



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOPMENT OF INTERACTIVE PROPELLING
WORKBENCH FOR DISABLED PEOPLE**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronics Engineering Technology (Telecommunication) with Honours.

by

NURUL HUDA BINTI JUNIT

B071510037

921107-08-6104

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING
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32610 Seri Iskandar Perak

Tarikh:

Disahkan oleh penyelia:

.....
En. Ahmad Fauzan Bin Kadmin
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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

Signature:

Supervisor : En. Ahmad Fauzan Bin Kadmin

Signature:

Co-supervisor: En. Shamsul Fakhar Bin Abd Gani

ABSTRAK

Tesis ini membentangkan perkembangan meja kerja untuk orang kurang upaya dengan menggunakan motor DC dan mikrokontroler Arduino UNO. Workbench adalah tempat di mana pekerja kebanyakan melakukan aktiviti kerja praktikal mereka. Projek ini bertujuan untuk mengatasi masalah yang berlaku di kawasan kerja yang melibatkan orang kurang upaya. Kebanyakannya, orang kurang upaya sukar mencari pekerjaan yang sesuai kerana kekurangan fizikal mereka yang tidak sesuai dengan persekitaran kerja. Isu ini menjadi serius kerana ia tidak adil untuk orang kurang upaya yang masih menentukan untuk mendapatkan pekerjaan dan menjalani kehidupan sebagai manusia biasa. Projek ini melibatkan penggunaan motor DC untuk menggerakkan meja kerja yang akan mengawal perisian dan perkakasan Arduino. Gerak motor dikawal oleh kayu bedik yang telah diprogramkan dengan UNO Arduino, motor dan joystick disambung dengan menggunakan kabel penyambung. Hasilnya menyimpulkan perkakasan berfungsi sebagai meramalkan yang motor dapat mengawal arah putaran roda dan sistem IoT dapat berkomunikasi dengan baik dengan peranti untuk memaparkan data yang tepat prestasi motor DC.

ABSTRACT

This thesis presents the development of propelling workbench for disabled people by using DC motor and microcontroller of Arduino UNO. Workbench is a place where a worker mostly done their practical work activities. This project are purposely to overcome the problem that happened in the workspace area that involving disabled people. Mostly, disabled people hard to find a suitable job due to their physical lack which not suitable with the work environment. This issue become serious as it unfair for disabled people who still determine to get a job and live a life as a normal human being. This project is involved the usage of DC motor to move the workbench which will be controlling by Arduino software and hardware. The motor motion is controlled by the joystick which been programmed with Arduino UNO, motor and joystick is connected by using a connector cable. The results conclude of the hardware are function as the predict which the motor can control the directions of the wheels rotation and the IoT system can communicate well with the device to display the accurate data of the DC motor performance.

DEDICATION

Alhamdulillah all praise to the Almighty Allah S.W.T. This thesis is dedicated to my family especially my father Junit Yeop Ahmad, my mother Norainun Mohd Shah and my beautiful sisters Noruljunita, Noruljuliana, Noruljunidah, Noruljuliati, Norfajillah, Noranira and Nurul Ain. Also to my supervisor Encik Ahmad Fauzan Kadmin and my dear friends. Thank you for their endless support.

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LIST OF SYMBOLS

%	-	Percent
mm	-	Millimeter
cm	-	Centimeter
V	-	Volts
Ω	-	Ohm
kg	-	Kilogram
s	-	Second
g	-	Gravity = 9.81 m/s
I	-	Moment of inertia
l	-	Length

LIST OF ABBREVIATIONS

IoT	Internet of Thing
DC	Direct Current
Wi-Fi	Wireless Fidelity
I/O	Input/Output
GPS	Global Positioning Satellite
LCD	Liquid Crystal Display
PWM	Pulse Width Modulation
Tx	Transmit
Rx	receive

CHAPTER 1

INTRODUCTION

In this chapter, it will be discussed briefly about the powered workbench. This chapter also will give a brief on the project background, problem statement, objective, scope, and methodology of the project. Understanding on the project can be gained from this chapter.

1.1 Project Background

Workbench is a place where a worker does their practical work. There is several range of workbench types from a normal surface to a very practical design where can fit a worker job scope. Usually a workbench is used by a worker to organize their tools or to hold their work pieces.

This project is purposely to overcome the problem that happened in the workspace area. Mostly, disabled people find it hard to find a suitable job due to their physical lack which is not suitable with the work environment. This issue becomes serious as it is unfair for disabled people who still determine to get a job and live a life as a normal human being. It also occurs when some employees cannot provide special facilities for this group of people.

As an overview of this project, there will be a device which is the propelling workbench as it will be a portable motor wheel to move a chair workbench. The microcontroller will operate and execute the data information as it sends the data via IoT

system. The microcontroller react as a controlling system for the motor motion and joystick connection.

1.2 Problem Statement

As the serious issue of unemployed graduate statistic reported happen today, so do the percentage of unemployed disabled people which face the same problem. According to the Department of Labour in 2016, the unemployment rate for the general population was 4.6%, but for people with disabilities the rate is pretty high with 10.5%. In other research was done at New Zealand in 2013 also show the high percentage rate of unemployed disabled people as shown in Figure 1.1 below.

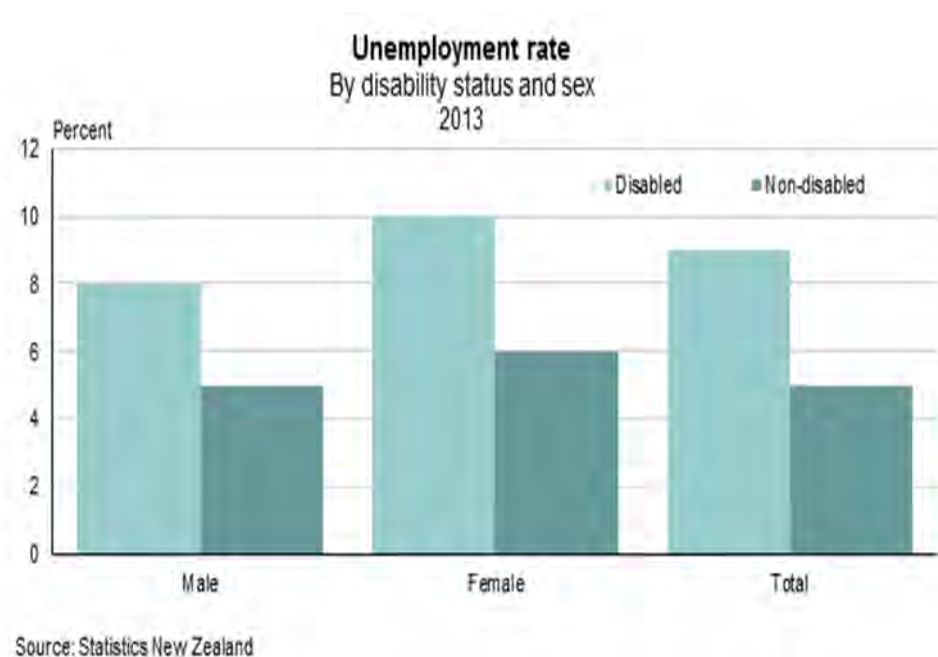


Figure 1.1: Unemployment rate in 2013

This problem encourage when there is no special treatment for disabled people especially when searching for a suitable job. There is still have many company who not willing to hire disability person because of not ready to offer suitable work environment. Besides that, disabled person itself feel uncomfortable to work along with general population because of their weakness which having a wheelchair for example.

Hence, the invention of this project can overcome the problem by developing the portable workbench to make the work environment become more practical for everyone.

1.3 Objective

The objective of this development project are:

- 1) To develop a portable propelling workbench using DC motor along with IoT data visualization.
- 2) To analyse system performance in workspace area for disabled people.

1.4 Project Methodology

To perform a successful project, a correct method and procedure of this project is needed. This project is to provide a portable propelling workbench for disabled people. In addition, this project also to make everybody feel comfortable working together. The methodology steps of this project is as below:

- i. Make a research on other journal that has same pattern of workbench design and will be put in literature review.
- ii. Follow by knowing characteristic of project, build design of project, step of project development.
- iii. Testing software and hardware
- iv. Make experiment and figure out expected outcome for this project.

At the end of this project, it is expected to be a successful software and hardware development system. The results of the hardware are function as the predict which the motor can control the directions of the wheels rotation and the IoT system can communicate well with the device to display the accurate data.

1.5 Project Scope

Interactive propelling workbench is project that introduce the development of portable workbench by using DC motor and microcontroller.

This project is involved the usage of DC motor to move the workbench which will be controlling by Arduino software and hardware. The motor motion is controlled by the joystick which been programmed with Arduino UNO, motor and joystick is connected by using a connector cable. In DC motor, it process the data of the voltage motor as it needs to transfer to the IoT platform which is ThingSpeak. This data is transferred by using the Wi-Fi connection which will display the visualization data. Other than that, LCD screen is used to display the motor operation status to the user.

CHAPTER 2

LITERATURE REVIEW

This chapter need to be done before proceeding with the project. It is important to gain more knowledge about the project so that it will be substantial. It is the process of collecting knowledge from the reading activity of the works of others before present on our own work. Literature review can be done by found from several sources such as books, journals, thesis report and valid website. This chapter will explain some project that related to workbench especially for disabled people.

2.1 Workbench

Based on the study that had been done, basically workbench is a place where a worker done their practical work. There is several range of workbench types from a normal surface to a very practical design where can fit a worker job scope. Usually a workbench is used by a worker to organize their tools or to hold their work pieces. A few factors to be consider in choosing the right workbench which is the weight capacity of the workbench need to support, the workbench surface type which will influence by the product object and the bench flexibility which very important to avoid harmful to the workers and workstation. Therefore, the design and the suitability must be significant in order to provide the effective workspace service and give benefit to the companies.

2.2 Traditional Workbench

Traditional workstation usually designs with low considering on the specific needs and requirement of the users. Therefore, some researcher come out with various ideas of workbench designs focuses more on relationship between user requirement and design requirement. In Figure 2.1 shows the example of the normal flat surface traditional workbench that always been used by a worker.(Çevik Onar, Büyüközkan, Öztayşi, & Kahraman, 2016) Basically traditional design has involved in innovation phase such a foldable workbench which combine work table and a portable fold leg that can be erected and collapsed by a simple one step motion of the operator. This invention of the workbench is good as the advantages of easy to assemble and keep it in a small space.



Figure 2.1: The normal flat traditional workbench

2.3 Automatic Workbench

As in the modern era which mostly introduce variety types of automatic machine to control and develop a product, human operators is still relevant to be part of manufacturing industries since not every production task can be done by the automated machine. Due to smart workbench literature, this issue is used as a guideline to develop a new smart workbench design. Based on different approaches towards the problem such as the assistance and monitoring of manual assembly tasks. Besides that, the purpose of smart workbench in industrial also to adapt the workspace environment and handling a worker life routine especially a handicapped person. Figure 2.2 shows the smart workbench design for assembly and packaging tasks. (Niedersteiner, Pohlt, & Schlegl, 2015)



Figure 2.2: The smart workbench design