Exoskeleton Mount

Ahmad Alharbi, Fahad Alhajri, Sayaf Almari, Alroumi Alenezi, Khaled Alzafairi, and Mohammad Alrashidi

NORTHERN ARIZONA UNIVERSITY

College of Engineering, Forestry & Natural Sciences

ABSTRACT

The purpose of this project is to develop a prototype for the Lower rib exoskeleton. There are various requirements and targets the team seeks to attain, including a better functioning model, providing a design that mounts it in an effective manner to the users' foot, thighs and the shank, make the design adjustable, and ensure that it is easy to don off and on.

INTRODUCTION

Patients who are unable to use their lower and upper limb muscles usually require assistive devices so as to enable them to carry out tasks that require the use of these muscles. The exoskeletons are also very useful since they provide functions that the weak muscles are unable to perform and exercising such muscles to help regain their strengths and functioning.

PROJECT GOALS

The team seeks to attain the following objectives in the end design:

- Improve the original systemTo allow the design to be Adjustable
- Come up with a design that is flexible for use
- Make the design easy to don on and off
- Make the design comfortable for the users
- Ensure that the design is light weight for ease of use
- Make the design to be powered by an electrical battery

Testing Procedure

The testing procedure looks into all the abilities of the components used in the design. the components looked into are:

1. Yield strength of at least 50 Mpa
2. Adjustable to a length ranging 6' to 20'
3. Use soft fabric
4. Limited weight of 0.75 kg/limb
5. No dimensions beyond the knee of 5cm

SELECTED DESIGN CAD Model

Figure 1: Left leg of our design

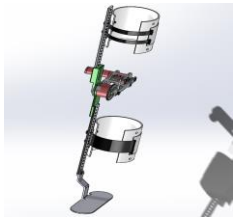

Figure 2: Right leg of our design

Components of Proposed Design

The components of the design that the team selected include the control box, DC motors, Straps, and Fiber glass. They are simulated to mimic a real case of the engineering. These components will be simulated in order to work together to yield the best outcome for the users.

Figure 3: Current design is attached to the normal kid's shoes

Figure 4: Current design from the side

PCB design

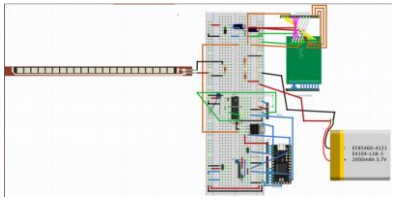

Figure 5: PCB design

We have in the EE system FSR, Micro-controller, Blue-tooth, Torque Sensors, Li-Po Battery, resistor, INA-125, and motor controller. So these part will connect to each other as you see above and resistor will protect the PCB from the battery and the battery will be the bower source and the FSR will send command to the micro-controller and the micro-controller will send command to the motor controller to move the motor back and forth.

User's expected weight for quality use

Human leg - 5kg
Control circuit board - 0.125kg
Carbon fiber glass reinforced with stockinet – 0.75kg
DC motor - 0.35kg
Lithium battery - 0.65 kg
Total weight - 8kg

References

Kossyk, Ingo. Multimodal Human Computer Interaction in Virtual Realities Based on an Exoskeleton.Mu̇nchen: Hut, 2012. Print.

Racine, Jean-Louis C. Control of a Lower Extremity Exoskeleton for Human Performance Amplification. , 2003. Print.

S. Moromugi. Exoskeleton Suit for Human Motion Assistance, 2003, pp. 45-165.

Acknowledgments

Client: Zach Lerner, Ph.D.
Instructor: Dr. Sarah Oman