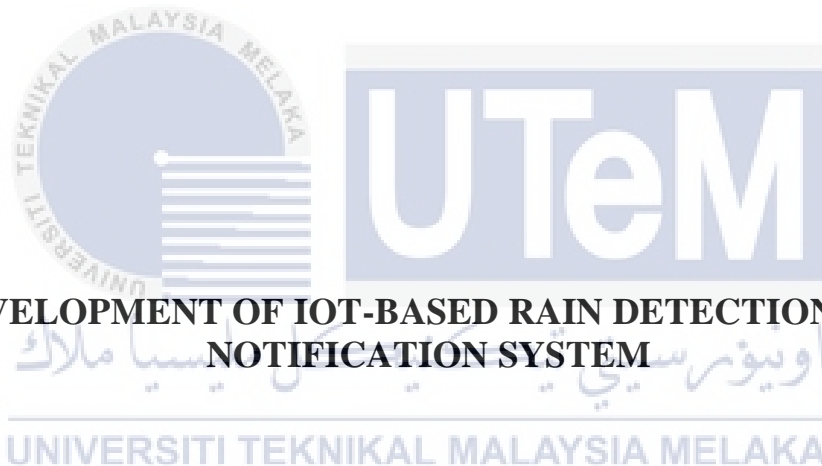




**Faculty of Electrical and Electronic Engineering Technology**



**DEVELOPMENT OF IOT-BASED RAIN DETECTION AND  
NOTIFICATION SYSTEM**

**MUHAMMAD HAZWAN FIRDAUS BIN MOHAMAD HAZLI**

**Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics)  
with Honours**

**2022**

**DEVELOPMENT OF IOT-BASED RAIN DETECTION AND NOTIFICATION  
SYSTEM**

**MUHAMMAD HAZWAN FIRDAUS BIN MOHAMAD HAZLI**

**A project report submitted  
in partial fulfillment of the requirements for the degree of  
Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics)  
with Honours**



اونيورسيتي تیکنیکل ملیسيا ملاک  
**Faculty of Electrical and Electronic Engineering Technology**  
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**2022**

**BORANG PENGESAHAN STATUS LAPORAN  
PROJEK SARJANA MUDA II**

Tajuk Projek : Development Of IoT-Based Rain Detection And Notification System

Sesi Pengajian : 1-22/23

Saya Muhammad Hazwan Firdaus Bin Mohamad Hazli 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: 15 Lebuh Bukit Kecil 4,  
Taman Sri Nibong, 11900 Bayan Lepas,  
Pulau Pinang



(COP DAN TANDATANGAN)

**Ts DR SYED NAJIB BIN SYED SALIM**  
Sensu Luzaru  
Faculty of Electrical & Electronic Engineering Technology  
Universiti Teknikal Malaysia Melaka

Tarikh: 21/2/2023

Tarikh:

22/02/2023

## DECLARATION

I declare that this project report entitled “Development Of IoT-Based Rain Detection And Notification System” 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 :

MUHAMMAD HAZWAN FIRDAUS BIN MOHAMAD

HAZLI

Date :

16/1/2023

اويور سيتي تيكنيكل مليسيا ملاك

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## 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 Electrical Engineering Technology (Industrial Automation & Robotics) with Honours.

Signature :



Supervisor Name : DR. SYED NAJIB BIN SYED SALIM

Date :

22/02/2023

Signature :

اونيورسيتي تيكنيكل مليسيا ملاك

Co-Supervisor :

Name (if any)

Date :

## DEDICATION

In the Name of Allah, the Most Merciful, the Most Compassionate, Alhamdulillah all praises belongs to Almighty Allah, the Lord of the worlds and prayers and peace be upon Muhammad His servant and messenger.

First and foremost, I must acknowledge my limitless thanks to Allah, the Ever-magnificent, the Ever-Thankful, for His help and bless by giving me the opportunity, courage and enough energy to carry out and complete the entire thesis work titled “Development Of IoT-Based Rain Detection And Notification System” submitted in partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics) with Honours in Technical University Of Malaysia Malacca.

I would like to dedicate this thesis to my parents Mohamad Hazli Bin Mat Hashim and Siti Saleha Binti Hashim. Thank you so much for everything! Words can hardly describe my thanks and appreciation to you. You have been my source of inspiration, support, and guidance. You have taught me to be unique, determined, to believe in myself, and to always persevere. I am truly thankful and honored to have you as my parents.

Besides that, I am grateful to some people, who worked hard with me from the beginning till the completion of the present research and have assisted me throughout the completion of this research.

Last but not least, I want to thank me, I want to thank me for believing in me, I want to thank me for doing all this hardwork, I want to thank me for having no days off, I want to thank me for never quitting. I made it! Alhamdulillah.



## ABSTRACT

Development of IOT-based rain detection and notification system are project that using motor to move the cloth rack to indoor preventing it from the rain. During rainy days, people frequently forget to bring in their clothes. Working people should be concerned about this because they don't have enough time to manage their everyday tasks and routines. Based on these examples, a solution was devised to avoid exposing clothes that have been dried outside to rain. Traditional clothes drying lines are unable to protect clothes from a heavy rain. The major control system function of this device is a microcontroller, which allows it to run autonomously. The main goal of this project is to use Proteus software to construct a rain sensor circuit and an LDR circuit. To create a controller code using an Arduino UNO system, as well as to build a rain sensor circuit and an LDR circuit. All of the applications in this device were implemented using an Arduino UNO, which are provided instructions for effectively operating this system, such as automatically fetching garments on sunny days and retrieving clothes on wet days. Then, as a key function, a DC motor, LDR, and rain sensor were required to make this system work properly. Aside from that, this device has the advantages of being energy and time efficient, as well as making it easier for employed people to accomplish duties at home indirectly.



## ***ABSTRAK***

Pembangunan sistem pengesanan dan pemberitahuan hujan berasaskan IoT adalah projek yang menggunakan motor untuk memindahkan rak kain ke dalam bangunan untuk mengelakkannya daripada hujan. Semasa hari hujan, orang sering terlupa untuk membawa masuk pakaian mereka. Orang yang bekerja harus mengambil berat tentang perkara ini kerana mereka tidak mempunyai masa yang cukup untuk menguruskan tugas dan rutin harian mereka. Berdasarkan contoh-contoh ini, penyelesaian telah dibuat untuk mengelakkan pakaian yang telah dijemur di luar terdedah kepada hujan. Talian pengeringan pakaian tradisional tidak dapat melindungi pakaian daripada hujan lebat. Fungsi sistem kawalan utama peranti ini ialah mikropengawal, yang membolehkannya berjalan secara autonomi. Matlamat utama projek ini adalah untuk menggunakan perisian proteus untuk membina litar sensor hujan dan litar LDR. Untuk mencipta kod pengawal menggunakan sistem Arduino UNO, serta membina litar sensor hujan dan litar LDR. Semua aplikasi dalam peranti ini telah dilaksanakan menggunakan Arduino UNO, yang mampu memberikan arahan untuk mengendalikan sistem ini dengan berkesan, seperti mengambil pakaian secara automatik pada hari cerah dan mendapatkan semula pakaian pada hari basah. Kemudian, sebagai fungsi utama, motor DC, LDR dan sensor hujan diperlukan untuk menjadikan sistem ini berfungsi dengan baik. Selain itu, peranti ini mempunyai kelebihan iaitu menjimatkan tenaga dan masa serta memudahkan orang yang bekerja untuk melaksanakan tugas di rumah secara tidak langsung.

## ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to my supervisor, DR. Syed Najib Bin Syed Salim and co-supervisor, Encik Khairul Azha for their precious guidance, words of wisdom and patient throughout this project.

I am also indebted to Universiti Teknikal Malaysia Melaka (UTeM) and my parents for the financial support through hard times which enables me to accomplish the project. Not forgetting my fellow colleague, Fadzli, Daniel, Hazman for the willingness of sharing his thoughts and ideas regarding 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 Puan Suhaila for all the motivation and understanding.

Finally, I would like to thank all the staffs at the FTKEE, fellow colleagues and classmates, the faculty members, as well as other individuals who are not listed here for being co-operative and helpful.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## TABLE OF CONTENTS

	<b>PAGE</b>
<b>DECLARATION</b>	
<b>APPROVAL</b>	
<b>DEDICATIONS</b>	
<b>ABSTRACT</b>	<b>i</b>
<b>ABSTRAK</b>	<b>ii</b>
<b>ACKNOWLEDGEMENTS</b>	<b>iii</b>
<b>TABLE OF CONTENTS</b>	<b>i</b>
<b>LIST OF TABLES</b>	<b>iii</b>
<b>LIST OF FIGURES</b>	<b>iv</b>
<b>LIST OF ABBREVIATIONS</b>	<b>vi</b>
<b>LIST OF APPENDICES</b>	<b>vii</b>
<b>CHAPTER 1 INTRODUCTION</b>	<b>1</b>
1.1 Background	1
1.2 Problem Statement	2
1.3 Project Objective	2
1.4 Scope of Project	2
<b>CHAPTER 2 LITERATURE REVIEW</b>	<b>4</b>
2.1 Introduction	4
2.2 System Design	4
2.3 Internet Of Things (IoT)	6
2.4 DC Motor	8
2.5 Sensor	10
2.6 Microcontroller	12
2.7 Summary	13
<b>CHAPTER 3 METHODOLOGY</b>	<b>15</b>
3.1 Introduction	15
3.2 Project Flowchart	16
3.3 Work Package 1: Literature Review	17
3.3.1 Task 1: Literature review	17
3.4 Work Package 2: To develop a system using sensors that can detect the presence of rain	18
3.4.1 Task 1: Designing the systems automatic cloth hanger	18
3.4.2 Task 2: Selection of hardware components	20

3.4.3	Task 3: Block Diagram	23
3.4.4	Task 4: Wiring and connection	24
3.4.5	Process of build automated cloth hanger	26
3.5	Work Package 3: To control a low-cost laundry hanging prototype for household usage	28
3.5.1	Remote monitoring system flow	28
3.5.2	Setup IoT platform (Cayenne)	29
3.5.3	Add Telegram Group Notification	31
3.6	Work Package 4: To remotely monitored system using internet and the data from the sensors that stored in the cloud by using Cayenne IoT platform	32
3.6.1	Functionality Test	33
3.6.1.1	Rain Drop Test	34
3.6.1.2	Condition Of Weather	34
3.6.1.3	Measure Voltage	35
3.6.1.4	IoT Monitoring	35
3.7	Work package 5: Report, Paper, and Journal writing	35
3.8	Summary	35
<b>CHAPTER 4 RESULTS AND DISCUSSIONS</b>		<b>37</b>
4.1	Introduction	37
4.2	Project Prototype	37
4.3	Project Demonstration	38
4.4	Monitoring automatic cloth hanger using mobile or laptop	39
4.4.1	Ldr sensor	40
4.4.2	Rain Sensor	43
4.5	Result Data	45
4.5.1	Rain Drop Test	45
4.5.2	Weather Condition	46
4.5.3	Measure on each sensor	46
4.5.4	IoT Monitoring	47
<b>CHAPTER 5 CONCLUSION AND FUTURE WORKS</b>		<b>48</b>
5.1	Conclusion	48
5.2	Future Works	49
<b>REFERENCES</b>		<b>50</b>
<b>APPENDICES</b>		<b>53</b>

## LIST OF TABLES

<b>TABLE PAGE</b>	<b>TITLE</b>	
	<b>Table 2.1 Comparison between AC Motor &amp; DC Motor</b>	<b>9</b>
	<b>Table 3.1: List of devices and components that involved in the project</b>	<b>20</b>
	<b>Table 4.1 Result for rain drop test</b>	<b>45</b>
	<b>Table 4.2 Results for condition of weather</b>	<b>46</b>
	<b>Table 4.3 Voltage drop for rain sensor</b>	<b>46</b>
	<b>Table 4.4 Voltage drop for ldr sensor</b>	<b>47</b>
	<b>Table 4.5 IoT Monitoring</b>	<b>47</b>



## LIST OF FIGURES

FIGURE PAGE	TITLE	
Figure 2.1	Type of Motors	9
Figure 3.1	Flowchart of Methodology	16
Figure 3.2	Flowchart of Literature Review	17
Figure 3.3	Testing Algorithm flowchart for automated cloth hanger	19
Figure 3.4	Block diagram of Iot Based Rain Detection And Notification System	23
Figure 3.5	Circuit drawing for automated cloth hanger using fritzing	24
Figure 3.6	Install wiring for auto cloth hanger	25
Figure 3.7	Continuity wiring test and voltage check	25
Figure 3.8	Cutting the board to make the house	26
Figure 3.9	Placement of component in the house structure	26
Figure 3.10	Installing gear motor which acts as the cloth hanger	27
Figure 3.11	Project model from outside view	27
Figure 3.12	The flow of remote monitoring system work	28
Figure 3.13:	Step1: For new user, we need to sign up to use the application	29
Figure 3.14:	Step 2: Hardware setup	29
Figure 3.15:	Step3: Add Cayenne Library to Arduino IDE	30
Figure 3.16:	Step 4: Configure Arduino IDE	30
Figure 3.17:	Step 5: Connect ESP32 to Cayenne IoT auto cloth hanger	31
Figure 3.18:	Step 1: Add a new trigger to be notified through telegram	31
Figure 3.19:	Step 2: Add if and then in the trigger	32
Figure 3.20:	Step 3: Repeat step 2 for other sensor or other trigger to be notify	32

<b>Figure 4.1 Auto cloth hanger prototype</b>	<b>38</b>
<b>Figure 4.2 Block Diagram of internet connection to ESP32</b>	<b>38</b>
<b>Figure 4.3 View using laptop</b>	<b>39</b>
<b>Figure 4.4 View using phone</b>	<b>39</b>
<b>Figure 4.5 Display from smartphone status presence light</b>	<b>41</b>
<b>Figure 4.6 Presence of light on ldr sensor</b>	<b>41</b>
<b>Figure 4.7 Display from smarthphone status absence light</b>	<b>41</b>
<b>Figure 4.8 Absence of light on ldr sensor</b>	<b>42</b>
<b>Figure 4.9 Message sent to telegram group after the light intensity is below than certain level</b>	<b>42</b>
<b>Figure 4.10 Display from smartphone not raining</b>	<b>43</b>
<b>Figure 4.11 Not raining</b>	<b>43</b>
<b>Figure 4.12 Display from smartphone raining</b>	<b>44</b>
<b>Figure 4.13 Raining</b>	<b>44</b>
<b>Figure 4.14 Notification from telegram application</b>	<b>45</b>

## LIST OF ABBREVIATIONS

<i>IoT</i>	-	Internet Of Things
LDR	-	Light Dependent Resistor
LED	-	Light Emmiting Diode





## LIST OF APPENDICES

APPENDIX PAGE	TITLE	
Appendix A	Coding for esp32	53
Appendix B	Coding for Sensor	55
Appendix C	Coding for Notification	57



# CHAPTER 1

## INTRODUCTION

### 1.1 Background

Most individuals in the modern period, and women in particular, are struggling to pick up their hanging garments in the event of an emergency, such as a rainy day. For instance, if it were to suddenly rain while the house's female occupants were out at work or otherwise occupied, any clothing left on a balcony or anywhere outside would be soaked.

Those who are often on the go have to worry about the weather damaging their outdoor-dried garments. They don't have time to keep up with their wardrobes since they have so many other responsibilities. For households without maids or for those in which the occupant lives alone, this might significantly cut into their free time.

The washing and drying process are the primary focus of this research. This is a good choice for those who don't have a maid or who live alone and have a hard time keeping up with their laundry throughout the day because of the unpredictable nature of the weather.

The proposed technology, an automatic drying rack that can detect when it's about to rain, that make people's lives simpler. Items may be hung out to dry on this rack without the user having to worry about the clothes becoming wet. When it starts raining at home, the user get notified on their smartphone through the Internet of Things' weather app.

## 1.2 Problem Statement

Unpredictable weather conditions sometimes make the process of drying the clothes outside the home area difficult. In addition, the weather patterns in Malaysia that received relatively high rainfall are a contributing factor to this problem as some of them are wet with rain.

For those who are busy working and at the same time not forgetting about the work of the home it is essential to find a modern and convenient solution. This is often associated with working women or among university students.

For those who have problems forgetting especially the elderly, it can be difficult to remember clothes that have been left outside especially if it is raining or forgetting to hang up the cloth for those who often sleep while waiting for clothes to be dried.

## 1.3 Project Objective

The following are the project's objectives:

- a) To develop a system using sensors that can detect the presence of rain.
- b) To control a low-cost laundry hanging prototype for household usage.
- c) To remotely monitored system using internet and the data from the sensors that stored in the cloud by using Cayenne IoT platform.

## 1.4 Scope of Project

A few guidelines are proposed, by narrowing the needs for this project, to ensure that this project achieve its objectives. The scopes covered are:

- a) This project is to focus on clothesline in order to make drying the cloth easier for those who always busy with their work and always not available at home.
- b) Using Esp32 microcontroller in monitoring the weather for rain detection system.
- c) This project works in two scenarios: first, when it rains, the rain sensor detect water and the hanger cloth automatically retrieve in. Secondly, when the water sensor dry and the LDR sensor receive enough light it automatically retrieve-out the clothes.
- d) To use the IoT application to control motors and monitor by developing an IoT platform for this project.



## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

In this chapter, the literature review on the automated cloth hanger and development of IoT-based Rain Detection and Notification System is presented. This chapter first describes how the system is modeled after former researchers. The aim of this project is to prevent cloth getting wet when the weather changes in an open area. The control system with the help of rain sensor and power motor that moves the rail of the cloth from an open area to a close area to prevent the cloth from getting wet. The function of IOT is to notify the user if the sensor is triggered when they are not available at home.

#### 2.2 System Design

The word "automation" is derived from two Greek words: "auto" (self) and "Matos" (movement). It is, thus, the mechanism for self-moving devices. As a result, automation can be defined as "a set of technologies that allows machines and systems to operate without requiring considerable human involvement and delivers performance superior to manual operation." [1] As a result of this investigation, an automated sliding door system that uses infrared sensors was developed. A sensor, a control unit, and a drive unit are used in conjunction with one another at the entry of a public facility in order to open and shut the doors. The primary objective of this research project is to gain an understanding of the fundamental concepts at play and to acquire specific information regarding the operation of an automatic door system that makes use of an AC variable speed control system and PLC

control electromechanical actuators to open and shut a door automatically. In the context of this project, the publisher is doing research into the operation of automated doors, defining an extensive circuit, and constructing a simple model. [2]

In this research work, we can said that the publisher developed Rain sensor alarm. It uses a rain drop sensor, SIM900 GSM module and Arduino Uno is uses for controlling and processing the data from the sensor. The purpose of this research work is to understand the detail about the system work which the system consists of a retractable roof which is build over the height of the flood lights so that the previous infrastructure of the stadium is not disturbed. [3] Automatic clothing protection against rain is provided by this technology. The publisher use relay to switch between drivers is controlled by an 8051 IC controller and a driven ULN 2803. Utilizing 555 timers and LDRs, a sensing system is developed. The tray is mounted directly below the roof, and the sensor equipment is fixed to the roof. Through a relay, the driver circuit controls the tray. They have utilised several software tools, including welpro software, which operates in intricate circuitry, and keil micro vision.[4]

Power traction mechanism is consisting of several parts mainly including main frame, DC motor, wheel, and overweight. [5] Clothes are automatically retrieved out on a sunny day and retrieved in when it is a rainy day. In this system, an Arduino UNO board was used to give instructions to the system via the programs installed on it. A DC gearbox motor moved clothes forward and backwards. A rain sensor circuit was designed. [6]

This mechanism may automatically pull the hanger in during a rainy day and push it out during a sunny day. The Atmega328P-PU is used in this project to install all of the coding programmed that give instructions on how to run the system properly. The LM7805 voltage regulator is also used to regulate the 5V supply. Rain sensors and Light Dependent Resistor (LDR) sensors are among the sensors used in this research. [7]

Automatic clothes dryer in a cabinet in this research are using wifi transmission to developed the project with a NodeMcu Esp8266 to operates its project. The sensor that been used by the publisher is temperature sensor to operate the measurement parameter with a computer. It also used an android application which is Linux-based mobile devices to create its own application. Heavy clothes had been used to relay information from the microcontroller about the state of the cabinet, and once a certain temperature is reached, the heater is turn off to avoid overheating. [8]

### **2.3 Internet Of Things (IoT)**

The ultimate goal of IoT is to make it possible for everything, everywhere, and at any time to be linked to any service or network. The Internet of Things usher in a technological revolution in several fields [9]. Kevin Ashton used the phrase "Internet of Things" [10] to describe the approaching era in which all of matter is connected and managed by a single digital network. With the ever-falling prices of IoT-related gear and network connections, it's not hard to imagine a future in which every object and person is permanently linked to the web through a mobile device. Between 26 and 50 billion gadgets had been online by 2020, according to estimates. [9].

Internet of Things (IoT) is a new internet revolution that allows us to connect everyday devices to a global network. Innovations in the Internet of Things are urgently required. IoT has many applications in areas as diverse as medicine, tourism, instruction, manufacturing, and commerce. In this study, the publisher used an IoT-connected mobile app to create an NFC tag that can be scanned from inside the fabric and then linked to a cloud-based database containing product information. [11]

You may simulate the LPG sensor, LDR sensor, toggle switch, ATMEGA microcontroller, motor control circuits, and DC motors with the help of the Proteus simulator. Espressif Systems is responsible for the creation of the ESP32 chip. The two cores may be clocked at speeds up to 240 MHz, making it a significant improvement over the 8266 processor. The articles below provide a concise summary of the many benefits offered by the ESP32 chip, including its cheap price, ease of use, and compatibility with Wi-Fi standards and protocols.[12]

Concepts that revolve around the Internet of Things (IoT), such as augmented reality, high-resolution video streaming, self-driving vehicles, smart environments, electronic health care, and many others, are becoming more and more commonplace. [13]. The concept of IoT revolves around the word “smartness” – “an ability to independently obtain and apply knowledge’ [14]. Thing Speak is an open application for the Internet of Things [15] that provides numerous advantages for developing an IoT-based system. Thing Speaks features include real-time data gathering, collected data visualizations and processing, and the ability to create plug-ins. It also incorporated web services, social media, and different APIs. [16] The Blynk programme, which is installed on this device and serves as the primary on/off switch, may be used to activate the gadget even when the users are in different parts of the globe. After being received from the sensor, the data are then sent to the microcontroller, which is already outfitted with an internet module. The FAVORIOT platform received data that the user may use to assist in monitoring the home, and it transferred an alarm to the user in real time. [17] In this research, the publisher designed and developed prototype for monitoring the water level in water wells. The IoT is applied in this project to monitor the project where it uses Cayenne application. The minimum application payload size for Cayenne visualisation is 4 bytes, consisting of 1 byte for the Cayenne channel, 1 byte for the data type, and 2 bytes for the water level percentage. [18]