Wearable Real-Time Gait Analysis And Sensory Feedback System For Gait Rehabilitation And Biomechanical Optimization

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SUMMARY
UCLA researchers in the Department of Bioengineering have developed a wearable sensory feedback system that provides instructive tactile feedback to guide the user towards biomechanical gait improvements, based on real-time motion analysis derived from wearable sensor data.

BACKGROUND
The current standard of care for neurological, musculoskeletal, and orthopedic rehabilitation is physical therapy, predominantly using prescribed exercises with supervision and manual physical assistance from a trained physical therapist. However, this form of therapy relies heavily on the training and visual observation of the physical therapist, and does not provide the physical therapist with sensitive, reliable, quantifiable, or digital means of measuring, analyzing, recording, or tracking a patient’s gait in real time. In addition, physical therapy is applied very inconsistently across the patient population, as its effectiveness depends heavily on both the training of the physical therapist and the dedication and persistence of the patient.

INNOVATION
Researchers at UCLA have developed a wearable sensory feedback system, which combines real-time gait analysis via fully wearable sensors with time-discrete instructive feedback designed specifically to correct specific features of gait. Based on real-time motion analysis derived from the sensor data, this system is able to guide users to achieve a more symmetrical or better-aligned gait. This system can improve the effectiveness of physical therapy by providing physical therapist more quantitative tools to assess and guide patients in real time. It could also improve patient participation and compliance by giving feedback that reinforces positive changes and discourage negative ones in real-time. This wearable feedback system can be used by patient in the absence of direct physical therapist oversight, thereby expanding the access of patient to high-quality gait coaching.

APPLICATIONS
▶ Physical therapy and rehabilitation of musculoskeletal and/or orthopedic disorders, including rehabilitation from traumatic injury or surgery
▶ Gait training for long-term management and mitigation of degenerative neurological and orthopedic conditions, such as peripheral neuropathy and osteoarthritis

ADVANTAGES
▶ Recognize individual steps and compute biomechanical gait parameters in real time, based on sensor data
▶ Provide instructive, biomechanically-related sensory feedback according to gait parameters computed
▶ Provide physical therapist with quantitative data to assess and guide patients
▶ Improve patient participation and compliance with physical therapy programs

PATENT STATUS
Patent Pending

OTHER INFORMATION
KEYWORDS
Sensory feedback system, tactile feedback, gait improvement, wearable, sensor, medical device, gait rehabilitation, musculoskeletal, orthopedic, physical therapy

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