

Exoskeleton Device

Introduction

Robots are becoming more interactive in assisting human beings in their daily lives, world over. They are now serving humanity in the fields of industry, defence and medicine. Exoskeletons are also the devices that reside in category of wearable robotics. It is an external structural mechanism with joints and links corresponding to those of the human body. Exoskeleton with their applications in rehabilitation medicine and virtual reality simulation, offer benefits for both disabled and healthy populations. These devices can be used as a capability magnifier or as assisting device for spinal cord injury patients, stroke patients, and the elderly.



The exoskeleton system consists of a wearable exoskeleton suit, powered by actuators and a closed loop control system to drive the mechanism. An array of six electrogoniometers comprises the feedback system of the controller. Depending on the feedback from the goniometer, an angle-based control algorithm drives the actuators for generation of the desired pattern for movement of the limbs. The device has been designed for therapeutic use under the supervision of a therapist or clinician. They have the functionality of independent exercise of the individual joints of the lower limb. These systems allow achievement of selective control of movement of the joint with predefined speed. It features 6 Degree of Freedom (DOF) augmentations, one for each hip, knee, and ankle joints. The twin wearable legs are powered by actuators, all controlled by a real-time microprocessor, which receives data from the sensors attached at each joint. The control algorithm, data manipulation, and the user interface are done in a real-time environment.

Features

- 6 Degree of Freedom (DOF) augmentations, one for each hip, knee, and ankle joints.

- Prime components: The exoskeleton suit, control hardware, interfacing circuit board, touch panel and power system.
- Software modes: Sit-stand mode, walk mode, therapy mode, etc.
- Powered with rechargeable battery, support 30 minutes of walking.

Relevance

- Over 21 million people in India are suffering from physical disability.
- Fully actuated gait assistance.
- Suitable for Rehabilitation Centres.
- Low physiotherapists to patient ratio.
- Suitable to wide variety of patients

Status

- Technology transferred to M/s Pentagon Rugged System, Hyderabad.
- Future developments on devices for walking on uneven terrain and full body exoskeleton in progress.