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## Wireless Wearable Gait Monitoring System using Wii Remote Control

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## Abstract

Gait monitoring systems currently used in clinical research consist of expensive equipments and software, usually located in a motion laboratory under a physician's or physical therapist's supervision. While such gait analyzers produce highly accurately measurements, they are often cumbersome and inconvenient to use, especially for patients in a rural area. For clinical rehabilitation need, a low-cost portable gait monitoring system can provide quantitative analysis complementing to physician's qualitative analysis. Our research team uses Nintendo Wii remotes to build a gait monitoring system which is inexpensive, wearable and easy to use. Our gait monitoring system is used to model gait phases of normal human walking, and calculate temporal gait parameters such as step/stride length, epochs of single stance and double stance. A typical experiment is carried out in three main steps: (1) data collection using the Wii remotes, (2) data processing and (3) gait parameters calculation using our mathematical model. In the first step, MATLAB software is written to collect 3-axis linear accelerations (at sampling rate 50 Hz) and process these data points wirelessly from the Wij remotes attached to a specific part of a subject's leg (tibia or c alf). In the second step, data signal is processed using moving-average to reduce unwanted noise. Then we use this resulted signal to study gait phases and compute the temporal gait parameters in the final step. The calculated step/stride length is compared with measurements from experiments. Three young male healthy adults are subjects in the experiment walking on both a treadmill and a level floor. For walking on the treadmill with controlled speed, the stride length obtained is accurate within 5% error. For walking on the level floor, the stride length is accurate within 30% error, where the magnitude of error is likely from the model calculation, which can be improved. In addition, with normal walking speed, our gait monitoring systems exhibit gait phases like those obtained from the ones in a motion laboratory.

Kenwords: Gait analysis, Motion analysis, Step/stride length