



**TITLE PROJECT:**

**AUTO KNEE MOVEMENT FOR REHABILITATION**

**NAME:** MOHD ZHAFRAN HADRI BIN ZULKIFLI

**NO. MATRIC:** 08DEU19F2014

**JABATAN KEJURUTERAAN ELEKTRIK**

**SESI 2 : 2021/2022**

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**NAME:** MOHD ZHAFRAN HADRI BIN ZULKIFLI

**NO. REGISTRATION:** 08DEU19F2014

This report submitted to the electrical engineering department in fulfillment of the requirement for a diploma in electrical engineering

**JABATAN KEJURUTERAAN ELEKTRIK**

**SESI 2 : 2021/2022**

## CONFIRMATION OF THE PROJECT

THE PROJECT TITLE ' AUTO KNEE MOVEMENT FOR REHABILITATION ' HAS BEEN SUBMITTED , REVIEWED AND VERIFIED AS A FULFILLS THE CONDITION AND REQUIREMENT OF THE PROJECT WRITING AAS STIPULATED

Checked by:

Supervisor's name : PUAN NAAGAJOOCHI A/P ADIN NARAINA

Supervisor's signature :

Date :

Verified by:

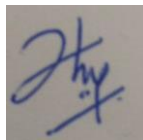
Project Coordinator name :

Signature of Coordinator :

Date :

"I acknowledge this work is my own work except the excerpts I have already explained to our source"

1. Signature :



Name : **MOHD ZHAFRAN HADRI BIN ZULKIFLI**

Registration Number : **08DEU19F2014**

Date : 17 JUNE 2022

**DECLARATION OF ORIGINALITY AND OWNERSHIP**  
**TITLE: AUTO KNEE MOVEMENT FOR REHABILITATION**

**SESSION: 2 2021/2022**

**1. I, 1. MOHD ZHAFRAN HADRI BIN ZULKIFLI**

is a final year student of Diploma in Electrical Engineering,  
Department of Electrical, Politeknik Sultan Salahuddin Abdul Aziz  
Shah, which is located at Persiaran Usahawan, Seksyen U1, 40150  
Shah Alam, Selangor. (Hereinafter referred to as 'the Polytechnic').

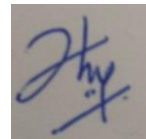
2. I acknowledge that 'The Project above' and the intellectual property therein is the result of our original creation /creations without taking or impersonating any intellectual property from the other parties.
3. I agree to release the 'Project' intellectual property to 'The Polytechnics' to meet the requirements for awarding the Diploma in Electrical Engineering to me.

**Made and in truth that is recognized by;**

**a) MOHD ZHAFRAN HADRI BIN ZULKIFLI**

**(Identification card No: - 010902120685)**

).



**(MOHD ZHAFRAN HADRI BIN ZULKIFLI)**

In front of me, **PUAN NAAGAJOOHI A/P ADIN NARAINA** As a project supervisor, on the date:

.....  
**(PUAN NAAGAJOOHI A/P ADIN NARAINA)**

## ACKNOWLEDGEMENTS

First and foremost, praise and thanks to ALLAH the Almighty. For his showering of blessing throughout our assignment to complete

I have taken this project seriously and put much Effort on making it. This is the first time that I have to create something out from scratch and build it piece by piece. In other word I can't achieve it without other support. First of all, I want to put my gratitude for my family because they always support from the start until now. The world become upside down when, I start the semester.

I also want to say thankyou to my supervisor that is Puan PUAN NAAGAJOO THI A/P ADIN NARAINA , for guiding me and also give much of education and spirit to keep on going. I a person that always lost track of everything. But thanks to my supervisor, I achieved my final project on time.

# ABSTRACT

## **AUTO KNEE MOVEMENT FOR KNEE REHABILITATION**

Author : Mohd Zhafran Hadri Bin Zulkifli  
Supervisor : Puan Naagajoothi A/P Adin Naraina

Department : Electrical Engineering Department  
Polytechnic Sultan Salahuddin Abdul Aziz Shah  
Email corresponding author : [naagajoothi@psa.edu.my](mailto:naagajoothi@psa.edu.my) & [mohdzhafran02@gmail.com](mailto:mohdzhafran02@gmail.com)

The development of joint stiffness can arise as a result of injury or damage to the joint. Stiffness can be reduced while maintaining range of motion (ROM) of the affected joint by using continuous passive movement (CPM) training. Preparing for recovery after surgery requires a lot of time and work. It usually takes a long time and a lot of work for both the therapist and the patient when they work together, one on one. Recently, new technology has allowed therapists to use robotic devices to give patients safe and intense therapy. This device can be used to do the same thing over and over again. The most frequently reported type of motion supplied by recovery robots that have been developed is continuous passive motion. It is a safe recovery method that uses repetitive movements to help patients who experience stiffness after knee surgery. I made this project even better by coming up with a way to help patients stay on track with their workouts. Exercising after an injury or stroke can help you become stronger and more mobile again. With this project, the overall goal is to develop AUTO KNEE MOVEMENT FOR KNEE RECOVERY, in the hopes of enabling patients with strokes and injuries to recover more quickly. The project uses an Arduino UNO and a servo motor to move the knee joint in a controlled manner, with the user having control over the rate of movement, as well as the level of movement and the timer. Patients will be able to find out how far they can bend their knees by paying attention to reaching the level of movement they have done.

KEYWORD : Arduino uno & servo motor

# ABSTRAK

## AUTO KNEE MOVEMENT FOR KNEE REHABILITATION

Penulis : Mohd Zhafran Hadri Bin Zulkifli  
Supervisor : Puan Naagajoothi A/P Adin Naraina

Jabatan : Jabatan Kejuretereraan Elektrik  
Politeknik Sultan Salahuddin Abdul Aziz Shah  
Email corresponding author : [naagajoothi@psa.edu.my](mailto:naagajoothi@psa.edu.my) & [mohdzhafran02@gmail.com](mailto:mohdzhafran02@gmail.com)

Perkembangan kekakuan sendi boleh timbul akibat kecederaan atau kerosakan pada sendi. Kekakuan boleh dikurangkan sambil mengekalkan julat pergerakan (ROM) sendi terjejas dengan menggunakan latihan pergerakan pasif berterusan (CPM). Bersedia untuk pemulihan selepas pembedahan memerlukan banyak masa dan kerja. Ia biasanya mengambil masa yang lama dan banyak kerja untuk kedua-dua ahli terapi dan pesakit apabila mereka perlu bekerja bersama-sama. Baru-baru ini, teknologi baharu telah membenarkan ahli terapi menggunakan peranti robotik untuk memberikan terapi yang selamat dan sesuai kepada pesakit. Peranti ini boleh digunakan untuk melakukan perkara yang sama berulang kali.

Jenis gerakan yang paling kerap dilaporkan yang dibekalkan oleh robot pemulihan yang telah dibangunkan ialah gerakan pasif berterusan. Ia adalah kaedah pemulihan selamat yang menggunakan pergerakan berulang untuk membantu pesakit yang mengalami kekakuan selepas pembedahan lutut.

Saya membuat projek ini lebih baik dengan menghasilkan cara untuk membantu pesakit berada di landasan yang betul dengan senaman mereka. Bersenam selepas kecederaan atau strok boleh membantu anda menjadi lebih kuat dan mudah alih semula. Dengan projek ini, matlamat keseluruhan adalah untuk membangunkan "AUTO KNEE MOVEMENT FOR REHABILITATION", dengan harapan membolehkan pesakit strok atau peakit lutut pulih dengan lebih cepat. Projek ini menggunakan Arduino UNO dan motor servo untuk menggerakkan sendi lutut dengan cara terkawal, dengan pengguna mempunyai kawalan ke atas kadar pergerakan, serta tahap pergerakan dan pemasa. Pesakit akan dapat mengetahui sejauh mana mereka boleh membengkokkan lutut dengan memberi perhatian untuk mencapai tahap pergerakan yang telah mereka lakukan.

KATA KUNCI : Arduino uno & motor servo

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# CHAPTER 1

## INTRODUCTION

### 1.1 INTRODUCTION

The knee has the largest articulating space of any joint. Therefore, it must operate properly to bear weight. Knee injuries are regular among adults, adolescents, and active children. After a knee injury, therapy is required to return to normal function. Total knee replacement surgery is a standard treatment for osteoarthritis, although it can cause knee stiffness. The term "stiffness" refers to a restricted range of motion (ROM) that limits a patient's ability to move and produces pain. Knee stiffness can make it difficult for a patient to do certain tasks, such as standing up from a seated position.

On the other hand, Stiffness is a challenging aetiology and treatment because it is one of the most difficult consequences to cure. As a result, it raises an unsatisfactory issue for both the surgeon and the patient. It can cause Patient difficulty moving around in their daily lives. This difficulty is frequently encountered by a patient or adult in the Intensive Care Unit who is in serious condition, such as a stroke. This group necessitates special attention to maintain a constant state of health. Exercise can help them recover from an accident or stroke by strengthening their muscles and making them easier to move.

## **1.2 BACKGROUND RESEARCH**

The original idea for this project came about when it was seen that there were problems when patient need to do their knee rehabilitation. Rehabilitation after surgery was need. Rehabilitation is performed manually by physiotherapists. The projects are based on Arduino uno that will take command from button that will set personally by the patient. The Motor power window will move with the data had been set. Further, to improve the project based on patient using the machine, I have designed a system where the data that had been set and patient ROM each exercise set will be record in cloud system

## **1.3. PROBLEM STATEMENT**

Some devices help the physiotherapists apply an uninterrupted passive motion to the patient's knee. After knee operations, it is necessary to perform rehabilitation to recover previous dexterity. CPM device is widely used after knee surgery because it might prevent the stiffening of joints and allow recovering patients full functionality after surgery. Physiotherapists will use the knee CPM device to help the patient regain movement. There are certain issues that I discovered after studying the existing equipment. The knee CPM device, for starters, is a massive and hefty gadget. It will be tough for the user to carry it. Second, the current device can only be used with an AC power supply. As a result, the user must hunt for an AC power supply before the treatment can begin, which can be inconvenient

## **1.4 RESEARCH OBJECTIVE**

The main objective of this project is to help patient reduce stiffness at knee after surgery. Other specific objectives are:

- I. To develop rehabilitation machine that help patient reducing the muscle stiffness, and supporting a range of motion by using of an Arduino UNO and servomotor to move the knee joint in a controlled manner, with the user having control over the rate of movement as well as the degree of movement and the timer
- II. To design mobile knee rehabilitation for knee problem patient
- III. To develop system that can make physiotherapist monitor patient remotely from hospital

## **1.5 SCOPE OF RESEARCH**

The scopes and limits to this research are:

- The project Knee surgery patient who encounter of muscles problem and prevent the stiffening of joints and allow recovering patients full functionality after surgery using adjustable knee angle with motor driver ,timer setting each reps and speed of the knee movement
- Physiotherapist to know how many patient frequently do some knee movement

## **1.6 project significance**

The advantages of this project the rehabilitation machine that help patient reducing the muscle stiffness, and supporting a range of motion by using of an Arduino UNO and servomotor to move the knee joint in a controlled manner, with the user having control over the rate of movement as well as the degree of movement and the timer. While in Blynk App, physiotherapist can monitor patient remotely from hospital. This project also design mobile knee rehabilitation for knee problem patient.that can make patient use everywhere

## 1.7 CHAPTER SUMMARY

This type of invention are suitable because its base on this diploma course that its electronic engineering major in medical, this prototype or the real project, coding and circuit already been studied study from semester 2-4 that include circuit build on, how to solder it, manage it and also how to assemble all the component needs. Further on, this invention also use, coding to run in the program that control the project functionality to works. For my project that is portable massager controlled via Bluetooth and application, it's have connection for this course because its relief back pain and to reduce the Stiffness of the muscle. Science discovered that if the muscle stress to much it will make the body overwork that can make the brain stress, it's also Make the body and mind tired that can cause un-healthy cycle. This can lead to another dangerous disease such as heart problem and also insomnia.