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Nintendo Wii remote for temporal parameters of gait

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INTRODUCTION

Typical gait parameters are difficult to obtain clinically. And, they require a very expensive device. We introduce Wii remote as an easy-to-use and affordable device. It has been increasingly used, not only for game players but also for medical researchers, especially in rehabilitation. In this study, linear acceleration and angular velocity from tibia of subjects captured by the device are used to calculate the temporal parameters.

METHODS

Three young healthy adults were instructed to walk on a treadmill. Two Wii remote with Wii Motion Plus were attached on both tibias of these subjects using elastic tubular bandages. 3-axis acceleration were obtained from the devices (at 50Hz sampling rate) and used to calculate stride length. Sum of their magnitude is used to detect phases of gait. 3-axis angular velocity was another component provided by the device, and used to calculate an orientation of the tibia. Then, a forward acceleration is estimated by projecting the 3-axis acceleration accordingly to the orientation. A total displacement of the tibia was obtained using trapezoidal integration method. Accumulated error from the integration was reset every gait cycle.

RESULTS

The stride length was obtained with 5% error which is proportional to the walking speed. Different phases of the normal gait were classified as shown in Fig1. According to this study, it is recommended not to use device for high speed walking (>3km/h) due to a limitation of the device.

CONCLUSIONS

Wii remote is considered a potential clinical device for calculating temporal parameters. It provides a 6D inertial measurement with affordable price. This device is easy-to-use and very suitable for people in developing countries. The implementation of multiple Wii remotes attached on lower limbs, femur and tibia for instance, can simultaneously determine more complex kinematic gait parameters.

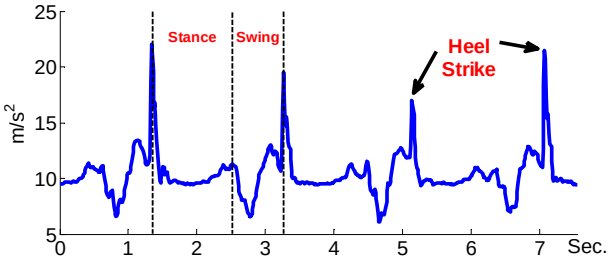

Fig.1 Sum of magnitude of 3-axis accerelation

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Reference

[1] Lee, J.A., et al. *Wearable accelerometer system for measuring the temporal parameters for gait*, 2007