

The Office of Technology Management

UNIVERSITY OF TEXAS  ARLINGTON

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Pneumatically actuated exoskeleton system for hand rehabilitation

INVENTORS: Dr. Muthu Wijesundara, Dr. Mahdi Haghshenas-Jaryani, Dr. Katie Carrigan,

TECHNOLOGY NEED

Robotic exoskeletons are penetrating into the rehabilitation market as they can complement therapists by providing assistive and repetitive motion to patient in a consistent manner. However, realizing exoskeletons for hand therapy is challenging due to the complexity involved in anatomical motion and the degree of control necessary within small joint sizes. Though a few hand rehabilitation robotic devices are available in the market, they are limited in terms of providing dexterous motion, adapting to patients' conditions, and accommodating sizing needs. By considering the vast number of hand impairment due to musculoskeletal disorders, orthopedic injuries, and neurological conditions; there exists a high demand for alternative solutions that can serve wider population and satisfy hand rehabilitation needs.

INVENTION DESCRIPTION/SOLUTION

Pneumatically actuated hand exoskeleton system is a portable, feedback controlled, and programmable standalone rehabilitation unit capable of implementing prescribed therapeutic schemes. The exoskeleton consists of five soft robotic digits where each digit is equipped with an inertial measurement unit sensor to monitor the joint motion during flexion and extension. Robotic digits' structure mimic human finger with three discrete joint allowing control over individual joint for dexterous motion. Associated adaptive algorithms offer physical assistance as needed to compensate impairment. A mathematical model embedded into the system determines the applied torque at each joint based on the motion parameters and actuator pressure applied during the therapy. Resulting joint-angle motion providing data for progress monitoring and evaluation. Remote monitoring and adjustment enable therapists to prescribe, monitor, and evaluate therapy outside of the traditional clinical setting.

APPLICATIONS

- Rehabilitation after surgery or neuromusculoskeletal injuries
- Task specific training for neurological rehabilitation (stroke, cerebral palsy, spinal cord injury)
- Assistive exoskeleton for daily living activities
- Assistive exoskeleton for preventing work place repetitive stress injuries

KEY BENEFITS

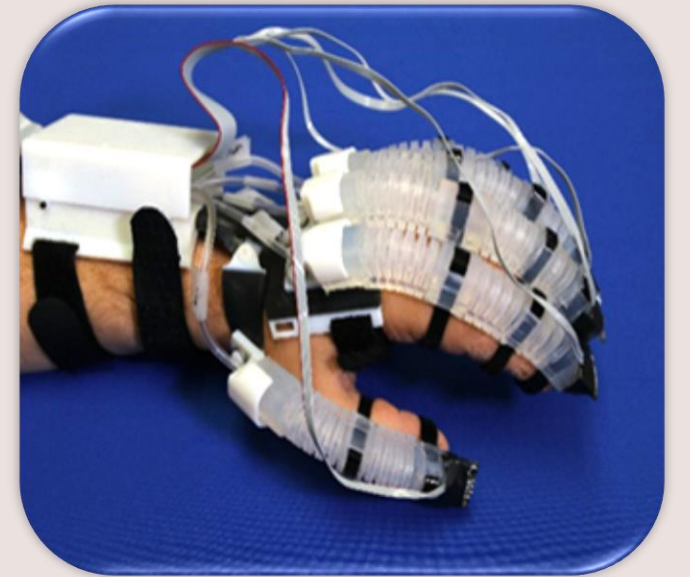
- Three therapy modes in one system (continuous passive motion, adaptive assistive motion, active resistance movement)
- Can be used with virtual reality rehabilitation gaming
- Can be used for mirror therapy (bilateral motion therapy)
- Evidence based optimal therapy (quantifiable diagnostic, progress monitoring, remote access and data logging)
- Affordable and usable (light weight and portable, easy-to-use and safe, low-Cost)

STAGE OF DEVELOPMENT

Prototyped and tested

PUBLICATION

[CBS 11 NEWS Link](#)



More about the Inventors:
[Dr. Muthu Wijesundara](#)

Contact information

For licensing, please contact
Sharon Ngwenya, Ph.D.
sngwenya@uta.edu
otm@uta.edu
P: 817.272.1130

Our mailing Address:

The Office of Technology
Management
701 S Nedderman drive,
Suite 333, Arlington, TX
76019

Connect with us:

