UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF AN AUTOMATIC HELMET WASHER USING ARDUINO

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Power) with Honours.

by

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DECLARATION

I hereby, declared this report entitled “PSM Title” is the results of my own research except as cited in references.

Signature : …….

Author’s Name : ……

Date : ……

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics) (Hons.). The member of the supervisory is as follow:

…….

(Project Supervisor)

ABSTRACT

The main goal of my final year project is to design and implement a user friendly and automated helmet washer which is controlled by Arduino. This project focuses on how to design and develop a product prototype of an automatic helmet washer and test the performance of the developed prototype efficiency to clean a helmet by observing its spraying pattern. In this prototype development project, some of the designs potential and materials used is suggested. Several discussions with the industries and potential consumers have been done in order to derive the best design for this project. SayapNiaga Bikes based in Kuala Lumpur and Malacca are involved in this project for product consultation and provide an amount of fund for this project development. The idea for this item is that it applies the same idea as a launder machine for garments which is without inordinate utilization of water. With a specific end goal to avoid the use of water, the industry had proposed to utilize a nanotechnology synthetic cleaner for bikers as its cleaning agent. Also, the type of helmet that will be focus on for this project is currently for a full face helmets .. This project suggests automated helmet washer which utilize an Arduino as a controller with Mini Water Pump as its primary parts.

ABSTRAK

Matlamat utama projek tahun akhir saya adalah untuk mereka bentuk dan melaksanakan prototaip mesra pengguna dan mesin pencuci topi keledar automatik yang dikawal oleh Arduino. Projek ini memberi tumpuan kepada bagaimana untuk mereka bentuk dan membangunkan prototaip produk topi keledar mesin basuh automatik dan mengujinya dengan melihat corak semburan untuk mengenalpasti adakah ia berkesan untuk membersihkan topi keledar. Dalam projek pembangunan prototaip, beberapa potensi reka bentuk dan bahan-bahan yang digunakan adalah disyorkan. Beberapa perbincangan dengan industri dan pengguna yang berpotensi telah dilakukan dalam usaha untuk memperolehi reka bentuk yang terbaik untuk projek ini. SayapNiaga Bikes berpangkalan di Kuala Lumpur dan Melaka terlibat dalam projek ini untuk rundingan produk dan menyediakan sejumlah dana untuk pembangunan projek ini. Idea untuk item ini adalah bahawa ia terpakai idea yang sama seperti mesin Launder untuk pakaian yang tanpa penggunaan air yang berlebihan. Dengan matlamat akhir khusus untuk mengelakkan penggunaan air, industri itu telah mencadangkan untuk menggunakan pembersih sintetik nanoteknologi untuk penunggang sebagai ejen pembersihan. Juga, jenis topi keledar yang akan memberi tumpuan kepada projek ini pada masa ini untuk topi keledar muka penuh.. Projek ini mencadangkan mesin pencuci topi keledar automatik yang menggunakan satu Arduino sebagai pengawal dengan pemampat sebagai bahagian-bahagian utamanya.

DEDICATIONS

Special dedicated to

My beloved parents, my friend and siblings, who have encourage, guided and supported me throughout my study.

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I would like to take this opportunity to express my deepest gratitude to my project supervisor, Dr Aliza bt Che Amran who has persistently and determinedly assisted me along the progress of the project. It would have been difficult to complete this first half of the project without enthusiastic support, insight and advice given by her.

My outmost thanks a lot for my family and friends who has given me support during my academic years. Without them, I might not be able to finish the project. I have gained a lot of help and support from friends and staffs in their faculty. I want to take this opportunity to say thank you to them for their advices and idea that help me with the project.

Thank you so much.

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LIST OF SYMBOLS AND ABBREVIATIONS

AC	=	Alternating Current
DC	=	Direct Current
Micro C	=	Microcontroller
PWM	=	Pulse Width Modulator
USB	=	Universal Serial Bus
ICSP	=	In Circuit Serial Programming
ISIS	=	Integrative Systems Implementation Software
CFC	=	Chloro-Fluoro-Carbon

CHAPTER 1

INTRODUCTION

1.1 Background Of Study

The idea of this project is to propose the ways on how to counter and solve the problems that many of people especially all motorcyclist in this country or people who wear any helmets. The concept for this product is that it applies the same concept as a dry clean method for clothing which is without the use of water.

Some of the design and the process involves in this prototype development is also taken from the discussions that had been done with SayapNiaga Sdn.Bhd in the early stage of this project proposal and will be also discuss from time to time until this project is finished. For this project, it will just use a biodegradable and nanotechnology bike cleaner (Mucc-Off) such as tetrachloro-ethylene (Mucc-Off 2016) instead of water which is suggested by the company itself to clean the helmet. Technically it will produce some sort of residue due the chemical reaction in the helmet. So the residue will be clean by the blower. This process involve for this prototype is automated by using an Arduino as it brain or controller.

After finishing all the researches including interview, survey and some discussion, the expected mechanical design and workflow has been decided for the time being.

1.2 Problem Statement

Helmets are one of the common gear that were used by people for safety issues refer to which the industry as “pere”. The problem we are facing today is that we are often using it day and night, rains and hot day, but we are not taking a good care of its hygiene and its cleanliness. Especially when a motorcyclist rides and wear a helmet, their sweat will cause the helmet to become wet and smells bad. Plus, the latest and the conventional way that people used nowadays is to wash their helmet only using water and shampoo or body soap. After that, the helmet is dry under the sun. The main problem here is it will take too much time and drying the helmet will be very difficult during raining season especially in this country.

Also a response received from SayapNiaga Bikes when they noticed a booth that provides helmet cleaning services at the Bike Week event at Kuala Terengganu. The method that they used were only by manual cleaning (human labor) which the estimated time taken to complete processing the helmet is more than one hour because of too many customer. So, from these problems there are huge potential demand from the market with this product if i manage to fulfil the criteria that they want.

1.3 Objective

The objective of this report is:-

- To design a prototype of an automatic helmet washer
- To develop the prototype by using Arduino
- To test the performance of the helmet washer using the develop prototype.

1.4 Work Scope

- The type of helmet that will be focus on is a full face helmets. Full face helmet is different from the normal open face helmet that usually people wear. It cover the entire scull and protect the chin of the rider. Many full face helmets include vents to increase the airflow to the rider's head and have its own smart air flow system.
- The scope for this product is to make sure that the inside of a helmet is washed and clean automatically without the use of water but only using latest chemical solvent or nanotechnology bike cleaner.
- This product also is more focus on the bike exhibition or to be put at the motorcycle company to help people clean their helmet automatically without human labour.
- A nozzle will be used to spread the chemical solvent uniformly inside the helmet.
- Mechanical design : This prototype design require several components or equipments such as its enclosed main body ,one unit of air brush compressor, 1 unit of valve, two types of nozzle, and other parts.
- Electronic design : For this prototype, Arduino will is used as a controller and to be programmed to make the prototype become automated.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Most importantly, before directing any undertaking or item models we need to allude to any examination or items that are as of now exist and set up. For this protective helmet washer model, we can take couple of thoughts on the most proficient method to direct and finishing the task in view of their inquires about. Also, this chapter is important in order to keep the procedure on track with a latest product used.

Recently, there are a few products which apply the same task as this project development prototype. This part will discuss about the helmet washer exist in the market, their specification and how its function. Many software and hardware and software also will be discussed.

2.1 Helmet Washer Machines at The Market.

In this country, an automated helmet washer is not yet widely use. But internationally, there are a few companies that produce the prototype which have almost the same criteria and task with this project.

2.1.1 Automatic Coin-Operated Or Electronic Card-Operated Washing Machine And Dryer For Helmets (U.S. Patent No. US8317933 , 2012)

This is a programmed coin-worked or electronic card-worked clothes washer and dryer for helmets, which capacities as a programmed distributing administration machine and consolidates the fast and powerful washing of a helmets with the insurance of its parts and fittings .Until today there are no comparative gadgets which draws close to take care of this issues. Specifically, a container with tepid water and cleanser is known, which is typically utilized for the washing of a helmets. Taking after that, the helmets is washed out and is permitted to dry in a room temperature.

The negative impact of the old way of a helmet washer is the time taken for the washing and drying process to be complete. What's more, the routine washing method wears off the internal instance of the helmet (because of moistness), which taking after various washings begins to disintegrate or rot. So for this anticipate, we attempt to avoid to avoid (or nor utilizing it by any means) as a result of time for the helmet to dry will be longer even there is a dryer inside the framework. Rather than utilizing cleanser, we will utilize some nanotechnology substance for cleaning materials.

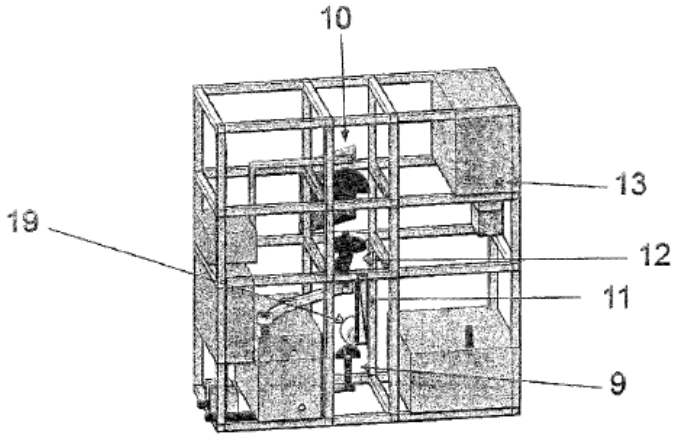

Figure 2.1 : The cross section view of the Automatic Coin-Operated Or Electronic Card-Operated Washing Machine And Dryer For Helmets (U.S. Patent No. US8317933 , 2012)

2.1.2 **Helmet Spa** (Helmet Spa 2016)

This is the latest automatic helmet washer that available in United States America known as Helmet Spa. The system for this product is almost hands-free. First, it injects the chemical solvent into the lining of the helmet. High power rotating jet is used to provide cleaning power and dry the helmet. The overall process takes place about 30 minutes which is quite good for the overall process including cleaning and drying the helmet. Also, a biodegradable cleaning fluid designed specifically for this process that cleans and lifts removes bad smell and clean the helmet lining.

Figure 2.2: Helmet Spa Model

(Source< Home Page. http://www.helmetspa.com/ >1/6/2016)

Furthermore, applying concoction treatment on the fabrics to grant antimicrobial properties, UV resistance and self-cleaning properties. The properties of the fabric test prior and then afterward treatment were assessed utilizing radar graphs as a part of terms of the utilitarian execution. The outcomes uncovered that 100% cotton treated fabric with twill 1\4 structure was the best specimen in

accomplishing high mechanical, physical and assurance properties for conceding solace variables (Ali Marwa, A., Amr, A., Abou-Okeil, A., & Aly, N. M. ,2013).

2.1.3 **Helmet Cleaning Apparatus** (U.S. Patent No. US 20140365360 A1, 2014)

This machine works like a vending machine for drinks and food. It provides a coin slot and also a card slot for payment. This apparatus design is in a rectangular shape with a washing compartment cover with transparent lid. Spherical shape helmet stand is designed to place the helmet fits with the helmet shape. There is tube outlet for vacuum and steam cleaning on the surface of the spherical shape mount. The first process is steam cleaning followed by vacuum cleaning. The vacuum will suck the waste product produced from the steam cleaning process.

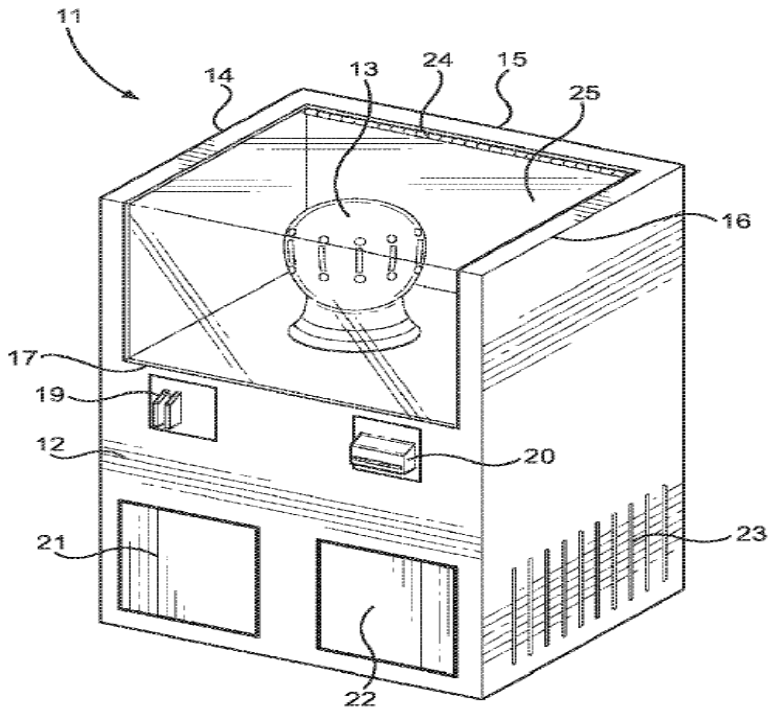

Figure 2.3: Helmet Cleaning Apparatus (U.S. Patent No. US 20140365360 A1, 2014)

2.2 Hardware Specification

In this project, there are a few main parts that will be use :

1) RC Servo Motor (Metal Gear)
2) Microcontroller (Arduino UNO & ATmega328)
3) 12 V DC Mini Water Pump
4) Blower

2.2.1 RC Servo Motor (Metal Gear) (Cytron 2016)

This metal gear RC servo with 17kg.cm holding will be used as a linear motion mechanism for the helmet washer. The advantage of RC servo over the DC brush motor is the ability to control its rotation angle. So, the distance will be control easily by adjusting the angle in Arduino programs.

Figure 2.4 : RC Servo Motor (Metal Gear) (Source< http://www.cytron.com.my/p-hd-1501mg> 1/6 2016)

Specification:

- Origin: China
- Metal gears
- Operating Voltage: 4.8 - 6VDC
- Speed at 6.0V(no load): 0.14 s/60°
- Torque at 6.0V : 17 kg.cm (~1.667 N.m)
- Size: 40.7x20.5x39.5mm
- Weight: 60g
- Rotation angle: 180 degree
- Package includes plastic servo horn and accessories
- You may need:

2.2.2 Microcontroller (Arduino UNO & ATmega328) (Arduino 2016)

This microcontroller will be use to become the brain for this product which is to control the system. The Arduino Uno is a microcontroller board based on the ATmega328 . It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

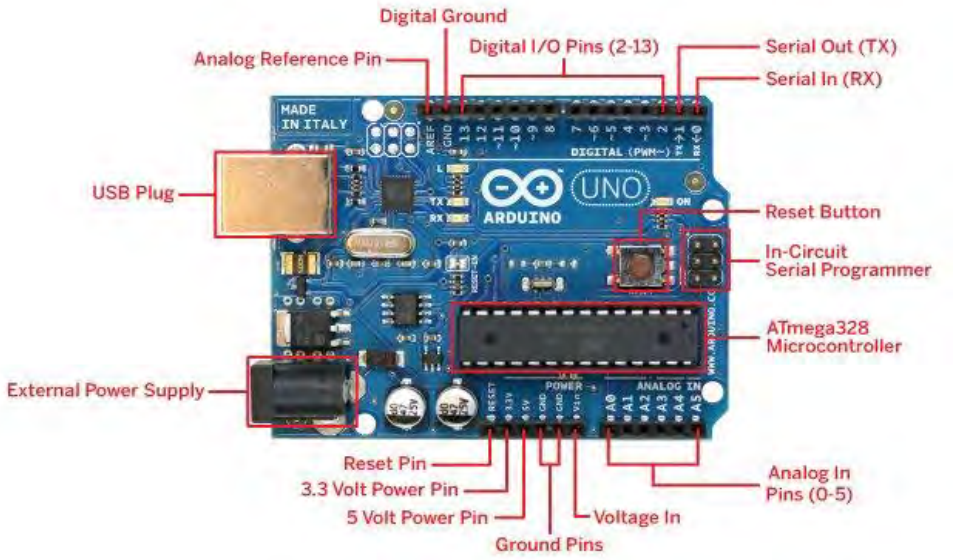

Figure 2.5 : Arduino UNO

(Source< Arduino (2016) *ArduinoBoardUno*. Available at: https://www.arduino.cc/en/Main/ArduinoBoardUno >1 June 2016)

Technical Specification:

- 14 digital input/output pins (of which 6 can be used as PWM outputs)
- 6 analog inputs, a 16 MHz crystal oscillator
- USB connection
- Power jack
- ICSP header
- Reset button
- Serial Out (TX), Serial In (RX)