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WheelFit – An integrated wellness management platform for manual wheelchair users

ID: 04568

Innovators: Kalai Tsang, Dan Ding, Khara James and Joe Ruffing

Technology Description

WheelFit is a smart wellness management platform for manual wheelchair users that provides data about the quantity and quality of wheelchair-related movements so that they can receive personalized feedback, customized exercises, and tips to keep their chairs at optimal condition enabling them to be more efficient in their everyday activities, and encourage a mindful approach to improve their physical activity and fitness.

The current WheelFit prototype has two commercially available wearable sensors, one on the users' wrists and another clipped to the wheels on their wheelchair, that stream movement data to an app on the users' mobile device. The WheelFit app then processes this movement based physical activity data using proprietary machine learning algorithms. The processed data from these algorithms is used to provide real-time feedback about the activity such as calories burnt, time being active, distance traveled, and push counts.

Advantages

- Apple watch, which provides push counts (similar to step counts), is the only activity tracker available for manual wheelchair users. In addition to providing push counts, WheelFit provides additional information about the quality of movement which is essential feedback for preventing injury caused by improper wheelchair techniques during propulsion, transfer, and other wheelchair-related activities.
- Currently, the only option for wheelchair service providers to provide preventive care is when the users come back to the hospitals with serious complications such as rotator cuff injury or if the wheelchairs have a catastrophic failure. WheelFit can serve as a portal of communication between the user and service provider to bridge this gap and promote a healthier active lifestyle for wheelchair users.

Applications

- Physical activity monitoring and promotion in manual wheelchair users
- Tele-rehabilitation platform
- Online peer support network

Stage of Development

-Validated machine learning algorithms with over 80% accuracy
-Other machine learning algorithms are under development

IP Status

Notable Mentions

- 2nd place, Randall Family Big Idea Competition 2018, University of Pittsburgh ($15,000).
- Finalist (selected in the top 7 among 135 teams from 25 different countries), Global Business Challenge 2018 at Brisbane Australia.

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Relevant Publications

- Conference proceedings and posters:
  Tsang, K; Ding, D. (2018) Design and development of WheelFit for Physical Activity Measurement and Promotion in Manual Wheelchair Users, *ACRM 95th Annual Conference, Dallas, TX*

  Tsang, K; Young, H; Rimmer, J; Ding, D. (2017) Can the custom algorithm for one fitness wearable be used for another device? *5th International Conference on Ambulatory Monitoring of Physical Activity and Movement (ICAMPAM), Bethesda, MD*

  Tsang, K; Young, H; Rimmer, J; Ding, D. (2017) Adapting commercial wearable fitness technology for manual wheelchair users. *33rd International Seating Symposium (ISS), Nashville, TN*

  Tsang, K; Young, H; Rimmer, J; Ding, D. (2016) Making off-the-shelf fitness wearables accessible to wheelchair users. *3rd State of the Science Conference on Exercise and Recreational Technologies for People with Disabilities, Washington, DC*

  Tsang, K; Hiremath, S; Ding, D (2015) Measuring energy expenditure in manual wheelchair users with ActiGraph monitor. *Annual Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Conference, Denver, CO*

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