iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** V **Month of publication:** May 2023

DOI: https://doi.org/10.22214/ijraset.2023.52459

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue V May 2023- Available at www.ijraset.com

Design and Fabrication of Stroke Therapy Chair

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Abstract: ***Stroke is usually the sudden death of brain cells due to lack of oxygen, caused by blockage of blood flow or rupture of an artery to the brain. A stroke occurs when part of the brain loses its blood supply and stops working. This causes the part of the body that it controls to stop working as well. There are several treatments for the stroke like endovascular treatments, surgical treatments etc. but the best treatment for the paralysis, strokes, is the physiotherapy. Usually, the therapy is done manually with an assistant. We propose a method in which the physiotherapy is done automatically with the help of simple mechanisms. This consists of a chair setup in which the patients are made to sit and the arms and the legs of the chair is given motion, so that the patients arms and legs move at a relative speed so that the treatment is done effectively.***
Keywords: Treatments, Stroke therapy, paralysis, neuroplasticity, physiotherapy

I. INTRODUCTION

If a stroke causes damage to the part of your brain that controls movement, one may experience weakness or paralysis on one side of the body and the problems with moving and carrying out everyday activities. Physiotherapy is an important part of the rehabilitation. Techniques such as exercise, manipulation, massage, skills training and electrical treatment are used to help to heal and recover the movement. The main focus of physiotherapy after the stroke is to help one to learn to use both sides of your body again and regain as much strength and movement as possible. After a stroke, our brains cannot grow new cells to replace the ones that have been damaged, so your recovery depends on your brain's ability to reorganize its undamaged cells and make up for what has been lost. This is called neuroplasticity. Physiotherapy can provide expert practical guidance to help. Physiotherapists often work with other members of the stroke team to make sure they can help with the range of problems that stroke can cause. The main aim of the project is to provide the physiotherapy treatment automatically to the patients with less involvement of the attendee. Therapy chairs come in a wide variety of formats to meet the specific needs of their users. They may include specialized seating adoptions, individualized controls, and may be specific to particular activities, as seen with sports wheelchairs and beach wheelchairs.

II. OBJECTIVES

The main objectives of the project as follows:

1) To avoid occupational therapist
2) To reduce the effort of the patient
3) Workout can be done in self mode
4) The patient can move from one place to another with no one's help.

III.METHODOLOGY

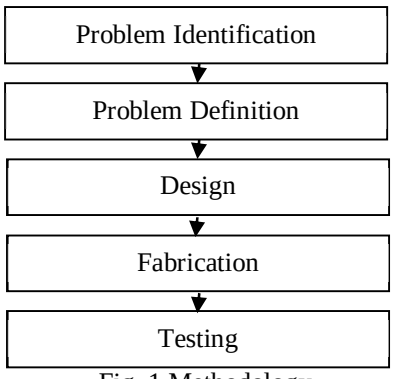


Fig. 1 Methodology

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IV. COMPONENTS USED

The major components are,

- Frame or chassis.
- Pneumatic cylinder.
- Spur gear.
- Bearing.
- Dc motor.
- Pedals.
- Battery.

A. Specification of Spur Gear

Pinion

Material : Cast iron
Outer diameter : 20 mm
Inner diameter : 10 mm
No. of teeth : 8

Wheel

Material : Cast iron
Outer diameter : 120.5 mm
Inner diameter : 110 mm
No. of teeth : 71

B. Components Description:

1) Pneumatic Cylinder

Pneumatic cylinders are mechanical devices which use the ability of propellant to supply a force in an exceedingly reciprocating linear motion. Like hydraulic cylinders, something forces a piston to manoeuvre within the desired direction. The piston may be a disc or cylinder, and therefore the connecting rod transfers the force it develops to the thing to be moved. Engineers sometimes like better to use pneumatics because they're quieter, cleaner, and don't require large amounts of space for fluid storage.



Fig. 2 Pneumatic Cylinder

2) Spur Gear

Spur gears perform two functions:

- Transmit power.
- It Produce radial loads on the shaft, not axial loads.

Spur gears mesh together correctly only if fitted to parallel shafts. No axial thrust is created by the tooth loads. Spur gears are excellent while rotating at moderate speeds but tend to be noisy at high speeds. Spur gears also require lubrication to reduce the losses due to friction.

Instead of being straight the sides of the cross section have a curved form (usually involve and less commonly cycloid) to achieve a continuous drive ratio.

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Fig. 3 Spur Gear Wheel

3) Lead acid Battery

The lead-acid battery is a type of rechargeable battery. Compared to modern rechargeable batteries, lead-acid batteries have relatively low energy density. Large-format lead-acid designs are widely used for storage in backup power supplies in cell phone towers. Lead acid batteries are generally used because of their power to weight ratio and their low cost. Inside the battery, the positive and negative electrodes consist of a group of plates welded to a connecting strap. The plates are immersed in the electrode, consisting of 8 parts of water to 3 parts of concentrated sulfuric acid.

V. WORKING PRINCIPLE

The experimental setup of the project consists of a chair setup in which the arms of the chair are fixed to it by suitable joints so that the arms can be moved independently. The leg part of the chair consists of pedal. The pedals are actuated by a DC motor operated by a battery.

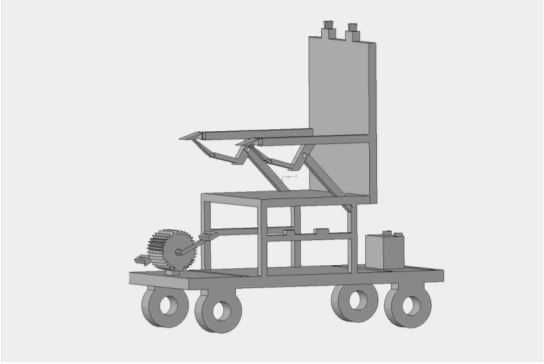


Fig. 4 Model Diagram

The power from the DC motor is transmitted to the pedals through a set of spur gears. The spur gears are used to increase or decrease the rotational speed of the motor. The stroke patients are made to sit on the chair and the hands and the legs of the patients are made to rest on the arms and the pedal of the chair respectively. Then the compressed air from the compressor is made to reach the solenoid valve. The solenoid valve is actuated by a toggle switch.



Fig. 5 Prototype model

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When the solenoid valve is actuated, the air is allowed to reach the pneumatic cylinder. The pneumatic cylinder reciprocates and the arm of the chair is moved thus tends to move the arms of the patients. The motion to the pedal is given by the motor operated by a battery. The power from the battery is transmitted to the pedals through the spur gears. As the pedal rotates, the legs also rotate.

VI. ADVANTAGES AND APPLICATIONS

A. *Advantages*

1) Simple in construction and adjustable according to the patients convenience
2) The components used for the fabrication are simple and easily available
3) The therapy for the stroke patients can be done automatically
4) Less attendee is enough for this system.

B. *Applications*

1) It is highly suitable for stroke patients
2) In other ways it can be used for paralyzed patients also
3) It can be used in Massaging centres also.

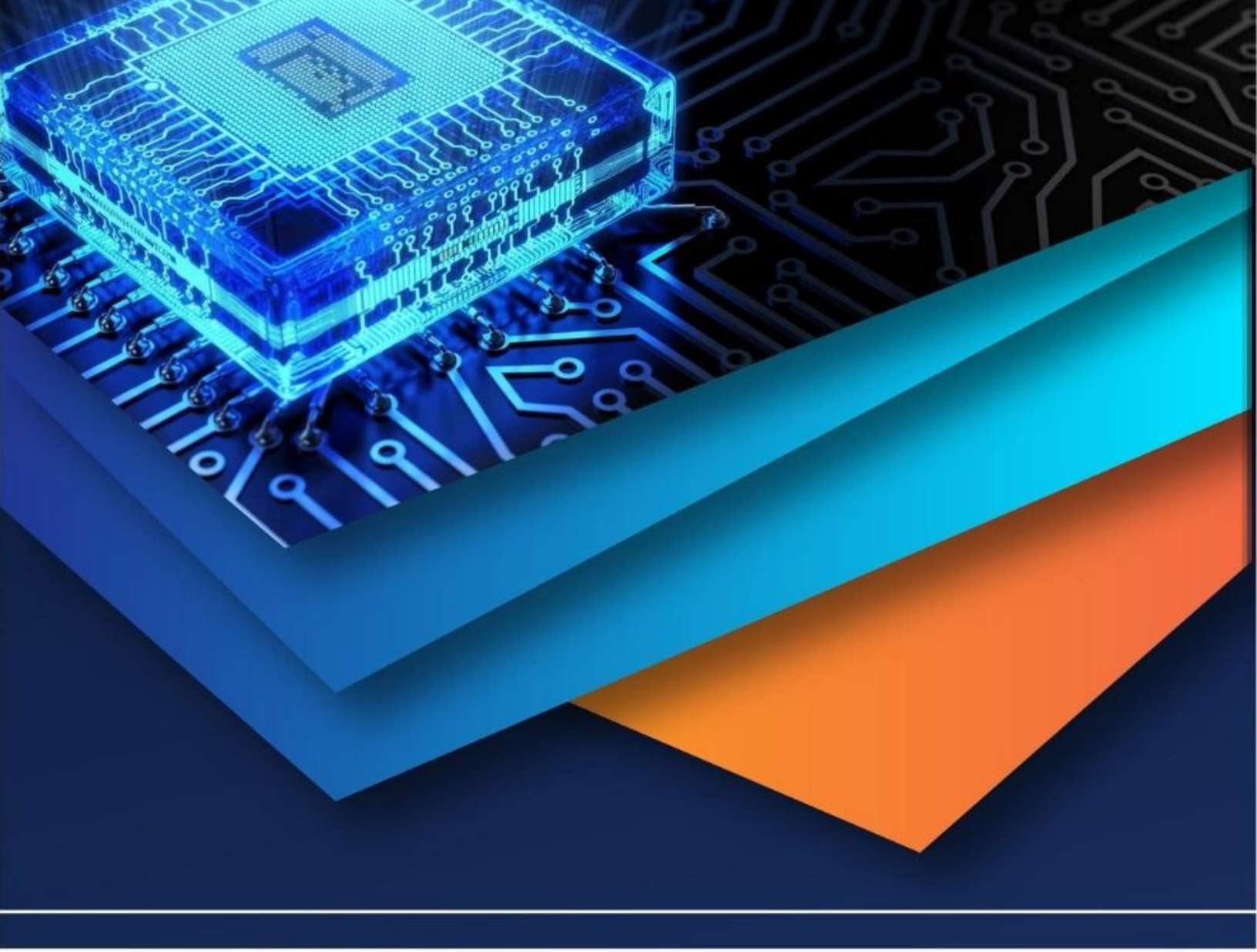
VII. CONCLUSION

This project is developed for the purpose of the persons who are affected in paralysis and also who got stroke, due to this the chair which was made for the patients is a probably useful one with low cost and high efficient. This project is mainly made for the purpose to operate the adjustable chair without any attendee, thus the patient gets comfort by operating the chair with their own convenience. This can be widely made to use in all hospitals, physiotherapist centres and mainly in their houses. The product can be still made comfort in future by adding cushioned chair for according to the patients need. And also the power of the battery, motor and actuators can be done easily.

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