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Mechanism for Alleviating the Effects of Joint Misalignment Between Users and Wearable Robots

Joint misalignment between a wearable robotic joint and its user can result in detrimental mechanical interference. For small degrees of joint misalignment, this interference can result in fatigue and friction-related user injuries, such as irritant contact dermatitis. Large degrees of joint misalignment can result in more severe injuries such as bruising, joint dislocation, and stress fractures. In addition to possible injuries sustained by the user, mechanical interference can adversely affect and damage the robot kinematics. The most common method to mitigate joint misalignment includes custom fitting of the wearable device to the user. However, joint misalignment can still occur in custom fitted devices. Furthermore, custom fitting of wearable devices can be costly and time consuming. In order to reduce the harm to the user and the device, there needs to be an effective and economical solution for alignment correction.

Researchers at Arizona State University have created a passive mechanism that can mitigate the effects of joint misalignment between a wearable robot and its user. When joint misalignment occurs, this device uses a passive slip mechanism to increase the translational degrees of freedom, thus alleviating mechanical interference between user and machine. This technology can be used to reduce fatigue and injury related to joint misalignment for the user. It can also prevent mechanical damage caused by joint misalignment for the robot, and correct the misalignment without damaging the device.

Potential Applications

- Prosthetics
- Human-robot interfaces
- Artificial limbs
- Joint alignment
- Rehabilitation

Benefits and Advantages

- Novel Design – Uses a passive slip mechanism to increase translational degrees of freedom and correct joint misalignment between a wearable robot and the user.
- Lower Costs – Reduces the need for expensive, custom-fitted wearable robots.
- Proven Results – A prototype has shown the ability to reduce user injury and mechanical damage to the robot by correcting joint misalignment.

For more information about the inventor(s) and their research, please see

Dr. Panagiotis Artemiadis's directory webpage

Dr. Hyunglae Lee's directory webpage