Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF SMART DRYING RACK SYSTEM WITH REMOTE CONTROL USING MOBILE APPLICATION

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Bachelor of Electronics Engineering Technology with Honours

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DEVELOPMENT OF SMART DRYING RACK SYSTEM WITH REMOTE CONTROL USING MOBILE APPLICATION

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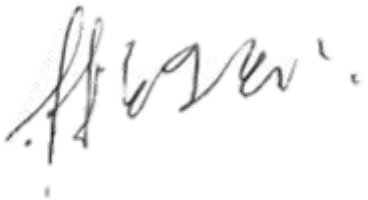
Signature 

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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 Electronics Engineering Technology with Honours.

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DEDICATION

This report is dedicated to my beloved parents who educated and supported me throughout the process of doing this project. I also wanted to say thank you to my supervisor and my friends who have encouraged, guided, and inspired me to complete this project.

ABSTRACT

Nowadays, mobile phones are a basic necessity in our lives. We often spend our time using the phone in entertainment, education, business, socialization, etc. Why not? We use mobile phones wisely in managing life in terms of household chores. With the help of mobile phones, we can reduce the pressure in our lives and make our lives to be systematic. We propose a solution to solve housework such as laundry that takes a lot of time, and if it rains due to unpredictable seasons, the problem will worsen. Therefore, we propose a smart drying rack system that can operate remotely using a mobile application to overcome the problems mentioned above. This drying rack uses ESP32 as a microcontroller to control the inputs and outputs of the system with integrated Wi-Fi. The sensor that measures the surrounding temperature and humidity is DHT11. Users will receive notifications once their cloth dries via their smartphone or there is a presence of water on the rain sensor. We built a mobile application that can control the drying rack system. Next, we collect the data and plot it as a scatterplot. With the help of scatter plots, we can obtain equations in Excel for study and analysis. Scatter plots are one of the most powerful data analysis tools. According to (Hao and Keim, 2010), they used scatter plots to analyze power consumption versus temperature data. Therefore, for our data collection and analysis, two studies were conducted to study the drying time of 100% nylon cloth and 100% cotton cloth, and the drying time of cotton clothes as the number of clothes increased and the distance was shortened. On the same hanger rack, length (33 cm). The collected data is generated as an equation used as a reference drying time and integrated into the mobile app algorithm code in automatic mode. As a result, the drying rack system can detect rain and cover-up clothes from getting wet. Integrated with drying racks using MIT App Inventor's mobile app, works flawlessly and reminds users of researched drying times. Therefore, there is an improvement in the drying process in the auto mode of the drying rack system. We believe that smart drying racks with integrated mobile apps make our lives easier and more systematic.

ABSTRAK

Pada masa kini, telefon bimbit adalah keperluan asas dalam kehidupan kita. Kita sering menghabiskan masa menggunakan telefon dalam hiburan, pendidikan, perniagaan, sosialisasi, dan lain-lain. Mengapa tidak? Kami menggunakan telefon bimbit dengan bijak dalam menguruskan kehidupan dari segi tugas rumah tangga. Telefon bimbit ini akan membantu kita mengurangkan tekanan hidup dan mengubah kehidupan kita menjadi sistematik. Berdasarkan pengalaman saya, pekerjaan rumah tangga seperti cucian memerlukan banyak masa, dan masalah akan bertambah buruk sekiranya hujan disebabkan musim yang tidak dapat diramalkan. Oleh itu, kami mencadangkan sistem rak pengeringan pintar yang dapat beroperasi dari jarak jauh menggunakan aplikasi mudah alih untuk mengatasi masalah yang disebutkan di atas. Rak pengeringan ini menggunakan ESP32 sebagai pengawal mikro untuk mengawal input dan output sistem dengan Wi-Fi bersepadu. Sensor yang mengukur suhu dan kelembapan sekitarnya adalah DHT11. Pengguna akan menerima pemberitahuan setelah kain mereka kering melalui telefon pintar mereka atau terdapat kehadiran air pada sensor hujan. Kami membina aplikasi mudah alih yang dapat mengawal sistem rak pengeringan untuk hasil awal. Seterusnya, kami mengumpul data dan memplotkannya sebagai plot serakan. Dengan bantuan plot taburan, kita boleh mendapatkan persamaan dalam Excel untuk kajian dan analisis. Plot taburan adalah salah satu alat analisis data yang paling berkuasa. Menurut (Hao dan Keim, 2010), mereka menggunakan plot serakan untuk menganalisis penggunaan kuasa berbanding data suhu. Oleh itu, untuk pengumpulan dan analisis data kami, dua kajian telah dijalankan untuk mengkaji masa pengeringan kain nilon 100% dan kain kapas 100%, dan masa pengeringan pakaian kapas apabila bilangan pakaian meningkat dan jarak dipendekkan. Pada rak penyangkut yang sama, panjang (33 cm). Data yang dikumpul dijana sebagai persamaan yang digunakan sebagai masa pengeringan rujukan dan disepadukan ke dalam kod algoritma aplikasi mudah alih dalam mod automatik. Akibatnya, sistem rak pengeringan dapat mengesan hujan dan pakaian penutup daripada basah. Disepadukan dengan rak pengeringan menggunakan aplikasi mudah alih MIT App Inventor, berfungsi dengan sempurna dan mengingatkan pengguna tentang masa pengeringan yang diselidik. Oleh itu, terdapat peningkatan dalam proses pengeringan dalam mod auto sistem rak pengeringan. Kami percaya bahawa rak pengeringan pintar dengan aplikasi mudah alih bersepadu menjadikan kehidupan kami lebih mudah dan lebih sistematik.

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^{o}C	-	Temperature
R	-	Resistor
%/RH	-	Humidity

LIST OF ABBREVIATIONS

API	-	Application Programming Interface
APK	-	Android application package
GSM	-	Global System for Mobile Communication
IOT	-	Internet Of Things
LED	-	Light Emitter Diode
LDR	-	Light Dependent Resistor
MIT	-	Massachusetts Institute of Technology
V	-	Voltage

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CHAPTER 1

INTRODUCTION

1.1 Background

In the early 20th century, most laundry works had traditionally been highly gendered, usually becoming women's responsibility. After they had washed their clothes, they will be hung up on poles or clotheslines to air dry. Meanwhile, J. Ross Moore is the first Inventor First Electric Dryer who lived on a North Dakota farm with laundry issues during the winter season. He erected a shed, mounted a furnace, and hung the garments to dry there. Moore worked on concepts for an automated clothes dryer, a drum-style machine, over the following 30 years. In 1938, his automatic clothes dryer had begun to sell and improved for the next years. Until the 21st century, the idea of automation clothes was used as a reference.

Nowadays, people are busy living a busy lifestyle with their work. They engaged with their education, jobs, and housework. Sometimes they do not have enough time to do laundry due to the unpredictable weather with the development of technology and innovation done for the drying rack to fulfill user requirements and solve a user problem. Later an Automatic Drying Rack Ceiling Mounted Cloth Hanger was introduced to the market. The product comes with space-saving and wireless remote operation that allows user to adjust high of the drying rack. It has a total weight-bearing capability of 35 kg and dimensions of 2.4 m x 4. The UV disinfection light is used to eliminate bacteria in clothes and prevent the odor of damp garments. This rack has a built-in fan which is to accelerates the drying process. This product can dry cloth during cold and rainy seasons. This rack is an energy-

saving product and does not consume much power. This dryer will complement your home's intelligent & modern aesthetics with low noise operation and an innovative frame. The cost of the product is RM 1,150.00, which you can order at the website of Lazada.

Besides that, a company XIAOMI has come out with an intelligent frog portable clothes rack hanger. This product can dry clothes and is easy to handle. It has the function of fast-drying, hot air mode, and cold air mode, which can switch accordingly to dry clothes effectively without damage. The design clothes dryer is like a hanger. Inside it has a PTC ceramic heating and hanger material with a high-temperature resistant flame-retardant material. Its price is RM129.00 per hanger.

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1.2 Problem Statement

Presently, types of drying racks commonly used by Malaysians are wall-mounted, versa line clothesline, clothes hanger wall mounted, t-poles, etc. It has become a problem encountered when busy, no people around at home, and unpredictable weather. Usually, they engage with their work, their education, jobs, and housework. Sometimes they even forget to pick up the cloth when they have a lot of work. As a result, the clothes were unable to dry properly and smelly in the next few days. Next, there are no people around at home, helping them to keep their clothes when their cloth is dry. Lastly, unpredictable weather becomes a factor that may affect the evaporation rate of cloth to dry, especially on a rainy day. So, we cannot estimate the time taken for dry cloth to dry. What happened to that shirt? According to (R. Splendore, F. Dotti, B. Cravello and A. Ferri, 2010) they did research that if their shirt did not get properly dry, the shirt would become smelly due to its bacteria and mold. Next, if prolonged shirt exposure to the sun can cause significant discoloration, fading, cracking/tearing, and brittleness to the shirt.

Some people prefer to have indoor drying cloth because it is easy and convenient to access. Nevertheless, according to researchers in Scotland, this could cause a person to have asthma. (Catharine Paddock, 2012). Besides that, indoor drying cloth has an issue with moisture issues of indoor drying and requires a longer time to dry laundry. The solution is that a portable ceiling cloth with Remote Control Operation has been introduced to the market. The product comes with a space-saving and wireless remote operation that allows us to lower or raise the drying rack efficiently. The UV disinfection light is used to eliminate bacteria in clothes and prevent the odor of damp garments. However, the cost is high, it is risky when installed correctly, and it seems untidy and unclean. Following that, XIAOMI has released an intelligent frog portable clothes rack hanger. This product can dry clothes and is easy to handle. It has the function of fast-drying, hot air mode, and cold air mode, which can switch accordingly to dry clothes effectively without damage. However, the product can only be used for one cloth. Hence it is not suitable and no practice to use for laundry.

Therefore, this project is proposed a smart drying rack system that can remotely control by using the mobile app—the ESP32 as a microcontroller to controls the input and the output of the system with integrated Wi-Fi. A notification will be received once the cloth is dry through their smartphone.

1.3 Project Objective

Our goal is to concentrate on the mobile application and drying rack. The following are the specific goals

a) To design the drying rack system to detect rain and cover-up clothes from getting wet.

b) To design a mobile application using MIT App Inventor and integrate it with drying rack.

1.4 Scope of Project

This project aims to develop a Smart Drying Rack System with Remote Control using Mobile Application. The Mobile application is android-based, an online database. The programming language used to create the android-based application will be block language. IoT middleware for mobile applications will set up the online database based on the Thing Speaks online database due to its simplicity and cost. The data stored in the online database will then display through the smart phone application. The scope of this project is as follows

a) The mobile application will display the value of temperature, humidity, and time taken to dry a shirt.

b) The display of the time taken on the mobile application will be changed based on the weather.

c) The mobile application will notify the user via alarm as the shirt is dry; after 5 minutes, it will automatically cover the shirt.

CHAPTER 2

LITERATURE REVIEW

This chapter covers existing products on the market and the relevance of this project with other research to have better analyze and avoid unnecessary repetition of the problem areas in this study.

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2.1 Existing Products Available in The Market

A drying rack is a portable frame used for drying clothes after laundry. Clothes are usually hung on the bar to evaporate water from cloth air. The material frame of the drying rack is wood, metal, or plastic. It is commonly used indoors and outside drying racks. So, in this part, we will introduce the currently available items.

2.1.1 Wall Mounted Clothes Drying Rack

This drying rack is an ingenious way to conserve space. When the rack is not in use, we can fold it back into the wall like an accordion. The material of the drying rack has sturdy metal that can handle the wet weight. The advantage of the clothes' drying rack is not prone to corrosion or breaking. Aside from that, it is dependable and quickly dries laundry at home. It is suited for using the laundry, bathroom, or pool area. The rack includes a rod with a hanger so that you can put your clothes on it. This drying rack can keep clothes neatly organized and avoid all types of wrinkles when removing your clothes from the dryer.