\

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Faculty of Electrical and Electronic Engineering Technology

Development of The Automated Medical Trolley under COVID-19 Pandemic

NUR AQILAH BINTI KAMARUDIN

Bachelor of Electronics Engineering Technology with Honours

2021

Development of The Automated Medical Trolley under COVID-19 Pandemic

NUR AQILAH BINTI KAMARUDIN

**A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electronics Engineering Technology with Honours**

Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI TEKNOLOGI KEJUTERAAN ELEKTRIK DAN ELEKTRONIK

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek   : Development of The Automated Medical Trolley under
            Covid-19 pandemic

Sesi Pengajian : 2021

Saya Nur Aqilah Binti Kamarudin mengaku membenarkan laporan Projek Sarjana

Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:
1. Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara
   institusi pengajian tinggi.
4. Sila tandakan (✓):

☑ **SULIT***   (Mengandungi maklumat yang berdarjah
                    keselamatan atau kepentingan Malaysia
                    seperti yang termaktub di dalam AKTA
                    RAHSIA RASMI 1972)
☐ **TERHAD***   (Mengandungi maklumat terhad yang telah
                    ditentukan oleh organisasi/badan di mana
                    penyelidikan dijalankan)
☐ **TIDAK TERHAD**

                                    Disahkan oleh:

_____   _____
    (TANDATANGAN PENULIS)   (COP DAN TANDATANGAN PENYELIA)
Alamat Tetap:
 Kampung Paloh Rambai Batu 11, 16450   **TS. DR. NORHASHIMAH BINTI MOHD SAAD**
Ketereh, Kelantan.   Pensyarah Kanan
                                Jabatan Teknologi Kejuruteraan Elektronik dan Komputer
                                Fakulti Teknologi Kejuruteraan Elektrik & Elektronik
                                    Universiti Teknikal Malaysia Melaka

Tarikh: 11/01/2022   Tarikh: 11/01/2022

*CATATAN: Jika laporan ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan
dengan menyatakan sekali tempoh laporan ini perlu dikelaskan sebagai SULIT atau TERHAD.

DECLARATION

I declare that this project report entitled "Development of the Automated Medical Trolley under Covid-19 " 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.

Signature :

Student Name : NUR AQILAH BINTI KAMARUDIN

Date : 11/01/2022
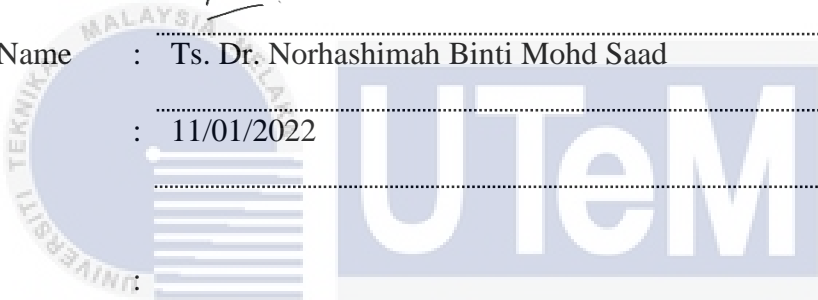
APPROVAL

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 Electronic Engineering Technology with Honours.

Signature   :   *Norhashimah*

Supervisor Name   :   Ts. Dr. Norhashimah Binti Mohd Saad

Date   :   11/01/2022

Signature   :

Co-Supervisor
Name (if any)   :

Date   :

DEDICATION

This project report is dedicated to my devoted mother Zuran binti Sulaiman, my father Kamarudin bin Hassan, and my siblings, who have provided as a continuous source of inspiration. I'd like to convey my gratitude to my supervisor, Ts. Dr. Norhashimah Binti Mohd Saad, as well as to all of my lecturers, for their aid and assistance throughout this project. They've given me the motivation and discipline to attack each project with zeal and dedication. Finally, but certainly not least, I want to express my gratitude to all of my friends. Without their assistance, this project would not have been possible.

ABSTRACT

COVID-19 cases continue to rise daily, leaving frontline personnel, particularly medical personnel, exhausted and at risk of infection. As is well known, this virus is transferred via air, physical touch between humans, and even direct contact between humans and objects. According to a current study, the COVID-19 virus can survive for up to 72 hours on the surface of plastic and stainless steel, so it is best to avoid any direct contact with medical personnel. The medical trolley alleviates the workload on medical professionals and reduces the risk of infectious disease spread. The purpose of this project is to create a prototype of a medical trolley for an infectious disease patient in order to limit the danger of infection to medical personnel. This concept introduces a new way of utilising the medical trolley in order to improve the working environment for medical personnel. Additionally, the system makes use of a human follower that is equipped with ultrasonic sensors. By automatically following the human location at a predetermined distance, the human follower controls the direction of the medical trolley prototype. Additionally, medical trolley innovation can assist medical workers in performing their duties more efficiently and in a safer work environment.

ABSTRAK

Kes COVID-19 terus meningkat setiap hari, menyebabkan kakitangan barisan hadapan, terutama kakitangan perubatan, kelelahan dan berisiko dijangkiti. Seperti diketahui, virus ini ditularkan melalui udara, sentuhan fizikal antara manusia, dan bahkan hubungan langsung antara manusia dan objek. Menurut kajian semasa, virus COVID-19 dapat bertahan hingga 72 jam di permukaan plastik dan keluli tahan karat, oleh itu lebih baik untuk mengelakkan sebarang kontak langsung dengan pegawai perubatan. Troli perubatan mengurangkan beban kerja profesional perubatan dan mengurangkan risiko penyebaran penyakit berjangkit. Tujuan projek ini adalah untuk membuat prototaip troli perubatan untuk pesakit penyakit berjangkit untuk membatasi bahaya jangkitan kepada pegawai perubatan. Konsep ini memperkenalkan cara baru untuk menggunakan troli perubatan untuk meningkatkan persekitaran kerja bagi kakitangan perubatan. Selain itu, sistem ini menggunakan pengikut manusia yang dilengkapi dengan sensor ultrasonik. Dengan mengikuti lokasi manusia secara automatik pada jarak yang telah ditentukan, pengikut manusia mengawal arah prototaip troli perubatan. Inovasi troli perubatan dapat membantu pekerja perubatan menjalankan tugas dengan lebih cekap dan dalam persekitaran kerja yang lebih selamat

ii

ACKNOWLEDGEMENTS

iii

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS

δ	-	Voltage angle
v	-	Volt
kg	-	kilogram
cm	-	centimeter
N.m	-	Newton Meter

LIST OF ABBREVIATIONS

V	-	Voltage
m	-	Mile
K	-	Kilogram
B	-	Byte
M	-	Mega
Hz	-	Frequency
W	-	Power

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1   Introduction

The first chapter covers the project overview, including the project overview, project aim, project scope, project methodology, and the structure of this project report. This section also briefly explains the breadth of work that has been completed from the beginning to the completion of the project. This chapter will lay the groundwork for the rest of the project, which will involve COVID-19's construction of an automated medical trolley. The ultrasonic sensor is used in this project to create a touchless medical trolley.

1.2   Background

A hospital is an institution that can provide medical and surgical treatment, as well as provide nursing care for sick or injured people. Hospitals are known for providing health services to people in order to maintain their health and get treatment. Therefore, the employees at the hospital are always busy to ensure that they can provide the best service to the public. Moreover, in the current challenging situation, where the spread of the Covid-19 virus that has hit the world, including Malaysia, has resulted in an increase in the workload for frontline workers, especially health workers. As a result of the spread of the Covid-19 virus, millions of people have died. Covid-19 cases are increasing in Malaysia on a daily basis, leaving frontline personnel, particularly medical personnel, exhausted and highly exposed to the

1

virus. This virus spreads through the air, through human-to-human physical contact, and through direct human-to-object contact.

To reduce the workload of medical staff, automatic trolleys have been innovated with a few smart features to control the movement of the trolley, by develop automated human followers. The stainless-steel trolley is a main tool that helps the medical staff to place their medical equipment or any medical items for treatment within the hospital. The medical staff needs to bring a trolley from one place to another in order to perform medical treatment or for other purposes, such as delivering food to the patient. Because of that, an automated trolley has developed in order to help medical staff during this critical period in the hospital. This new version of the trolley can minimize manpower because this trolley can move without the need for manpower. With this method, it can help to reduce the workload of health workers while reducing the risk of spreading the virus to frontline workers dealing with Covid-19 patients. The smart feature method is the use of human followers to control the movement of the trolley.

1.3   Problem Statement

The old version of the trolley was not user-friendly and required manual control. It required a lot of manpower to move from one place to another, which led to the heavy workload. Health workers face difficulties moving trolleys around to provide health services such as delivering medicines, food, clothing, and other medical necessities to patients.

The second problem is that medical staff are exposed to the risk of infection from viruses when dealing with the COVID-19 patients. Furthermore, in the case of the Covid 19 pandemic, dumping in hospitals is increasing. This encourages a large workforce of health staff, and direct contact with patients can cause a high percentage of infections to them.

Therefore, the development of a touchless trolley is essential to reduce the occurrence of direct contact rates.

1.4   Project Objective

The aim of this project is to build an automated trolley to ease the burden of the medical staff and ensure their safety during an infectious disease outbreak.

  a) To develop a prototype of an automated medical trolley system integrated with the microcontroller based on the Arduino Uno R3 under the COVID-19 pandemic.
  b) To analyze the trolley system using proteus and Arduino software.
  c) To evaluate the performance of the mechanism and functions of the medical trolley system

1.5   Scope of Project

This project is divided into two main parts. The first part is about the programming coding for the obstacle detection and automated following functions using the Arduino IDE software and proteus. Using this platform, the circuit of the system is designed and the coding for the system is written

This automated medical trolley has feature that using an ultrasonic sensor that acts as a human follower. This method can move any direction. The trolley will move by the direction input given by user.

The second part of this project consists of the hardware of the wire connection from the Arduino to the sensors and output device. These main two parts are important in order to achieve the objective. This project scope is stated below:

a) To design and construct the circuit using proteus and Arduino software as coding for the system.

3

b) To control the trolley's movement by using the wireless switch using buttons and the human follower using ultrasonics

c) To detect obstacles within a certain range by using ultrasonics

The main purpose of this project is to help the medical staff in the ward by reducing the staff workload by bringing the trolley from one place to another. This medical trolley can ease the medical staff's lifting of heavy loads. This trolley can use any place or any direction as it does not require any specific track.

1.6 Outline of the project

Introduction (Chapter 1)

This chapter summarises the project, which will be discussed in greater depth later in the report. That is the project's background. The project's introduction will be described in this section, which will include an overview, an issue report, the study's objectives, and the scope of work.

Review of the Literature (Chapter 2)

This chapter summarises concepts, experimental investigations, and major discoveries from previous research that are relevant to the current project. The research will also be highlighted.

Methodology is the third chapter.

Chapter 3 delves deeper into the planning process for achieving the objectives. This chapter will go over control theory and how to use it. Each stage, as well as the overall project's flow chart, has its own technique.

Result and Analysis (Chapter 4)

The graphics and graphs that accompany the tests depicted in the photographs, as well as the study's findings, are discussed in this chapter.

Conclusion and Recommendation (Chapter 5)

The findings of the study, as well as the project's important milestones, are summarised in this chapter. This chapter also includes some predictions for improvement growth and improvement. For potential innovators, recommendations for further research are also being prepared.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter discusses the project's literature review. Based on the past articles, papers, theses, or any similar sources that relate to the "Development of the Automated Medical Trolley Under the Covid-19 Pandemic" project. The similar ideas of the past referenced in this project, such as the hardware of the project used, the software used, the advantages and disadvantages of the project, and the prices of the components used, have been analyze and summarize in this chapter. By studying those elements of the past reference, we can help this project develop by adding the features and finding other solutions based on the limitations of the past reference project. Furthermore, based on the results of the past research that has been analyzed, this project is very important in order to understand its function and flow.

2.2 Previous Research Paper

From the previous study, [1] proposed paper follows me multifunctional automated trolley. A "follow me" automated trolley is capable of carrying products while autonomously following the user without the need for human assistance. A tablet with an Android platform is attached to the trolley to perform the functions mentioned above. After that, the trolley returns to its spot automatically whenever the customer has completed their purchases. According to this research paper, a follow me robot is being developed to automatically follow the client when the client is completing shopping activities at the supermarket. The Sharp IR sensor is used to control the trolley, which is linked to an Arduino mega board. The distance between the customer and the trolley will be determined using a Sharp IR. The

6

Arduino microcontroller was used to build the following line, and all of the sensors were attached to the Arduino board. An Android app created with the Android Studio IDE. Through this application, the programme will present the consumer a list of suggestions for the goods that the customer has already purchased, and the customer will simply need to use a bar code scanner to purchase the items. All of the data is stored in a hosted database, and the data was transferred to the Android application using Json. The desktop application was created with the Microsoft Visual Studio IDE. Based on this application, all purchasing details were saved in a desktop application using web services while the customer was shopping.

Figure 2.1: Robot Automatic Following

This paper provided a new framework of multi motion layer analysis to detect and track moving objects in an aerial platform based on a paper [2]. To begin, the moving object will

7