah penanaman berasaskan tanah, sistem hidroponik dengan menggunakan air dengan lebih berkesan. Air yang mengandungi nutrien mineral yang diperlukan oleh tumbuhan mengalir terus ke tanaman. Kelebihan lain dari pendekatan ini adalah ia sangat sesuai digunakan di ruang kecil, seperti di kawasan rumah bandar, di mana ruang yang ada terbatas. Dalam kehidupan seharian mereka, penduduk bandar menghabiskan lebih banyak masa di luar rumah, pergi bekerja, sekolah, membeli-belah, dan aktiviti lain. Unsur utama projek ini merangkumi sistem bertenaga air, kaedah pertanian yang menghilangkan keperluan tanah. Hasil tanaman dibekalkan dengan air dan nutrien menggunakan alat automatik hidroponik ini, yang diatur oleh maklum balas sensor seperti suhu dan kelembapan, serta monitor pH dan rangkaian kekonduksian motor elektrik.

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I am also indebted to my fellow colleague and housemate for the willingness of sharing his thoughts and ideas regarding the project which enables me to accomplish the project.

My highest appreciation goes to my parents, and family members for their love and prayer during the period of my study. An honourable mention also goes to my mom for all the motivation and understanding. Your prayer for was what sustained too this far. Thank you for supporting me for everything, and especially I cannot thank you enough for encouraging us throughout this experience.

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TABLE OF CONTENTS

PAGE

DECLARATION

APPROVAL

DEDICATIONS

ABSTRACT **i**

ABSTRAK **ii**

ACKNOWLEDGEMENTS **iii**

TABLE OF CONTENTS **i**

LIST OF TABLES **iii**

LIST OF FIGURES **iv**

LIST OF FIGURES **v**

LIST OF SYMBOLS **viii**

LIST OF ABBREVIATIONS **ix**

LIST OF APPENDICES **x**

CHAPTER 1 INTRODUCTION **1**

1.1 Background 1

1.2 Problem Statement 1

1.3 Project Objective 2

1.4 Scope of Project 2

CHAPTER 2 LITERATURE REVIEW **3**

2.1 Introduction 3

2.2 Previous Related Work 3

2.2.1 Smart Agriculture System using IoT Technology 3

2.2.2 An Architectural design proposal for IoT in Agriculture 5

2.2.3 IoT Based Smart Farming System 7

2.2.4 Monitoring of Hydroponics System using IoT Technology 8

2.2.5 Development of IoT at Hydroponic System using Raspberry Pi 10

2.2.6 IoT based Automated Hydroponics System 12

2.2.7 The Design and Implementation of a Hydroponics Control System 13

2.2.8 IoT based Smart Agriculture 14

2.2.9 Automating and Analysing Greenhouse Hydroponic Farms using IOT 15

2.2.10 Optimization and Control of Hydroponics Agriculture using IoT 17

2.3 Summary Table 19

CHAPTER 3 METHODOLOGY 25
3.1 Introduction 25
3.1.1 Planning 26
3.1.1.1 Flowchart of general flow of PSM 27
3.1.1.2 Gantt Chart 28
3.2 Methodology Project 29
3.2.1 Experimental setup 31
3.2.1.1 Flowchart of the Project 33
3.2.1.2 Parameters 34
3.2.1.3 Equipment 35
3.3 Software Setup 45
3.3.1 Arduino IDE 45
3.3.2 Blynk Server 46
3.4 Summary 47

CHAPTER 4 RESULTS AND DISCUSSIONS 48
4.1 Introduction 48
4.2 Circuit Design 49
4.3 Block Diagram of the system 50
4.4 Software Development 51
4.4.1 Arduino IDE 51
4.4.2 BLYNK Application 53
4.5 The analysis of the project 54
4.5.1 Temperature and Humidity Analysis 55
4.5.2 Ph Solution and Water Level Analysis 58
4.6 Hardware development 61
4.7 Prototype Design 63

CHAPTER 5 65
5.1 Conclusion 65
5.2 Future Works 66

REFERENCES 67

APPENDICES 69

LIST OF TABLES

TABLE	TITLE	PAGE
Table 2.1	Summary Table regarding to previous related work	19
Table 3.1	Gant Chart	28
Table 3.2	Pin Configuration	36
Table 3.3	Specifications of NodeMCU ESP32	37
Table 3.4	Specifications of Water Level Sensor	41
Table 3.5	Report Temperature data collected from Blynk	56
Table 3.6	Report Humidity data collected from Blynk	57
Table 3.7	Water level sensor reading	59
Table 3.8	pH value reading	60

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 2.1	Diagram of System Block Smart Agriculture	4
Figure 2.2	Assembly of the microcontroller	5
Figure 2.3	Data flow diagram for an Internet of Things-based System	6
Figure 2.4	Flowchart of Overall Process IoT Based Smart Farming System	8
Figure 2.5	Hydroponic system block diagram	9
Figure 2.6	Model B Raspberry Pi	10
Figure 2.7	Project Methodology	11
Figure 2.8	Proposed Block diagram IoT based Automated Hydroponics System	12
Figure 2.9	The System as a Whole Project	14
Figure 2.10	Overview of system IoT based Smart Agriculture	15
Figure 2.11	Real image of Hydroponics Set Up	16
Figure 2.12	Block diagram of automated hydroponic farm	16
Figure 2.13	Block diagram of the Optimization and Control of Hydroponics Agriculture using IOT system	17
Figure 3.1	Significant steps in the methodology	25
Figure 3.2	Flowchart of general flow PSM	27
Figure 3.3	Data flow diagram for IoT based System	29
Figure 3.4	Block diagram of the project	31
Figure 3.5	Flowchart of whole project	33
Figure 3.6	NodeMCU ESP 32	35
Figure 3.7	DHT22	38

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 3.8	DHT22 Specification	39
Figure 3.9	Water Level Sensor	40
Figure 3.10	pH-Sensor	41
Figure 3.11	Fan	42
Figure 3.12	Relay Module	43
Figure 3.13	Block Diagram of Relay	43
Figure 3.14	Male to Female Jumper Wire	44
Figure 3.15	Male to Male Jumper Wire	44
Figure 3.16	Arduino IDE software	45
Figure 3.17	Blynk Application's Architecture	46
Figure 4.1	Circuit Design in Proteus	49
Figure 4.2	The block digrm of the project	50
Figure 4.3	Progrm of Arduino IDE	51
Figure 4.4	Reading in serial monitor	53
Figure 4.5	BLYNK demonstration	52
Figure 4.6	The chili seed in the soil pot	54
Figure 4.7	The reading according to requirement	55
Figure 4.8	Fan will turn ON	55
Figure 4.9	Super chart for ph and water level	58
Figure 4.10	Connection between relay, pump, and fan	61
Figure 4.11	Soldering capacitor to the pump	61

Figure 4.12	Connection of all the hardware	62
Figure 4.13	Hardware setup	63
Figure 4.14	Final look of the design	64

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix A	Coding of the project	63

CHAPTER 1

INTRODUCTION

1.1 Background

The aim of this study is to implement the Internet of Things (IoT) communication by using a cloud-based subscription and publishing approach. The aim of combining Cloud computing and IoT systems is to combine things, and this is to enable end-users to monitor and control or set IoT parameters via the cloud-based approach, by allowing data or information collection and organization via the middleware layer and application layer, via the Cloud based approach. In a hydroponic system the IoT is employed

1.2 Problem Statement

Since soil in many parts of the world lacks sufficient nutrients for plant growth, hydroponics is a plant cultivation method without usage of soil. Plants are typically dissolved in water rather than having their nutrients taken from the soil, and their roots are suspended, flooded, or handled poorly with nutrients. Depending on the type of hydroponic device used, there might be a solution so that the ingredients will reach the plant. It is essential for growth.

a) Lacks enough nutrients in soil for plan growth
b) Farmers have less time for doing and keeping maintenance of hydroponic plants
c) Traditional farming faced manual ploughing, weeding, pest and climate

1.3 Project Objective

The major objective of this project is to offer the objectives of this project based on the above-mentioned problem statement:

a) To develop the hydroponics automatic control system using microcontroller

b) To design and construct a hydroponic system for IoT monitoring of various factors such as water pH, water level, temperature, and humidity.

c) To develop the automatic hydroponic using real timing control.

1.4 Scope of Project

The scope of this project are as follows:

a) Using Node MCU 32 and Blynk IoT platform to control and monitoring IoT system.

b) Implement the behaviors of hydroponics system using IoT for monitoring various parameters which is temperature, humidity, water level and pH level

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The study on many publications helps to gain insight into the prediction notion. The aim of this section is to audit and focus various trials and tasks that have been successfully completed by the various analysts or specialists that is relevant to the field of research. It will also display the relevant hardware that was used. Aside from that, this system was introduced with the goal of enhancing analysis and preventing needless replication of the study's problem area. IoT technologies are become more common as a result of their ability to build a variety of applications nowadays, but only a limited portion of them is currently available in industry.

2.2 Previous Related Work

2.2.1 Smart Agriculture System using IoT Technology

Muthunoori Naresh, P Munaswamy [1] aims to improve the efficiency of the product there by supporting the rancher as well as the country to utilize the innovation that assesses the nature of harvest and makes recommendations. In order to overcome obstacles, the Internet of Things (IoT) transforms agribusiness by involving farmers in a wide range of practice, such as precise farming and conservative farming.

This is because IoT supports development aid in social affairs on climate, temperature and soil productivity, web harvest surveillance involves weed fields, weed level, bug recognition and animal intrusion, alteration, and cultivation in the field. With this technology, IoT utilizes farmers to link from anywhere and anyplace to their homes. Farms are monitored with remote sensor framing and small-scale controls for control and roboticization of property shapes.

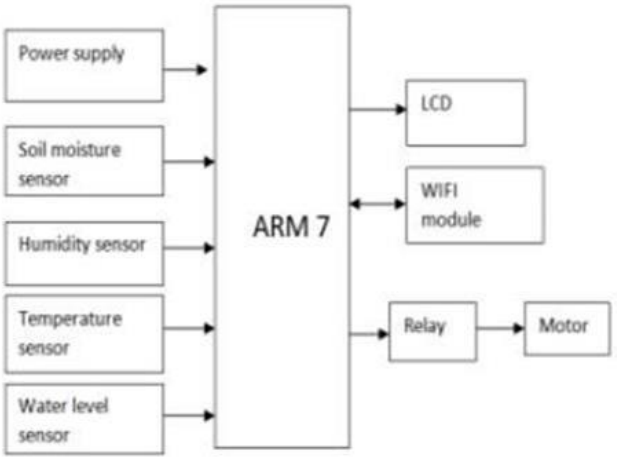

Figure 2.1: Diagram of System Block Smart Agriculture [1]

Diagram of the project block depicted in Figure 2.1 above. LPC2148 is the most popular icon in this project for the ARM-7 family. The reason for the ARM7 processor is because each part of the development package is interfaced. The number of pins in this CPU is 64. Each bolt is confined for a certain capacity to a certain portion of the device. This processor LPC 2148, which also regulates the programmed engine ON and OFF and the pump for water transmission into the horticultural field, determines the sensor edges estimates.

A Soil humidity sensor, a humidity sensor, a temperature sensor, and a water level sensor monitor and control the component of the project. The WSN frame requires a combined control unit with an interface in this document. Because of the major obstacles associated with unit control, warm exchange and wireless sensor systems in general, efficient, neighborly, and speedy safety methods must be employed to preserve sensor data. This condition can then be greatly resurrected by the structure IoT. The IoT is an inter- network of raw equipment, transit, architecture, and numerous elements that are integrated in the equipment, programming, sensors, actuators, and frameworks, including the collection and exchange of information in these sections.

2.2.2 An Architectural design proposal for IoT in Agriculture

J. Martis [2] examines the objective of agricultural issues and increases agricultural production quality and quantity by using sensing technology to make farms “smarter” and more IoT-connected, as also known as "smart agriculture." It is used to produce a product that is cost-effective and works with renewable energy sources, as well as to predict the best crop possible in a selected agricultural area.

This project's scope is mainly in the agricultural sector. The best crop for cultivation within a particular farm field is projected using data such as temperature, intensity of light, frequency of rain, humidity, and moisture in the soil. Farmers use these expected crops to maximize farm yields.

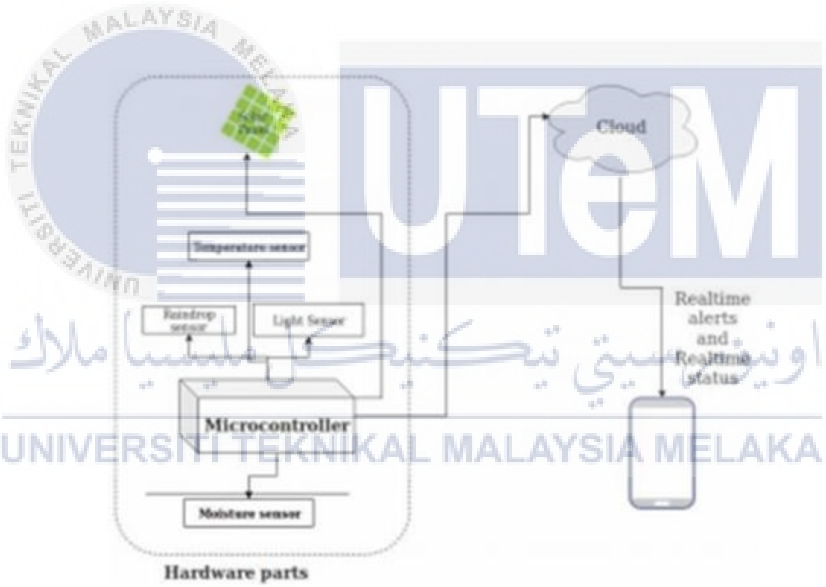

Figure 2.2: Assembly of the microcontroller [2]

The programmed comprises an IoT platform that includes seasonal as well as daily and weekly irrigation profile configuration. The software sends the main module a notification to enable/disable the system. Sensors detect and transform all physical parameters to digital value analogue value. Moisture and temperature sensors are used on the ground to assess humidity and temperature. A Soil Moisture Sensor is a capacitive sensor embedded in the soil and used for soil

moisture assessment. A module is combined to obtain data in real time from sensors. This data is subsequently forwarded to the IoT gateway. The IoT gateway sends data via the Wi-Fi module to the IoT platform (Cloud). The cloud of the system will have a database. The IoT gateway data is stored in the database. The acquired data is analyzed by decision-making bodies. In this project, four sensors are utilized to monitor and regulate parameters.

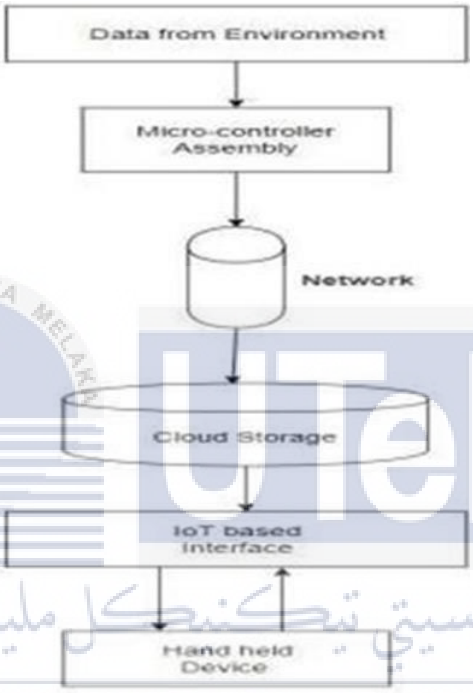

Figure 2.3: Data flow diagram for an Internet of Things-based System [2]

2.2.3 IoT Based Smart Farming System

Y. Fahim and T. Sarkar [3] survey evaluates an IoT-based Smart Farming System to provide farmers with real-time data on soil humidity and temperature at low cost to monitor in real time. The IoT Based Smart Farming System focusses on the real-time monitoring of environmental data such as temperature, humidity, and other variables via sensors. By placing the system on the ground and receiving Live data feeds from various devices, such as smartphones, tablets, and other devices, farmers can directly implement smart farming to analyze sensor data. Cloud computing allows agricultural consultants to conveniently exchange and access data from anywhere. Technology integration.

This project is driven by a circuit-programmed Arduino, which is connected with sensors and a Wi-Fi module. The working principle of the model is to use an Arduino to store sensor data and then send it to a Wi-Fi module. The Wi-Fi module uses cloud computing to supply a computer with data updates. The device provides real-time data via Wi-Fi to the channel and the graph is graphited with mat laboratory technology. The circuit is powered by a rechargeable battery connected to the power supply of the Arduino. There is also a charging circuit with an AC/DC converter for charging the battery. There is also an adapter that provides Arduino circuits directly with power if the battery is not charged.

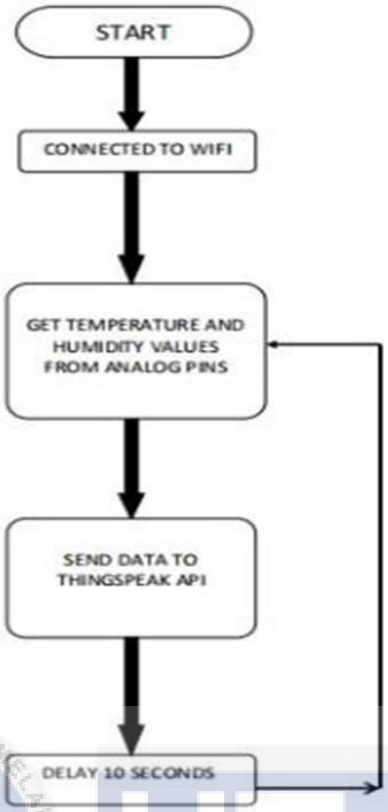

Figure 2.4: Flowchart of Overall Process IoT Based Smart Farming System [3]

The graphic above illustrates the process diagram. The technology collects real- time temperature and soil moisture data with great efficiency and precision. In this research, the suggested IoT-based smart agriculture system will help farmers to increase their agricultural returns, better manage the production of food by delivering more than 99 percent accurate live feed of environmental temperature and soil moisture.

2.2.4 Monitoring of Hydroponics System using IoT Technology

N. Patil, S. Patil, A. Uttekar, and A. R. Suryawanshi [4] research is aimed at developing and implementing a hydroponics system that uses IoT to track different crop parameters. The objective of this project is to develop and execute a hydroponic system using IoT to regulate various parameters including water pH, water nutrients, temperature and humidity, as well as