



Partial-Assist Lower-Limb Exoskeletons with Backdrivable Actuation and Task-Adaptive Control

TECHNOLOGY NUMBERS: 2021-069, 2021-178, 2021-179, 2021-180, 2023-572, 2024-236, 2025-533

Accelerate Blue Foundry - 2025 (Life Sciences)

Technology ID

2023-572

Category

Medical Devices

Life Sciences

Accelerate Blue Foundry -
2025/Life Sciences

Inventor

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Further information

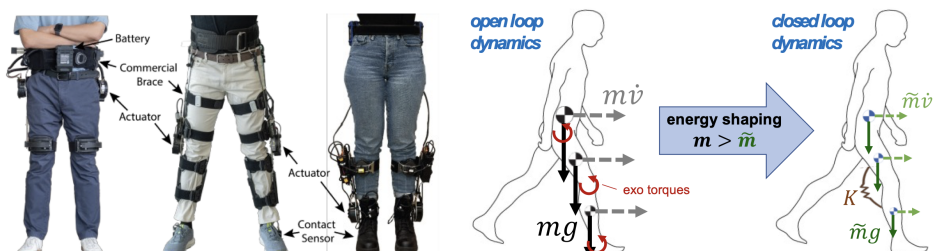
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OVERVIEW

This modular exoskeleton technology delivers adaptive, user-synchronized assistance for both healthy workers in physically demanding jobs and individuals with mild to moderate mobility limitations, using compact, backdrivable “quasi-direct drive” motors and intelligent control to flexibly assist movement across many activities—without being limited to specific tasks or noisy, rigid devices.



DESCRIPTION

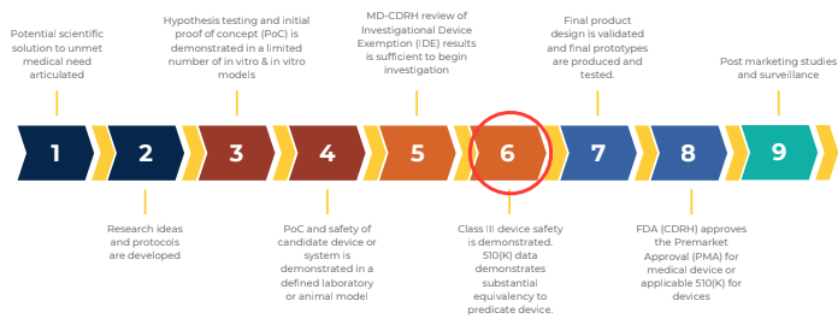
The system uses lightweight, compact electric motors coupled with simple, efficient gear systems to provide strong yet easily reversible support at the hip, knee, or ankle. Unlike previous exoskeletons, this technology adapts automatically to whatever the wearer is doing, forgoing predefined motion patterns or task-specific programming. Its modular design allows flexible assistance at different leg joints, catering the level and location of support to unique user needs and scenarios. All of this is achieved with a new kind of actuator and a smart control approach that tracks the user's natural movement, minimizing bulk, noise, complexity, and the restrictions often imposed by competing devices.

VALUE PROPOSITION

- High-torque assistance with minimal effort required from the user, combining strength with flexibility across a wide range of activities.
- Modular, plug-and-play joint configurations allow personalized support—suited both workplace and clinical/recovery needs—without sacrificing comfort or adaptability.
- Task-agnostic, trajectory-free control synchronizes seamlessly with users' natural movements, overcoming limitations of rigid, pre-programmed devices and eliminating the need for complex task classification.

TECHNOLOGY READINESS LEVEL

Medical Device Technology Readiness Levels



INTELLECTUAL PROPERTY STATUS

Patent applications pending.

MARKET OPPORTUNITY

There is significant unmet need for adaptable mobility support—ranging from mild-moderate mobility-limited individuals (such as seniors or those with chronic conditions) to healthy workers facing risk of fatigue or injury in physically taxing roles. Key market applications include industrial workplaces (e.g., logistics, manufacturing), rehabilitation and senior care, and home/community mobility aids. The technology's modularity and adaptability open the door to broad adoption in environments where traditional exoskeletons fail due to rigidity or limited versatility.

Over 40 million U.S. adults face mobility limitations, and fatigue-related injuries remain a leading occupational hazard in physically demanding industries.