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Science News

from research organizations

Engineers combine AI and wearable cameras in self-walking robotic exoskeletons

Date: March 15, 2021

Source: University of Waterloo

Summary: Robotics researchers are developing exoskeletons and prosthetic legs capable of thinking and moving on their own using sophisticated artificial intelligence (AI) technology.

Robotics researchers are developing exoskeletons and prosthetic legs capable of thinking and making control decisions on their own using sophisticated artificial intelligence (AI) technology.

The system combines computer vision and deep-learning AI to mimic how able-bodied people walk by seeing their surroundings and adjusting their movements.

"We're giving robotic exoskeletons vision so they can control themselves," said Brokoslaw Laschowski, a PhD candidate in systems design engineering who leads a University of Waterloo research project called ExoNet.

Exoskeletons legs operated by motors already exist, but users must manually control them via smartphone applications or joysticks.

"That can be inconvenient and cognitively demanding" said Laschowski, also a student member of the Waterloo Artificial Intelligence Institute (Waterloo.ai). "Every time you want to perform a new locomotor activity, you have to stop, take out your smartphone and select the desired mode."

To address that limitation, the researchers fitted exoskeleton users with wearable cameras and are now optimizing AI computer software to process the video feed to accurately recognize stairs, doors and other features of the surrounding environment.

The next phase of the ExoNet research project will involve sending instructions to motors so that robotic exoskeletons can climb stairs, avoid obstacles or take other appropriate actions based on analysis of the user's current movement and the upcoming terrain.

"Our control approach wouldn't necessarily require human thought," said Laschowski, who is supervised by engineering professor John McPhee, the Canada Research Chair in Biomechatronic System Dynamics. "Similar to autonomous cars that drive themselves, we're designing autonomous exoskeletons and prosthetic legs that walk for themselves."

The researchers are also working to improve the energy efficiency of motors for robotic exoskeletons and prostheses by using human motion to self-charge the batteries.

Story Source:

Materials provided by [University of Waterloo](#). Note: Content may be edited for style and length.

Journal Reference:

1. Brokoslaw Laschowski, Reza Sharif Razavian, John McPhee. **Simulation of Stand-to-Sit Biomechanics for Robotic Exoskeletons and Prostheses with Energy Regeneration**. *IEEE Transactions on Medical Robotics and Bionics*, 2021; 1 DOI: [10.1109/TMRB.2021.3058323](https://doi.org/10.1109/TMRB.2021.3058323)

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Questões:

- 1) Observe o texto (título, subtítulo, cognatos, etc) e responda: qual é o gênero do texto?

Notícia de site, revista científica.

- 2) Qual é o assunto principal do texto?

Fala sobre pesquisas que estão desenvolvendo exoesqueletos e protótipos de calças que podem tomar decisões para ajudar na movimentação de pessoas através do uso sofisticado de inteligência artificial.

- 3) Qual é a data da publicação do texto e qual o nome da instituição de pesquisa que serviu de fonte para o texto?

15 de março de 2021, Universidade de Waterloo.

- 4) Conforme o texto, o que é o ExoNet?

É o nome do projeto que visa permitir a o exoesqueleto se autocontrolar.

- 5) De acordo com o texto, de que forma os usuários do sistema de pernas de exoesqueleto já existente controlam seus movimentos?

De forma manual, através de joysticks ou aplicativos de celular feitos para isso.

- 6) Na frase “a PhD candidate in systems design engineering who leads a University of Waterloo research project called ExoNet”, o pronome relativo “**who**” faz referência a quem/quê?

Brokoslaw Laschowski.

- 7) Na frase “To address that limitation”, a qual limitação o autor do texto faz referência?

Após cada atividade o usuário deve pegar seu telefone e selecionar o que deve ser feito, pois o exoesqueleto não realiza isso sozinho.

- 8) Traduza para o português os seguintes grupos nominais:

- a) wearable cameras
câmeras vestivei.
- b) Robotics researchers
Pesquisadores de robótica.
- c) computer vision
visão computacional.
- d) a new locomotor activity
uma nova atividade locomotora.
- e) sophisticated artificial intelligence technology
Tecnologia de inteligência artificial sofisticada.
- f) systems design engineering
engenheiro de design de sistemas.
- g) the Canada Research Chair in Biomechatronic System Dynamics
O presidente de pesquisas do Canadá em dinâmicas de sistemas de biomecatrônica.
- h) smartphone applications
aplicações de celular.
- i) a student member of the Waterloo Artificial Intelligence Institute

um estudante membro do instituto de inteligência artificial de Waterloo.

- j) the energy efficiency of motors for robotic exoskeletons and prostheses
a eficiência energética dos motores para exoesqueletos robóticos e próteses.