

Review on Application of Lower Body Exoskeleton

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Abstract : Aim of our project is Design and Development of Lower Body Exoskeleton i.e. chairless chair. It is simple in design and which can be easily worn like an exoskeleton, it consists of damper, spring, thigh strip, sole. The legs muscles are in rest position due to its weight transfer to the damper, sitting position is comfortably acquired. It keeps your back straight and can reduce the occurrence of bad postures for both healthy workers and those recovering from muscle related injuries. This exoskeleton based support would be useful to people whose current job requires them to stand for long hours. This new and modernized "chair" will ease the aches in the thighs and back.

Keywords - exoskeleton, damper, thigh strip.

I. INTRODUCTION

In this world technology is increasing day today life. As we move forward the technology is progressing and it is becoming compact for easy to carry it with us. Tendency of human whose current job requires them to stand for long hours is decreasing. This new and modernized "chair" will ease the aches in the thighs and back. For this purpose we have design a lower body exoskeleton.

It is ergonomics device that is designed around the shape and function of the human body, with segments and joints corresponding to those of the person it is externally coupled with. Its like a chair that isn't there ,but magically appears whenever you need it. In industrial, it is known as the chairless chair and worker in industrial can wear it on legs like an exoskeleton. Although lower body exoskeletons already exist on the market, they still have shortcomings that prevent widespread use among the general public. Our method of achieving our goal consists of splitting up into smaller groups; allowing us to complete work more efficiently. The objectives of this project are to study , analyse, and develop a new mechanism that assist the human locomotion, to learn in details about how the lower body exoskeleton works and understand the concepts involved. The concepts of this simple chair is when it activities; you can walk normally or even run.

a. Problem statement:

While doing internship in a C-Tech Engineers PVT LTD company we have observe that the workers have to work for long hour on CNC and VMC machines in standing position due to which it effect to their postures. The problems occur in worker may cause increase fatigue of worker and may lead to decrease in productivity.

The major problem faced by elderly people are :-

- Inability to sit , stand perform transfers and to walk
- need for personal assistance at home
- risk losing independence
- reduce quality of life
- financial problems to employees careers

b. Factor Consideration In A Project:

- 1) Compatibility with project and plan.
- 2) Availability of needed material and skill for research.
- 3) Move out away a critical technical problem.
- 4) Go back of financial expected.
- 5) Cost and availability of capital required for investment.
- 6) Estimate of costs of development, production, and marketing.
- 7) Growth prospects for the future.

c. Objective:

The objective of our project is to enable the worker to have the ability to move around with absolute ease, with the use of a lower body exoskeleton i.e. chairless chair.

To develop a portable device capable of providing ankle joint mechanical assistance during walking without using external power from on board actuators. The device we set out to build should be light weight, portable and user friendly. The device should not hamper the normal gait cycle of an individual but should only enhance it.

Our goal was to provide all of the benefits of an actively powered exoskeleton but in a portable framework without motors or an external energy source to provide an ease in the gait cycle. We hypothesize that a passive wearable device using parallel elastic elements during the walking cycle is capable of recycling a significant portion of the ankle joint mechanical work and could reduce the metabolic cost of walking. We set out to develop a passive, 'energy-neutral' system with the following key design objectives.

II. Advantages

- I.** The movements of the worker are copied by the exoskeleton, i.e. the limbs of the human and the exoskeleton are aligned during motion.
- II.** No external power source required.
- III.** Heavy objects can be lifted for long period of time.
- IV.** Increases efficiency of operator.
- V.** Robust in design, requires less space, can be assembled & disassembled easily.

III. Disadvantages

- 1. Distinction of intended from unintended movements is often difficult and results in systems with many different kinds of sensors and complex signal processing.
- 2. But the cooperation and function allocation, man-machine information exchange, real-time motion planning and safety control are the difficulties faced by building such a control strategy.
- 3. Free body motions are restrained.
- 4. May require costly materials like carbon-fibre, aluminium.

IV. Applications

- 1. Medical /Rehabilitation purposes where the devices are aimed to support physically weak, injured, or disabled people to perform a wide range of motions.
- 2. A small number of exoskeletons have also been designed for military applications for soldiers.
- 3. For Industrial application to lift or carry heavy loads.
- 4. In civilian areas, exoskeletons could be used to help fire fighters and other rescue workers survive dangerous environments.

V. Future Scope

The basic operation of this machine to reduce fatigue by sustaining the weight of the wearer in a similar fashion as that by a regular chair. As your leg weakness progresses due to increasing in your age, your health care team may recommend equipment known as ambulation aids and bracing to help you with walking. Other devices can help give you needed support as the muscles in your neck and arms weaken. There may be a use of such exoskeletons which can give more effect than braces and ambulation aids. The specific aid or device that's best for you depends on the extent of the weakness and your willingness to use such a device. Using such instruments for walking climbing, doing work is safe and you're confident that you won't fall. For some, this means having an attendant or using an assistive device when walking short distances. Such instruments are going to bring more flexibility, mobility and most importantly the confidence. Apart from in medical therapy and military sector, active or hoses or exoskeletons offer other applications, for example as a power booster during assembly work in production. They act here as a strength support device to prevent signs of fatigue that occur especially when performing repetitive actions.

VI. CONCLUSION

The aim of this project was to design and develop a lower body exoskeleton i.e. chairless chair. With the help of the guide of our project and the departmental head. It was a nice opportunity and to develop such things that is essential to the industrial worker for long hours duration. It is a simple device which consists of mechanism and linkages to transfer the motion no external battery source is required.

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