Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF AN IOT BASED LAUNDRY NOTIFICATION SYSTEM WITH RAIN WATER SENSOR FOR CLOTHLINE USING MICROCONTROLLER

AMNI NAJIHAH BINTI ABD AZIZ

Bachelor of Computer Engineering Technology (Computer Systems) with Honours

2022

DEVELOPMENT OF AN IOT BASED LAUNDRY NOTIFICATION SYSTEM WITH RAIN WATER SENSOR FOR CLOTHLINE USING MICROCONTROLLER

AMNI NAJIHAH BINTI ABD AZIZ

A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Computer Engineering Technology (Computer Systems) with Honours

Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2022

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI TEKNOLOGI KEJUTERAAN ELEKTRIK DAN ELEKTRONIK

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : DEVELOPMENT OF AN IOT BASED LAUNDRY

Sesi Pengajian :

Saya Amni Najihah binti Abd Aziz mengaku membenarkan laporan Projek Sarjana Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. Sila tandakan (✓):

☐	**SULIT***	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)
☐		(Mengandungi maklumat terhad yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)
☑	**TIDAK TERHAD**	

Disahkan oleh:

(TANDATANGAN PENULIS)
Alamat Tetap: No 40 Jalan MJ 1/9 Taman Meranti Jaya 47100 Puchong Selangor

(COP DAN TANDATANGAN PENYELIA)

NURLIYANA BINTI ABD MUTALIB
PENSYARAH
Jabatan Teknologi Kejuruteraan Elektronik Dan Komputer
Fakulti Teknologi Kejuruteraan Elektrik Dan Elektronik
Universiti Teknikal Malaysia Melaka

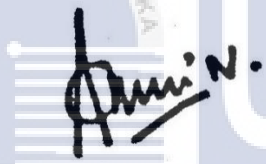
Tarikh: 27/1/2023

Tarikh: 24/2/2023

*CATATAN: Jika laporan ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali tempoh laporan ini perlu dikelaskan sebagai SULIT atau TERHAD.

DECLARATION

I declare that this project report entitled "**DEVELOPMENT OF AN IOT BASED LAUNDRY NOTIFICATION SYSTEM WITH RAIN WATER SENSOR FOR CLOTHLINE USING MICROCONTROLLER**" 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.

Signature : 

Student Name : AMNI NAJIHAH BINTI ABD AZIZ

Date :

APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Computer Engineering Technology (Computer Systems) with Honours.

Signature : 

NURLIYANA BINTI ABD MUTALIB
PENSYARAH
Jabatan Teknologi Kejuruteraan Elektronik Dan Komputer
Fakulti Teknologi Kejuruteraan Elektrik Dan Elektronik
Universiti Teknikal Malaysia Melaka

Supervisor Name : NURLIYANA BINTI ABD MUTALIB

Date : 24/2/2023

Signature :

Co-Supervisor :

Name (if any)

Date :

DEDICATION

I would like to express my gratitude to both of my parents, Abd Aziz bin Lisot and Siti Rohayawati Abdul Karim, for their support and encouragement during the completion of my senior Final Year Project. My parents always made sure to celebrate the little victories and give me words of encouragement whenever I accomplished something new. In addition to that, they made a pleasant space for me to work in so that I could generate concepts and find motivation to finish my duties.

ABSTRACT

In proportion to the growth of science and technology, human comfort and requirements are growing. Drying clothes is a time-consuming task if you must wait and maintain their dryness. This is because people are occupied with household chores or have busy working hours, leaving them with insufficient time to complete all domestic tasks, such as picking up clothing from their clothesline. In this project, hardware and software components are used to make it work. This project has three input sensors which are rain sensor, light, temperature and humidity sensor. Rain sensor works by detecting rain fall and notify the user when it rains. From here, the input from the rain sensor will determine whether the clothesline will extend or compress based on the conditions. Temperature and humidity sensor on the other hand works by monitoring the surrounding air of the clothesline and this will be displayed on the user interface of Blynk Application while light sensor will just indicate if it is bright or dark outside. NodeMCU ESP8266 will act as microcontroller where it will communicate with Blynk Application via Internet of Things (IoT) to send notification or data to the user's mobile phone. To extend or compress the clothesline, a servo motor will be used either after the rain sensor detects the presence of water or manually by the user. The software part that is used in this project are Arduino IDE and Blynk Application. Arduino IDE works as a coding platform for the working of NodeMCU ESP8266 and for the system to run whereas Blynk Application will act as a medium for the notification or data to be displayed for the user. This project has a significant influence on busy people by relieving them of their anxieties about their garments outside, allowing them to focus on other vital matters.

ABSTRAK

Selaras dengan pertumbuhan sains dan teknologi, keselesaan dan keperluan manusia semakin meningkat. Mengeringkan pakaian adalah tugas yang memakan masa jika anda mesti menunggu dan mengekalkan kekeringannya. Ini kerana orang ramai disibukkan dengan kerja rumah atau mempunyai waktu kerja yang sibuk, menyebabkan mereka mempunyai masa yang tidak mencukupi untuk menyelesaikan semua tugas domestik, seperti mengambil pakaian dari jemuran mereka. Dalam projek ini, komponen perkakasan dan perisian digunakan untuk menjadikannya berfungsi. Projek ini mempunyai tiga sensor input iaitu sensor hujan, cahaya, suhu dan kelembapan. Penderia hujan berfungsi dengan mengesan hujan turun dan memberitahu pengguna apabila hujan. Dari sini, input daripada sensor hujan akan menentukan sama ada tali jemuran akan memanjang atau memampat berdasarkan keadaan. Sensor suhu dan kelembapan sebaliknya berfungsi dengan memantau udara sekeliling jemuran dan ini akan dipaparkan pada antara muka pengguna Aplikasi Blynk manakala sensor cahaya hanya akan menunjukkan sama ada di luar cerah atau gelap. NodeMCU ESP8266 akan bertindak sebagai pengawal mikro di mana ia akan berkomunikasi dengan Aplikasi Blynk melalui Internet of Things (IoT) untuk menghantar pemberitahuan atau data ke telefon mudah alih pengguna. Untuk memanjangkan atau memampatkan tali jemuran, motor servo akan digunakan sama ada selepas sensor hujan mengesan kehadiran air atau secara manual oleh pengguna. Bahagian perisian yang digunakan dalam projek ini ialah Arduino IDE dan Aplikasi Blynk. Arduino IDE berfungsi sebagai platform pengekodan untuk kerja NodeMCU ESP8266 dan untuk sistem berjalan manakala Aplikasi Blynk akan bertindak sebagai medium untuk pemberitahuan atau data untuk dipaparkan kepada pengguna. Projek ini mempunyai pengaruh yang ketara kepada orang yang sibuk dengan menghilangkan kebimbangan mereka tentang pakaian mereka di luar, membolehkan mereka memberi tumpuan kepada perkara penting yang lain.

ACKNOWLEDGEMENTS

I want to start by thanking my supervisor, Puan Nurliyana binti Abd. Mutalib, and co-supervisor, Dr. Suhaila binti Mohd Najib, for their invaluable advice, wise words, and patience during this assignment.

I would like to express my gratitude to Universiti Teknikal Malaysia Melaka (UTeM) for both the financial aid the university gave me and for the fact that it made it possible for me to finish the project. Not to mention my bestfriend Ainul Balqis binti Hairuddin for the fact that she was willing to discuss her thoughts and views on the project.

During this time of intense learning, I am grateful beyond words to my parents, Abd Aziz bin Lisot and Siti Rohayawati Abdul Karim and the rest of my family, Aina Nabilah and Syamil Akmal for the support and prayers they have offered.

Finally, I would want to express my gratitude to myself. I would want to thank myself for having faith, for putting in all this effort, for not taking any days off, for never giving up, for constantly being a giver and attempting to give more than I receive, and for having no days off.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background

In our standard of living, we devote a great amount of time to cleaning our clothes. Laundry is typically dried outside since sunlight has antibacterial and effective properties. [1]. However, the temperature has an effect on the laundry since it may be hard to do the laundry when rain is predicted, and clothing becomes wet when it rains suddenly. This also becomes an issue when people neglect to remove their garments from the clothesline when it rains. In addition, [2] Malaysia's location above the equator causes rain and humidity throughout the year. This will produce in clothing that are neither dry nor odor-free. Increasingly, it relies on information technology to improve productivity and assist daily operations. [2]. Therefore, a large number of innovations were produced with the assistance of the internet in order to facilitate simple communication between all devices that are linked to the internet. That means that any and all gadgets may be accessed in real-time.

1.2 Problem Statement

People in the current day is extremely active and competitive that they always find ways to ease their daily life routine because of their busy lifestyle.[2] Most people nowadays, both men and women, prioritize their careers, thus simple details like household chores are sometimes disregarded, such as drying clothes, which can take a long time if all of the processes must be done. The process of drying clothes might be difficult, especially now that the rainy season has arrived. As a result, technology keeps to grow and pitch as a quick fix to every issue that develops in mankind, including the difficulties that have been mentioned.

This issue can be mitigated with a laundry notification with automated clotheslines system, particularly for home settings. It was intended to help human beings to juggle between doing other household chores and managing their laundry while at home. While the clothes are hanged outside, this system will detect any changes in rain, temperature and humidity where the clothesline will compress or extend based on the conditions. This approach will enhance the effort to resolve the issue without requiring anyone to physically intervene.

1.3 Project Objective

The primary goal of this project is to provide a method that is both systematic and effective for with a level of accuracy that is acceptable. The following is a more detailed list of the objectives:

a) To develop a clothesline system that extend and compress based on specific conditions

b) To develop a laundry notification IoT-based system so users can monitor their clothes condition remotely using Blynk Application

c) To develop a system that can detect the presence of rain and compress clothesline without human intervention

1.4 Scope of Project

In order to eliminate any potential for confusion regarding the outcome of this project as a result of certain limitations and restrictions, the scope of the project has been established as follows:

a) Inform user if it rains and can view the light, temperature and humidity value in the user scope

b) Rain, light, temperature and humidity data are collected from the sensors

c) The data for temperature and humidity will be collected in real time and displayed in Blynk Application

d) During extending and compressing of the clothesline system, servo motor can only rotate in the range of 0° to 90°.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The research is based on a study completed within five years of the execution of the project. It is appropriate to be used as a reference. In addition, the applicability of the search strategy to the actual project will be studied, evaluated, and decided. The pros and cons of hardware and system must be taken into account in order to make the selection of hardware for assembly in this project more precise. Finally, previous study results and techniques will be compared and examined to ensure they serve as the most reliable and relevant source of information for this project.

2.2 Wi-Fi Module

In most cases, Wi-Fi Modules are surface-mount devices connected to the host PCB with solder (PCB). Some researchers have used ESP32 and NodeMCU ESP8266 in the past to build a link between devices and the internet. Low-cost Wi-Fi modules like the NodeMCU ESP8266 and ESP32 are frequently used in Internet of Things (IoT) projects. Using Wi-Fi, we can simply monitor and control the system from afar.

Both the ESP32 and NodeMCU ESP8266 are WiFi-centric SOCs (Systems on Chop). Both microcontrollers contain a 32bit CPU, with the NodeMCU ESP8266 operating at 160MHz single core [6] and the ESP32 operating at 80MHz to 240MHz twin core [7]. The NodeMCU ESP8266 and ESP32 are two distinct toolkits. The NodeMCU ESP8266 consumes less energy than its rival, while having more digital pins. ESP32 systems have greater GPIO, allowing them to work on projects that are more complicated and practical.

Table 2.1 Differences between ESP32 and NodeMCU ESP8266 [6][7]

ESP32	Model	NodeMCU ESP8266
BLE & Bluetooth 4.2	**Bluetooth**	No
Yes	**SRAM**	No
600 DMIPS Xtensa Dual-core 32-bit	**MCU**	L106 Xtensa Single-core 32-bit
160MHz	**Frequency of use**	80Mhz
Yes	**Flash**	No
34	**GPIO Pins**	17
Yes	**Sensor of temperature**	No
Yes	**Sensor of touch**	No
HT40	**Wi-Fi 802.11 b/g/n**	HT20

2.3 Rain Sensor

The rain sensor module is a straightforward instrument for determining the presence of rain [5]. It is possible to use a raindrop that passes through the rainy board as a switch, and it may also be used to determine how intense the rainfall is. The module features a power indicator LED, a potentiometer, and a separate rain board and control board for convenience [10]. Additionally, the sensitivity can be adjusted using the potentiometer. Changes in rainfall totals can be detected through analysis of the analog output.

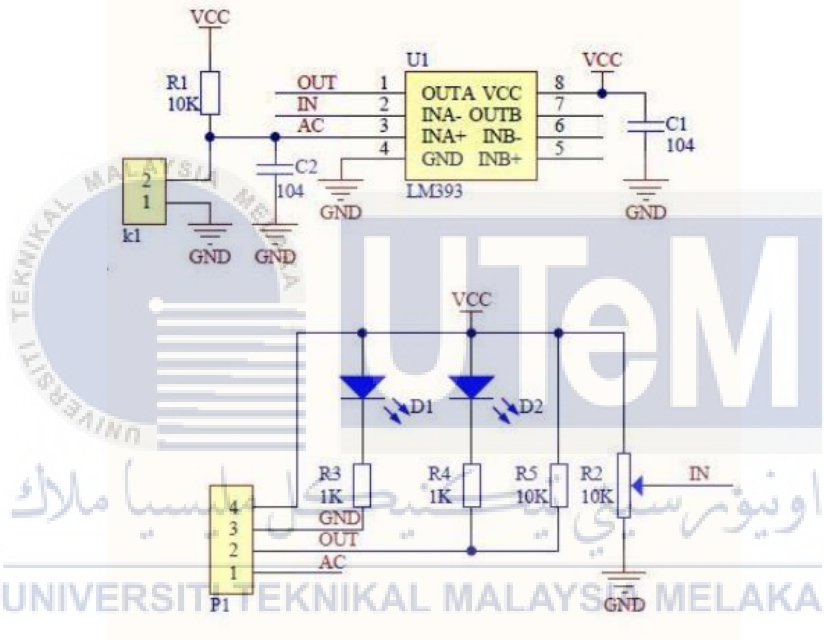


Figure 2.1 Schematic Diagram of Rain Sensor [10]

The testing of rain sensors involves simulating rain by pouring water over the sensor using a pipette. The quantity of water droplets in the experiment was varied. If the indication light illuminates when the sensor is wet and turns off when it is dry, this sensor is reliable and should be utilized.[9]

Table 2.2 Rain Sensor Test Result [9]

Test	Water (ml)	Indicator Light	Information
1	0	Off	dry
2	0,05	Off	1 drop pippete
3	0	Off	be dried
4	0,10	On	2 drop pippete
5	0	Off	be dried
6	0,15	On	3 drop pippete
7	0	Off	be dried
8	0,20	On	4 drop pippete
9	0	Off	be dried
10	0,25	On	5 drop pippete

Referring to Table 2.6, the sensor's sensitivity is intentionally tuned to be inactive when the input received is less than 0.1 ml (less than two drops of the pipette) in order to differentiate between rain inputs and inputs from other water sources such as dew, water vapor, etc. [9]

2.4 Temperature and Humidity Sensor

The DHT is a low-cost digital temperature and humidity sensor.[8] It makes use of a humidity sensor that is based on a capacitor in conjunction with a temperature sensor component, in order to obtain an accurate reading of the ambient temperature and humidity. After the digital signal created by the sensor has been sent, it should be transferred to the appropriate data pin. This sensor is accurate, and it can perform in a wide variety of environmental conditions regarding temperature and humidity.

Table 2.3 Differences between DHT11 and DHT22 [8]

DHT11	**Model**	DHT22
0 – 50°C / ±2°C	**Temperature Range**	-40 – 80°C / ±0.5°C
20 – 90% / ±5%	**Humidity Range**	0 – 100% / ±2 – 5%

1Hz	**Sampling Rate**	0.5Hz
15.5mm x 12mm x 5.5mm	**Body Size**	14mm x 18mm x 5.5mm
3 – 5V	**Operating Voltage**	3.3 – 6V
2.5mA	**Max Current During Measuring**	2.5mA

Based on Table 2.3, it can be seen that DHT22 is much more accurate in the temperature and humidity range. To test the humidity level, an experiment using hygrometer is used to measure it. Sensors and hygrometer are placed in rooms with varying humidity levels to acquire moisture fluctuations. Alternatively, a cloth that is moist or somewhat damp might be used.

Table 2.4 Humidity Sensor Test Result <65% [9]

Test	Hygro meter (%)	DHT (%)	Fan	Deviation	Error (%)
1	51	57	Off	6	11,76
2	53	59	Off	6	11,32
3	52	58	Off	6	11,53
4	52	57	Off	5	9,62
5	54	59	Off	5	9,26
6	53	58	Off	5	9,43
7	53	57	Off	4	7,55
8	53	58	Off	5	9,43
9	57	60	Off	3	5,26
10	56	59	Off	3	5,36
Average				4,8	9,05

Table 2.5 Humidity Sensor Test Result >65% [9]

Test	Hygro meter (%)	DHT (%)	Fan	Deviation	Error (%)
1	64	67	On	3	4,69
2	68	71	On	3	4,41
3	68	72	On	4	5,88
4	67	71	On	4	5,97
5	66	69	On	3	4,55
6	64	67	On	3	4,69
7	62	66	On	4	6,45
8	74	77	On	3	4,05
9	67	70	Off	3	4,48
10	68	73	On	5	7,35
Average				3,5	6,15

As seen in Table 2.4, all moisture samples identified by the sensor <65% have the indicator fan turned off. This means that the humidity sensor used has met one of two prerequisites for use. While in table 2.5, the indication fan is on for all moisture samples detected by the sensor that are greater than 65%. This ensures that the moisture sensor being utilized is worthwhile. It is also known that for humidity figures > 65%, the difference between the hygrometer measurement and the sensor's value on average is 3.5. [9]