AUTOMATED PORTABLE MEDICAL CARE HOSPITAL BED FOR PATIENT WITH INFECTIOUS DISEASE

SAIDATUL SHAKIRA BINTI SHAKIREN
B071710649

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BACHELOR OF ELECTRONICS ENGINEERING TECHNOLOGY (INDUSTRIAL ELECTRONICS) WITH HONOURS

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Faculty of Electrical and Electronic Engineering Technology

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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AUTOMATED PROTABLE MEDICAL CARE HOSPITAL BED FOR PATIENT WITH INFECTIOUS DISEASE

SAIDATUL SHAKIRA BINTI SHAKIREN

A thesis submitted
in fulfullment of the requirements of the degree of
Bachelor of Electronics Engineering Technology (Industrial Electronics) With Honours.

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Faculty of Electrical and Electronic Engineering Technology

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2021

DECLARATION

I declare that this Choose an item. entitled " Automated Portable Madical Care Hospital Bed for Patient with Infectious Disease" is the result of my own research except as cited in the references. The Choose an item. has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature :

Name : Saidatul Shakira Binti Shakiren

Date : 12 / 02 / 2021

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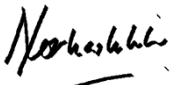
APPROVAL

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 the Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours.

Signature : 

Supervisor Name : Ts. Dr. Norhashimah Binti Mohd Saad

Date : 14 / 02 / 2021

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DEDICATION

This project report is lovingly dedicated to my family member my beloved mother Hasnah Binti Osman, to my father Shakiren Bin Salleh @ Ismail, also to my stepmother Nor Sazana Binti Deraman, my stepfather Harmain Bin Asnawi and my sisters, who was constant source of inspiration. A gratitude of thank you to my supervisor Ts. Dr. Norhashimah Binti Mohd Saad and all my lecturer that have been helping and supporting me throughout this project. They have given me the drive and disciple to tackle any task with enthusiasms and determination. Last but not least, to all my friends that have been there for me. Without their support this project would not been made possible.

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ABSTRACT

The automated portable medical bed is the solution to ease the burden and minimize the risk of infectious disease spread to the medical staff. This project aims to build a prototype of an automated portable medical care hospital bed for a patient with infectious disease. This project gives an innovation in the use of the automated bed to improve the quality of working environment for medical staff. The system comprises a medical bed, automatic guidance, a wireless controller and human follower using ultrasonic sensors. The wireless remote drives the automatic bed using buttons A, B, C and D representing the movement forward, backward, right and left. Meanwhile, the human follower controls the direction of the portable bed prototype automatically by following the human position at a distance between 50 cm to 100 cm from the ultrasonic sensor. Overall, the prototype of an automated portable hospital bed for a patient with infectious disease work well. Innovation in using automatic beds in hospitals can help medical staff work more efficiently in a safer work environment.

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ABSTRAK

Katil hospital mudah alih automatik adalah salah satu penyelesaian bagi mengurangkan beban tugas serta risiko jangkitan penyakit berjangkit kepada petugas kesihatan. Tujuan projek ini dijalankan adalah untuk mereka prototaip katil hospital mudah alih automatik untuk pesakit dengan penyakit berjangkit. Projek ini memberikan inovasi baru dalam penggunaan katil automatik sebagai usaha untuk meningkatkan kualiti persekitaran kerja petugas kesihatan Sistem ini terdiri daripada katil perubatan automatic, alat kawalan tanpa wayar dan pengikut pergerakan manusia *(human follower*) menggunakan sensor ultrasonik. Alat kawalan jauh dapat mengawal pergerakan katil automatik ini dengan penggunaan butang A, B, C dan D mewakili pergerakan ke depan, belakang, kanan dan kiri. Manakala, *human follower* mengawal pergerakan prototaip katil mudah alih secara automatik dengan mengikut kedudukan manusia pada jarak antara 50 cm hingga 100 cm daripada sensor ultrasonik. Secara keseluruhannya, prototaip katil hospital mudah alih automatik untuk pesakit dengan penyakit berjangkit ini dapat berfungsi dengan baik. Inovasi dalam penggunaan katil automatik di hospital dapat membantu petugas kesihatan bekerja dengan lebih efisien serta dalam persekitaran kerja yang lebih selamat.

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

TABLE OF CONTENTS

PAGE

DECLARATION

APPROVAL

DEDICATION

ABSTRACT **i**

ABSTRAK **ii**

ACKNOWLEDGEMENTS **iii**

TABLE OF CONTENTS **iv**

LIST OF TABLES **vi**

LIST OF FIGURES **vii**

LIST OF SYMBOLS AND ABBREVIATIONS **ix**

LIST OF APPENDICES **x**

LIST OF PUBLICATIONS **xi**

CHAPTER 1 INTRODUCTION **1**

1.1 Background 1

1.2 Problem Statement 1

1.3 Objective 3

1.4 Scope Project 3

CHAPTER 2 LITERATURE REVIEW **5**

2.1 Overview 5

2.2 Microcontroller 5

2.2.1 Comparison Between Microcontroller 5

2.2.2 Comparison Between Arduino 9

2.3 Motor 11

2.3.1 Comperison Between Power Window Motor With DC Motor 11

2.4 Comparison Between Automated Bed 13

2.4.1 Automated Bed Assignments in a Complex and Dynamic Hospital Environment 13

CHAPTER 3 METHODOLOGY **16**

3.1 Overview 16

3.2 Project Planning 16

3.3 Process Flow of The Project 20

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

3.3.1 Overall Flowchart of The System 21
3.3.2 Input From Wireless Switch 22
3.3.3 Input From Human Follower Using Ultrasonic Sensor 23
3.4 Develop Hardware 25
3.4.1 Arduino UNO R3 26
3.4.2 Ultrasonic Sensor 27
3.4.3 RF Module and Switch 27
3.4.4 Power Window 29
3.4.5 Relay Module 30
3.4.2 Battery 12 V 31
3.5 Software That Uesd 31
3.5.1 The Integrated Development Environment (IDE) 31
3.5.2 Fritzing 33
3.6 Project Costing 35

CHAPTER 4 RESULTS AND DISCUSSION 37
4.1 Overview 37
4.2 Result 37
4.2.1 Hardware Circuit Diagram 37
4.2.2 Pin Connection 40
4.2.3 Hardware Component Setup 41
4.2.4 Project coding 42
4.2.4.1 Coding For Wireless Switch 42
4.2.4.2 Coding For Human Follower 48
4.4 Discussion 50

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS 52
5.1 Overview 52
5.2 Conclusion 52

REFERENCES 54

APPENDICES 56

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF TABLES

TABLE	TITLE	PAGE
Table 2.2.1	Comparison between Arduino and PIC18F4550	8
Table 2.2.2	Comparison between Arduino Mega and Arduino UNO	10
Table 2.3.1	Comparison between Power window motor and DC motor 12V	13
Table 2.4.1	Comparison our system with another system	15
Table 3.2.1	Gun chart of this project for Semester 1	18
Table 3.2.2	Gun chart of this project for Semester 2	20
Table 3.5.1	Part of IDE software and the explanation	33
Table 3.6	The list of hardware component project costing	36
Table 4.2.2.1	The connection of Arduino Uno R3 for wireless switch	40
Table 4.2.2.2	The connection of Arduino Uno R3 for human follower using ultrasonic sensor	41
Table 4.2.2.3	The input and output for relays	41

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 2.2	Example of Microcontroller	5
Figure 2.2.2.1	Arduino Mega	9
Figure 2.2.2.2	Arduino UNO	10
Figure 2.3.1	Power window motor	11
Figure 2.3.2	DC motor 12V	11
Figure 3.2	Flowchart Project Planning	17
Figure 3.3.1	Overall flowchart of project	21
Figure 3.3.2	Input from Wireless Switch	22
Figure 3.3.3	Input from human follower using ultrasonic sensor	24
Figure 3.4.a	Shows the hardware circuit board for wireless switch	25
Figure 3.4.b	Shows the hardware circuit board for human follower	26
Figure 3.4.1	Shows the Arduino UNO used in this project	26
Figure 3.4.2	Shows the ultrasonic sensor	27
Figure 3.4.3	Shows the RF module and the button	28
Figure 3.4.4	Shows the power window to control the wheel	29
Figure 3.4.5	Shows the relay module for two channels	30
Figure 3.4.6	Shows the battery power used in the project	31
Figure 3.5.1.1	IDE software	32
Figure 3.5.1.2	IDE software sketch	32
Figure 3.5.2.1	Fritzing Software	34

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 3.5.2.2 Fritzing software sketch 34

Figure 4.2.1.1 Shows schematic diagram of the wireless switch 38

Figure 4.2.1.2 Shows schematic diagram of the human follower system 39

Figure 4.2.3 Shows the prototype of automatic bed 42

Figure 4.2.4.1.1 Shows source code to declare ultrasonic sensors and wireless swith 43

Figure 4.2.4.1.2 Shows source code to declare wireless switch 44

Figure 4.2.4.1.3 Shows source code for obstacle detection using ultrasonic 45

Figure 4.2.4.1.4 Shows source code to control motor 47

Figure 4.2.4.1.5 Shows source code for declare of input and output 47

Figure 4.2.4.1.6 Shows source code for move the motor of system of bed for wireless switch 48

Figure 4.2.4.2.1 Shows source code for declaration 49

Figure 4.2.4.2.2 Shows source code for the motor movement when it goes forward, left, right and stop 49

Figure 4.2.4.2.3 Shows source code to set up the relay module 49

Figure 4.2.4.2.4 Shows source code to calculate the distance between the object 50

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF SYMBOLS AND ABBREVIATIONS

V	-	Voltage
m	-	Mile
A	-	Current
K	-	Kilo
B	-	Byte
M	-	Mega
hz	-	Frequency
W	-	Power

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LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix 1	Data Sheet for Arduino UNO	56
Appendix 2	Data Sheet for Relay 2 Channel 5V Module	57
Appendix 3	Guide Line for RF 433 Mhz Transmitter/ Receiver Module	58

LIST OF PUBLICATIONS

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CHAPTER 1

INTRODUCTION

1.1 Background

As we all know, the spread of COVID-19 virus is widespread worldwide. Until today, the World Health Organization states that over one million people worldwide have died due to the disease. The public also knows that this virus is easily spread just from others who have the virus. The disease spreads primarily from person to person through small droplets from the nose or mouth, which are expelled when a person with COVID-19 coughs, sneezes or speaks. These droplets are relatively heavy, do not travel far and quickly sink to the ground.

People can catch COVID-19 if they breathe in these droplets from a person infected with the virus. There are some symptoms of this virus, such as a mild cough or a mild fever, generally do not need medical treatment, it is only necessary to stay at home, isolate yourself and monitor the symptoms. But if you live in an area with malaria or dengue fever, it is important that you do not ignore the symptoms of fever. You need to get medical help. Malaysia also issued guidelines or Standard Operating Procedures (SOP) to ensure the total spread of the disease can be reduced.

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This chapter discusses the introduction, project background, problem statement, objectives and scope of this project. This project focuses on reducing the spread of infectious disease such as COVID-19, which is spreading among hospital medical practitioners.

1.2 Problem statement

Automated portable medical care hospital bed for a patient with infectious disease is a project that can help to ease burden of medical staff and to ensure their safety in order to improve hospital's working environment. The infectious disease such as novel coronavirus disease (COVID-19) is one of the most severe public health emergencies that need to face by medical staff. They are facing heavy workloads and high risk of infection (Zhang Z., Liu S., Xiang M., Li S., Zhao D., Huang C. & Chen S., 2020).

Even though there are many studies in this area, there are still several research gaps. Firstly, most of the innovation regarding hospital bed is more focusing on patient support. Hospital beds comprise complex mechanical and electronic components for movement, functionality and convenience for patients to use (Lemire Guy, Jean-Paul Dionne, Nicolas Cantin, Marco Morin, Richard Paré, Pascal Castonguay, Luc Petitpas & David Kim Soui Wan Fong, 2011). But, in the context of medical staff – is it easy to handle a huge and heavy bed with a patient on it when they need to allocate the patient to another section? This issue needs to highlight in order to ease medical staff burden.

Secondly, there are guidelines in occupational safety to secure the medical staff's health, safety, and welfare at the hospital. In the context of medical staff during the pandemic of COVID-19, that disease also spread among them who handling patients infected with COVID-19. Wearing full personal protective equipment (PPE) is the way to minimize exposure and contact between medical staff and infected patients. As the new cases of COVID-19 are increasing every day worldwide with the new variant reported, how to ensure the safety of medical staff, especially to minimize the contact with the infected patients?

Coherence with the unresolved question above, automated portable medical care hospital bed for a patient with infectious disease is a project that can help lessen the infection among medical staff in order to improve occupational safety during an infectious disease outbreak and also reduce their workloads.

1.3 Objective

The purpose of this project is to build an automated portable medical care hospital bed for patient, where it can be moved in any direction by using a multiple method. Therefore, some of the objectives that need to achieve in the project includes:

i. To develop a prototype of an automated bed system integrated with microcontroller based on Atmega328 called Arduino Uno R3 in order to improve hospital's working environment.
ii. To analyze the circuit diagram using Fritzing and Arduino software as a coding for the system.
iii. To evaluate the performance of the system based on its functionality.

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1.4 Scope project

In order to achieve the objectives, this project is divided into two main parts. The first main part include the programming coding for the automated following functions and obstacle detection. While for the second part is the hardware of wire connections from Arduino to sensors and output device. The scope of this project is stated below:

i. To design and construct the circuit using Fritzing and Arduino Software as a

coding for the system.

ii. Control bed using wireless switch and human follower by using ultrasonic sensor.

iii. Ultrasonic sensors to detect obstacles between a certain ranges.

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CHAPTER 2

LITERATURE REVIEW

2.1 Overview

This chapter discusses the literature review for the "Automated portable Medical care hospital bed for patient with infectious disease" design, and the literature evaluation helps throughout the technique of discovering the right interface features, device, and programming approach. In this chapter, a particular lookup is needed to determine the required software and method of improvement based on comparing the project and the desire to create this project using the software. The secondary source is observed, analysed, and summarized, which is important for evaluation. The software development resources help the programmer build and change the program to find the difference between programming languages and software applications.

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2.2 Microcontroller

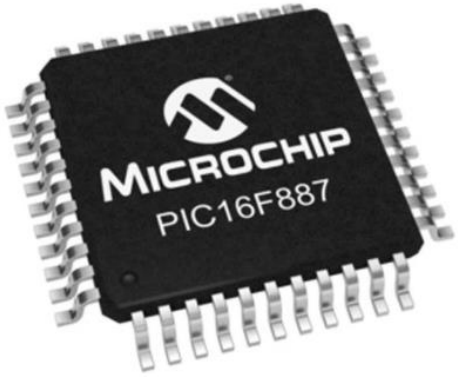

Figure 2.2: Example of Microcontroller

A compact device on a single metal-oxide-semi conductive, integrated MOS and IC chip is a microcontroller. A microcontroller requires one or two CPUs and memory and programmable peripherals with input/output. Unlike in personal computers or in other general applications with separate discrete chips, microcontrollers are designed for embedded applications. Automatically controlled goods and equipment, such as automotive motor control systems, implantable medical instruments, remote controls, office machinery, appliances, tools, toys and other embedded systems, are fitted with microcontrollers.

By that the size and the expense of a microprocessor, memory and input/output equipment architecture it is cost-effective for microcontrollers to digitally monitor many more machines and processes. Microcontrollers for mixed signals are popular, incorporate analog components used to monitor electronic non-digital systems. Microcontrollers are an inexpensive and common way to capture, sensor and work physically as edge devices inside the internet.

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In other consumer goods or machines, including the phones, peripherals, motor vehicles and home equipment for computer systems, most programmable microcontrollers used today are integrated. Input and output instruments include solenoids, LCD panels, relays, switches and sensors for data, for example, moisture, temperature or illumination.

2.2.1 Comparison between Microcontroller

PIC is a microcontroller designed with Microchip which is simple and easy to implement. Microchip Peripheral Device Controller (PICs). The quick programming and