Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF IOT AUTOMATIC CLOTHES FOLDING MACHINE WITH RECOVERY SYSTEM

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

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DEVELOPMENT OF IOT AUTOMATIC CLOTHES FOLDING MACHINE WITH RECOVERY SYSTEM

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

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I declare that this project report entitled “Development of IoT Automatic Clothes Folding Machine with Recovery 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.

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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.

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Signature : -

Co-Supervisor : -

Name (if any)

Date : -

DEDICATION

I dedicate this report to my loving parents whose pray and support me always to reach at this destination.

To my beloved mother, Nihayatun Binti Mohd Razali, my father, Azali Bin Ismail,

and

to all supported me along this research.

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ABSTRACT

A busy daily schedule is made people forget about laundry job especially for people who are having problems with work-related at home such as a people who are working a tide schedule and a shift working hour. The problem arises because people now don't do housework that seems as easy as folding clothes. Clothes folding machines are developed and designed for the routine tasks of folding machines because of the indispensable requirements in our daily lives. Therefore, the project is made of low-cost automatic clothes folding machines that use microcontrollers, infrared sensor modules and servo motors. In addition, it is complete with the Internet of Things, IoT that can make machine monitor and control by user in internet interface. This project also aims to reduce the use of time and energy by using this machine, makes the folds of the clothes more neatly and looks like a professional fold, prevent clothes from becoming wrinkled during the folding process and prevent clothes from being damaged due to machine folding.This machine represents an automatic system of mechanical design with electrical control design. This technology was created to assist regular humans of average ability. As a result, its design clearly demonstrates how to fold clothes by hand, with actions such as folding the rear of the sleeves, folding the bottom of the shirt. Finally, fold the clothes into several parts on top of it while handing it over to human strength. In all others stage, an ESP32 microcontroller will be used to manage the project. Next, Infrared sensor is used as inputs for this project's automated clothing folding machine as the recovery system. In the meantime, four servo motors aid in the folding processes. Following that, the usage of red Light Emitting Diode (LED) indicates that the machine needs focus, while green LED shows that the equipment is fully automated. Push Start Button also is used for 'Input' (clothes) insertion for the machine to start running the activity of folding clothes. Finally, the IoT expansion in this folding system through internet interface where users will be given two reminders regarding the status of the folding machine such as Machine Running' and 'Machine Stop when the system has errors that need to be maintained.

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ABSTRAK

Jadual harian yang padat menyebabkan orang ramai mengambil mudah tentang kerja dobi terutama bagi mereka yang menghadapi masalah berkaitan kerja di rumah seperti orang yang bekerja mengikut jadual yang padat dan syif waktu bekerja. Masalah timbul kerana orang ramai sekarang tidak membuat kerja rumah yang kelihatan semudah melipat baju. Mesin lipat pakaian dibangunkan dan direka bentuk untuk tugas rutin kerja lipatan pakaian kerana keperluan yang sangat diperlukan dalam kehidupan seharian kita. Oleh itu, projek ini diperbuat daripada mesin lipat pakaian automatik kos rendah yang menggunakan pengawal mikro ESP32, modul *sensor* inframerah, butang suis hidup & matikan, Penunjuk *Light Emitter Diode*, aplikasi *Blynk* dan motor servo. Selain itu, ia lengkap dengan Internet of Things, IoT yang boleh membuatkan mesin dipantau dan dikawal oleh pengguna dalam antara muka internet. Projek ini juga bertujuan mengurangkan penggunaan masa dan tenaga dengan menggunakan mesin ini, menjadikan lipatan pakaian lebih kemas dan kelihatan seperti lipatan profesional, mengelakkan pakaian menjadi berkedut semasa proses melipat dan mengelakkan pakaian rosak akibat mesin sedang lipat. Mesin ini mewakili sistem automatik reka bentuk mekanikal dengan reka bentuk kawalan elektrik. Teknologi ini dicipta untuk membantu manusia biasa yang berkebolehan sederhana. Hasilnya, reka bentuk jelas menunjukkan cara melipat pakaian dengan tangan, dengan tindakan seperti melipat belakang lengan, melipat bahagian bawah baju. Akhir sekali, lipat pakaian menjadi beberapa bahagian di atasnya bagi mengurangkan penggunaan kekuatan manusia. Dalam semua peringkat yang lain, mikropengawal ESP32 akan digunakan untuk menguruskan projek. Seterusnya, sensor Inframerah digunakan sebagai input untuk mesin lipat pakaian automatik projek sebagai sistem pemulihan. Sementara itu, empat motor servo membantu dalam proses lipatan. Akibatnya, penggunaan Diod Pemancar Cahaya merah (LED) menunjukkan bahawa mesin memerlukan fokus, manakala LED hijau menunjukkan peralatan automatik sepenuhnya. Butang mula juga digunakan untuk sisipan 'Input' (pakaian) untuk mesin mula melakukan aktiviti melipat pakaian. Akhir sekali, pengembangan IoT dalam sistem lipatan ini adalah melalui antara internet di mana pengguna akan diberi dua peringatan berhubung status mesin lipatan seperti '*Machine Running'* dan *'Machine Stop'* apabila sistem tersebut mempunyai ralat yang perlu diselenggara.

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LIST OF SYMBOLS

°	-	Degree
Ft	-	Feet
Cm	-	Centimeter
%	-	Percentage
Kg	-	Kilogram

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LIST OF ABBREVIATIONS

V	-	Voltage
AC	-	Alternate Current
DC	-	Direct Current
IoT	-	Internet of Things
LED	-	Light Emitting Diode
ADC	-	Analog-to-Digital Converter
PWM	-	Pulse-width Modulation
Wi-Fi	-	Wireless Fidelity
BDP	-	Bachelor Degree Project

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CHAPTER 1

INTRODUCTION

The background study for the project, statement of the purpose, problem statements, and project scope are all included in this chapter.

1.1 Background

According to Qihao Weng & Paolo E. Gamba, 2018, maximum through a long way of the improvement is anticipated to make peoples lifestyles less demand in order to fulfill the requirements of being emotionless. A wheel was created on the objects for it moves easily on the ground. People used elevators or lift facility instead of stairs for ease daily life. They created a microwave oven to save time and effort while cooking. Innovative ideas come from lazy people who want to make things much easy. The household and industrial sectors are the two key markets for folding clothing machines (Dami Lee, 2019). This machine is a beneficial domestic equipment that has the ability to change what people live in today's homes.

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The venture of machine turned into meant to deal with the issues of folding clothes for housewives or any person who face problem of folding clothes as per (*Clothes Folding Machine* , 2017). Many studies are trying through making an investment electricity folding clothes in view of our patron interviews. However, clothes folding machine in the market now are excessively costly and only focused for large industries. Therefore, development of Iot automatic in clothes folding machine with recovery system try to manufacture flexible programmed clothes folding machine at a modest fee to serve two the significant majority.

It consolidated the measurements from present objects. In addition, having better designs is more beneficial and proficient too.

Washers and dryers have become normal to be use every day and people now no longer recall them as new ideas. The process to control apparel now no longer modified for proper round a hundred and sixty years since Hamilton Smith certified the rotating clothes washer in 1858. Folding cloths is a troublesome task for some individuals especially working people as it was a dreary and tedious.

Thus, some people beings virtually unload their apparel into the cloth cabinet without arranging them. This behavior often leaves and offers inconvenience while people are locating their clothes. From that, a financially savvy collapsing machine that could therefore distinguish and overlay the clothes has been fabricated. The past time of the machine calls for minimum human inclusion, that's basically treasured for people who are not inclined to kind out their garments (Li et al., 2017).

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Nowadays, most people had been dealing with tight schedule of the day where they spent 8 to 16 hours with working. Among the complete track which might be time and power devouring is in which laundries are concern. Clothes like shirts, dress and pants and if duplicated through the amount of person in a family, will dissipate a ton of time and power. This is a scrape for everyday person that must be settled. (Gomesh et al., 2013).

Based on (Bersch et al., 2011) clothing is high upon the rundown of common family unit errands that numerous people might prefer now, no longer to do and could. Probably, be completed via way of robot management. In addition, there are three stage of laundary

process which is washing , drying and folding that can make human very busy to do after a long day tired.

What gives off an impact of being easy errands for a human, postures significant demanding situations for an automatic framework. Most mechanical robots have been produced to work with unbending articles in an extremely dull manner.

1.2 Problem Statement

The main idea of this project is due to people nowadays do not have much time to fold their own clothes with a tight schedule problem. The tight schedule problem is inevitable because they have more important tasks and should be preferred instead of folding clothes. This is also because the folding clothes duty is just a subjective job and will take time to do it. There will be not enough time for certain people with a compact daily timetable. In addition, there is no folding system with low cost, power saving usage and recovery system that support by Iot as indicator exist in the current market.

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There is no “free lunch” in this era of modernization and we have to pay for what we want. Many people often will take the easier way by sending their clothes to laundry store for arrange their clothes. Because of that, waste of money and time will occur. Hence, the idea of a low-cost project is urgently needed today. Moreover, the low usage of electricity also will make the idea of this project saving power consumption since it totally used low voltage electronic application. Next, most people experience a nasty problem in wardrobe at home. This is due to the problem of uneven creases and different crease sizes and types. This causes wastage of space in the closet and at the same time causing the closet looked messy. So, a folding machine was really needed to be built to help people.

Last but not least, in the era of robots and automation system, every technology nowadays makes an inventory that could make human and machine interact with internet source. Sometimes people may not always be at home when the folding machine are running. In other case, the machine needs to be reset because of need to recovery factor. This happened when the user's handphone that containing Internet interphase to link their folding machine and that just need to reset their folding machine at their fingertips. In summary, this is an advantage for user from operate their own clothes folding machine while it can be use IoT to do the recovery system. Recovery system in this appliance folding machine more on user just monitor supplies exact quantity, the status of the machine and can make user control their machine.

1.3 Project Objective

The following are the sum of this project to be an objective need to achieve at the end of the project development:

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i) Invented a low-cost electronic automatic clothing folding machine.

ii) To analyse the capability in term of speed of machine to complete in one cycle.

iii)To provide more economic and less energy consumption machine.

iv)To achieve and meet the types, weights and sizes of clothes that will be ready to be folded with quick folding.

v) To create a safe automation clothes folding machine.

1.4 Scope of Project

The scope is set as a border of this project to clarify the area of a study that would be cover in this report and which is not. The limitation of this report is included as:

Clothing size refers to the label measurement used for clothes sold off-the-shelf. There is a huge range of general sizing structures around the world for various clothes, inclusive of dresses, tops, skirts, and pants. Made to order clothes require measurements to be taken, however these do now no longer want to be transformed into country wide general form. This machine also specific to a few types of fabric such as various type of T-shirt, pants, towel and also suitable clothes that can be fold with the machine.

There are three methods for clothing size labelling:

a) The labelling specifies the various body sizes by which the product was created. (For example, t-shirts are available in a variety of sizes ranging from S to XXXL.)
b) Product dimensions: The product's feature dimensions are listed on the label. For example, a denims label specifying the denim's internal leg length in centimetres or inches.
c) Sizes: There is no evident courting to any measurement on the label, which mentions a size range or code. (For instance, size 12 XL.)

Tactically, Because of changing demographics and expanding human shapes, clothing has been labelled the use of many unique and unique lengths, which has led to various size methods among special producers manufactured for special international regions,the phenomena known as arrogant sizing. This outcomes in particular country labels

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incurring extra costs, and may make net or mail order difficult. Some new requirements for apparel sizes being advanced are consequently primarily based totally on frame-dimensions, inclusive of the EN 13402 "Size designation of garments (Joint_European_standard_for_size_labelling_of_clothes, n.d.).

a) With all of this IoT information is transmitted, the possibility of the clothes folding machine losing its privacy and it's safety issues is increases.
b) This will work in a semi-automated operation, with the user just laying the clothing flat on the platform and the machine folding and stacking them.
c) Design and develop prototype of clothes folding machine

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will go through the prior background research that was done in order to make this project a success. In this approach, some knowledge and study was accomplished using a variety of resources, including books, journals, articles, the internet, and documentation and scientific research. Some evidence was used as part of this project as a guide for innovative improvement, and it was extremely important to have a better idea of this project. A comparison of a few of the previous research will be made. It also discusses and illustrates the benefits and disadvantages of an existing project.

There are many types of folding machines in the market, each with different shapes and specifications. At the beginning of the creation of the folding machine, the design of the folding machine was simple and had limited functionality where this type of folding machine looks unattractive and need to more futuristic and modern due to nowadays advance technology. This folding machine is also difficult to use for folding because it is not neat to fold. Thus, through various research, many improvements were made to satisfy all the problems to meet the prefect specifications some of part of the components.

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