Transforming wheeled mobility

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

NRI: INT: MiaPURE (Modular, Interactive and Adaptive Personalized Unique Rolling Experience)

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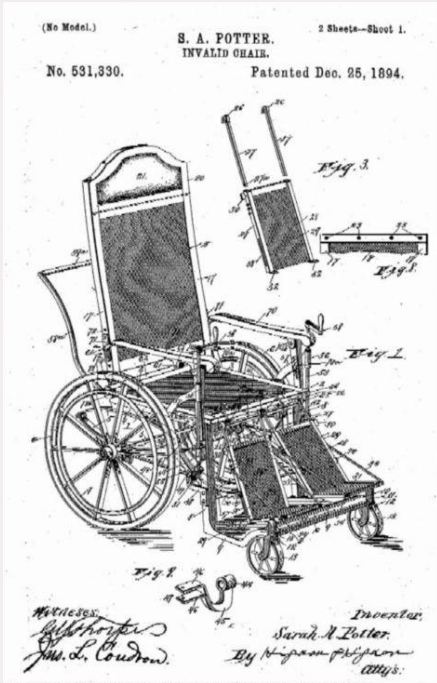
Challenge

- Wheelchair design has changed little in 150 years
- Manual wheelchairs
  - 70% upper extremity injuries
  - Propulsion needs both hands
  - Limited terrain & tight spaces
  - Easy to tip/fall
- Powered wheelchairs
  - Heavy, large, costly
  - Limited tight spaces
  - Need modified vehicle


(No Model.) 2 Sheets—Sheet 1.

S. A. POTTER.

INVALID CHAIR.

No. 531,330. Patented Dec. 25, 1894.

Courtesy of the United States Patent and Trademark Office

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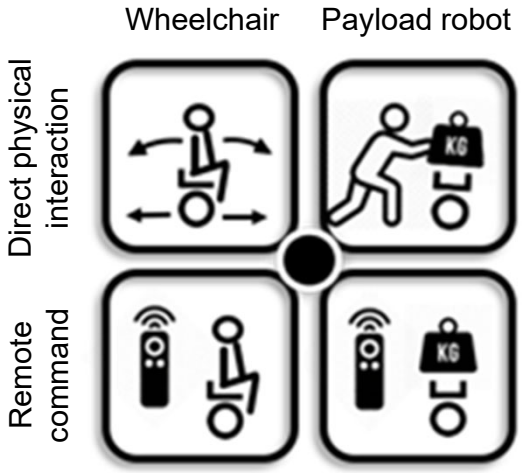
Solution

- PURE (Personalized Unique Rolling Experience)
  - Self-balancing ballbot
  - Hands-free motion
  - Lean-to-steer ability
  - Omni-directional motion
  - Compact design
- Modular
  - Common ballbot drivetrain
  - Open-source drivetrain platform
  - Wheelchair - Payload robot
- Interactive
  - Intuitive user interface
  - Direct physical interaction
  - Remote command
- Adaptive
  - Multiple users – loads
  - Multiple terrains
  - Driving assistance



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Scientific Impact

- Common omnidirectional ballbot platform
  - Compact, agile, safe
  - Open-source
  - Multiple human-robot interfaces

User-Centered Design (continual focus & UX groups)
manual wheelchair users, able-bodied allies

AIM 1: Explore intuitive human-robot user interfaces.

AIM 2: Address low-level control of ballbots under direct physical interaction or remote command.

AIM 3: Establish higher-level control to improve user driving experience.

Self balancing w/ 50 lb load

Broader Impacts

- Transformational user-centered co-robot
  - Organic hands-free rolling mobility
- University courses, high school summer camps
  - Design thinking focused on design for disability
- New Human Performance Maker Lab
  - US Paralympic Training Center in UIUC/DRES

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