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Smart Shoes with Adaptive Sampling for Rehabilitation and Health Monitoring

Background

Insufficient physical activity in individuals is strongly linked to various health complications that can lead to avoidable death. With sedentary lifestyles becoming more common as society modernizes, individuals are more likely than ever to suffer its health effects. Even so, prioritization and tracking of physical activity with the aid of technology has helped grow a health-conscious demographic. Together, these trends create an important opportunity for health-monitoring technologies to help manage conditions such as diabetes and cardiovascular disease.

Rehabilitation and treatment programs for these types of conditions often involve performing structured physical activity on a regular basis. Health professionals may track progress using an activity-monitoring device worn by the patient. The large amount of data collected by many available devices, however, compromises battery life. Therefore, a redesigned tracking system that avoids unnecessary data collection can lead to more sustained operation and increased practicality.

Invention Description

Researchers at Arizona State University have developed smart shoes to be used in daily health monitoring and rehabilitation, featuring an adaptive sampling algorithm, pressure sensors, and a global positioning system. By adapting to identified human activities, the amount of collected data is reduced by 95 percent. This reduction of collected data results in a significant increase in battery life without sacrificing the accuracy and reliability of the device. In addition, the smart shoes collect multiple types of data in order to fully contextualize the user's daily activity: Pressure sensors within the shoes measure ground contact forces, and a global positioning system records the user's traveled path. The resulting device offers fully integrated continuous monitoring of activity without additional articles of clothing.

Potential Applications

- Health and rehabilitation
- Personal safety

- Motion/location tracking

Benefits and Advantages

- Power-saving – Adaptive algorithm extends battery life by cutting unnecessary data collection by 95%
- Effective – Reliably and accurately detects human walking dynamics
- Convenient – Integrates into shoes without need for separate wearable devices
- Multi-dimensional – Captures both ground contact forces as well as user location

[Homepage of Professor Wenlong Zhang](#)