Project Proposal Reference Number

46S_BE_4993

A PROJECT SYNOPSIS

"Exo-skeleton Arm for Treatment of Paralysis Patient"

KSCST SPONSORED

Submitted in partial fulfillment of the requirements for the award of

Bachelor of Engineering
in
Electrical and Electronics Engineering
Submitted to

Visvesvaraya Technological University
Belagavi, Karnataka, 590 018

Submitted By

TIRUPATI LAMANI	**2KE18EE040**
MANIKANTA S RATHOD	**2KE20EE404**
PEENI JAYARAM KUMAR	**2KE20EE406**
PRATIK PUNYAWANT	**2KE20EE407**

Under the Guidance of

Dr. Prakash Kerur

K. L. E. SOCIETY'S
K. L. E. INSTITUTE OF TECHNOLOGY
Hubballi 580 030

Department of Electrical and Electronics Engineering

Key words:

Exo skeleton arm, paralysis treatment, Arduino UNO, master control unit, actuators, wind shield motors.

Introduction

Our proposed structure serves as a valuable tool in the rehabilitation process for paralysis patients, particularly those unable to visit the hospital for treatment regularly. With the help of this device, patients can regain their sense of independence. The primary objective of this device is to provide an active upper limb support system that aids in rehabilitation.

By utilizing our device, patients with paralysis can receive treatment and therapy within the comfort of their own homes, eliminating the need for frequent hospital visits. The device serves as a means for patients to actively engage in their rehabilitation process, promoting self-reliance and reducing dependency on healthcare professionals.

Our innovative device focuses on creating a supportive structure that assists in the movement and functionality of the upper limb. This support system facilitates targeted exercises and activities that aim to improve muscle strength, coordination, and range of motion in the affected limb.

Designed with the goal of enhancing the patient's overall quality of life, our device promotes neuroplasticity by stimulating the reestablishment of neural connections associated with motor control. It also aims to alleviate pain and discomfort commonly experienced by paralyzed individuals due to limited mobility.

The device's user-friendly design ensures ease of use, allowing patients to navigate and control the active upper limb support system independently. Safety features are incorporated to minimize the risk of accidents or injuries during the rehabilitation process.

Moreover, our device emphasizes the importance of long-term affordability and accessibility. By offering a cost-effective solution that can be used at home, we aim to extend the benefits of rehabilitation to a wider population of paralysis patients, regardless of their geographical location or financial resources.

In summary, our proposed structure serves as an active upper limb support system for paralysis patients, enabling them to partake in their rehabilitation journey and regain independence. By bringing treatment to the patients' doorstep, we aim to enhance their quality

of life, promote neuroplasticity, and provide a cost-effective solution for long-term rehabilitation.

Objectives

1. Restore arm functionality and independence for paralysis patients.
2. Improve muscle strength and coordination in the paralyzed arm.
3. Increase range of motion and flexibility in the affected limb.
4. Promote neuroplasticity and reestablish neural connections for motor control.
5. Alleviate pain and discomfort associated with immobility.
6. Enhance patient's quality of life through increased mobility and autonomy.
7. Customize the exoskeleton arm to suit individual patient needs.
8. Ensure user-friendly operation and intuitive interface.
9. Incorporate safety features to prevent accidents or injuries.
10. Strive for long-term affordability and accessibility for a larger population of paralysis patients.

Methodology

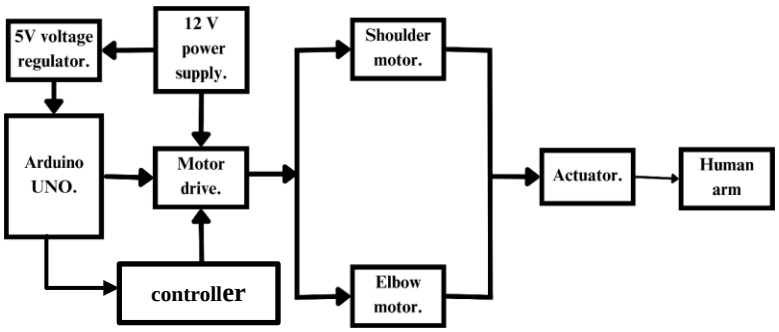

Fig 1: Block diagram of Exo-skeleton Arm

Fig 3.1 shows the block diagram where it consists of Arduino UNO, motor drive, controller, motors, actuators, and human arm. The 12v power supply is given to motor drive, the same 12v power supply is given to 5v voltage regulator, the output of regulator is given to Arduino and output of Arduino is given to motor drive. Using a controller and the program dumped in the Arduino the output of the motor drive is given to shoulder motor or elbow motor, the output of these will activate the actuator which leads the human arm to move.

- The Arduino Uno is the main block in the above block diagram where it controls the whole unit.

- The 12v and 5v supply is given for the respective units like Arduino Uno and motor drive where the supply voltage is calculated using full wave rectifier.
- Motor drive is used for the movement of a DC motor(shoulder and elbow motor) it is controlled by the controller where the input is taken by the Arduino Uno.
- Actuators are used to move the human arm in the front and side ways motion where it takes the input from the Torque of a motors.

The construction of the mechanical structure, serves as the foundation for the exoskeleton arm. It involves assembling aluminium and wooden strips, 'L' shaped aluminium strips, foam sheets, straps, buckles, and fasteners. The wiper motors are also integrated into the structure.

The working principle involves using a master switching control unit to operate and execute the program. Four switches are dedicated to two motors, allowing the user to rotate the motors in either a clockwise or counter clockwise direction by pressing the corresponding switch. The master controller provides flexibility for user operation and customization according to individual requirements. The detailed circuit layout is as shown in fig 2

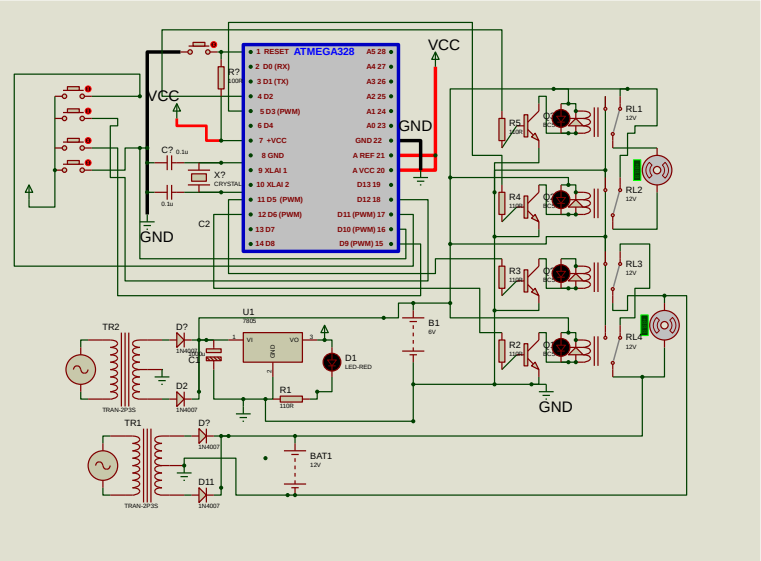

Fig 2 : circuit layout diagram

Results And Conclusion

The exoskeleton arm design effectively tackles the challenges encountered by patients, offering practical solutions. Its ease of use is attributed to a straightforward control unit,

ensuring user-friendliness. The implementation of a secure, portable, and efficient power supply adds to its convenience and makes it environmentally conscious.

The proposed exoskeleton arm solution effectively resolves the problems experienced by patients, catering to their needs and requirements. Its simplicity and intuitiveness contribute to its user-friendly nature, allowing individuals to operate it with ease and confidence. By incorporating a safe power supply mechanism, the design ensures the well-being and security of users throughout their rehabilitation process. The fig 3 shows the model of our project for the treatment of paralysis patient.

Fig 3: proposed model of the project

The exoskeleton arm's portability adds an additional layer of convenience, enabling patients to utilize the device wherever they may be, thereby enhancing their independence and mobility. Furthermore, the incorporation of an efficient power supply not only improves functionality but also promotes energy efficiency, aligning with sustainable practices and environmental consciousness.

Overall, the proposed exoskeleton arm successfully addresses the challenges faced by patients, providing them with a user-friendly and efficient solution. By considering factors such as simplicity, safety, portability, and environmental impact, the design demonstrates a comprehensive approach to enhance the overall experience and benefits for the patients.

Future Scope

In the future, the exoskeleton arm can be enhanced by replacing the control panel switch with a more user-friendly interface, such as a pressure sensor, simplifying the operation even further. Moreover, advancements can be made to enable the exoskeleton arm to be controlled using brain waves, offering a more intuitive and seamless experience for the users.

Additionally, the project has the potential to implement various features, such as incorporating gears into the exoskeleton arm design to enable its use in day-to-day routines, expanding its functionality and practicality. The utilization of AI (Artificial Intelligence) can facilitate the analysis of patient records, providing valuable insights and streamlining the rehabilitation process.