

Wii-Based for Knee Joint Angle Measurement

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Aim

Biomechanical information is increasingly important for rehabilitation purposes. The inertial measurement unit (IMU), which is a combination of gyroscopes and accelerometers that are capable of measuring angular velocities and linear accelerations, normally provides needed information such as joint angles. Its measurements are proven clinically accurate, reliable and cost effective; however, clinicians or researchers may be unfamiliar with the IMU device; and it may not be accessible to many households. We propose a Nintendo Wii-based alternative to measure knee joint angles.

Methods

Four Wii remotes with Wii Motion Plus were wrapped with elastic tubular bandages on a normal subject, two on thighs and two on shanks (left and right). The device reference frame was set with respect to the anatomical reference frame of the subject. When a subject walked on a treadmill, a knee joint angle was calculated from the difference between shank and thigh angles obtained from gyroscope angular velocities. A single static calibration at the beginning of the experiment using and the linear de-drift algorithm were used to eliminate integration errors in every gait cycle.

Result

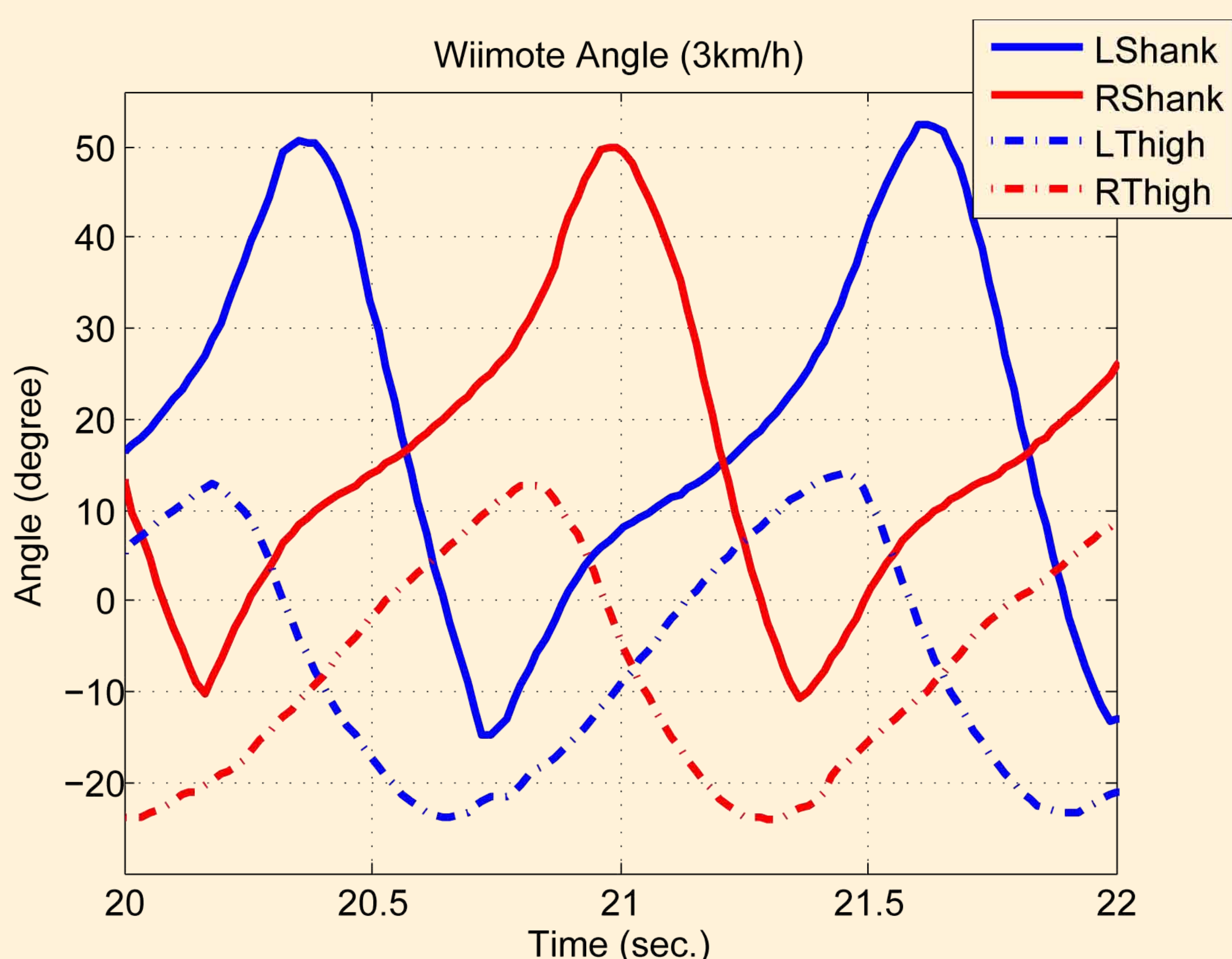


Figure 1: Angles from thigh and shank at 3 km/h

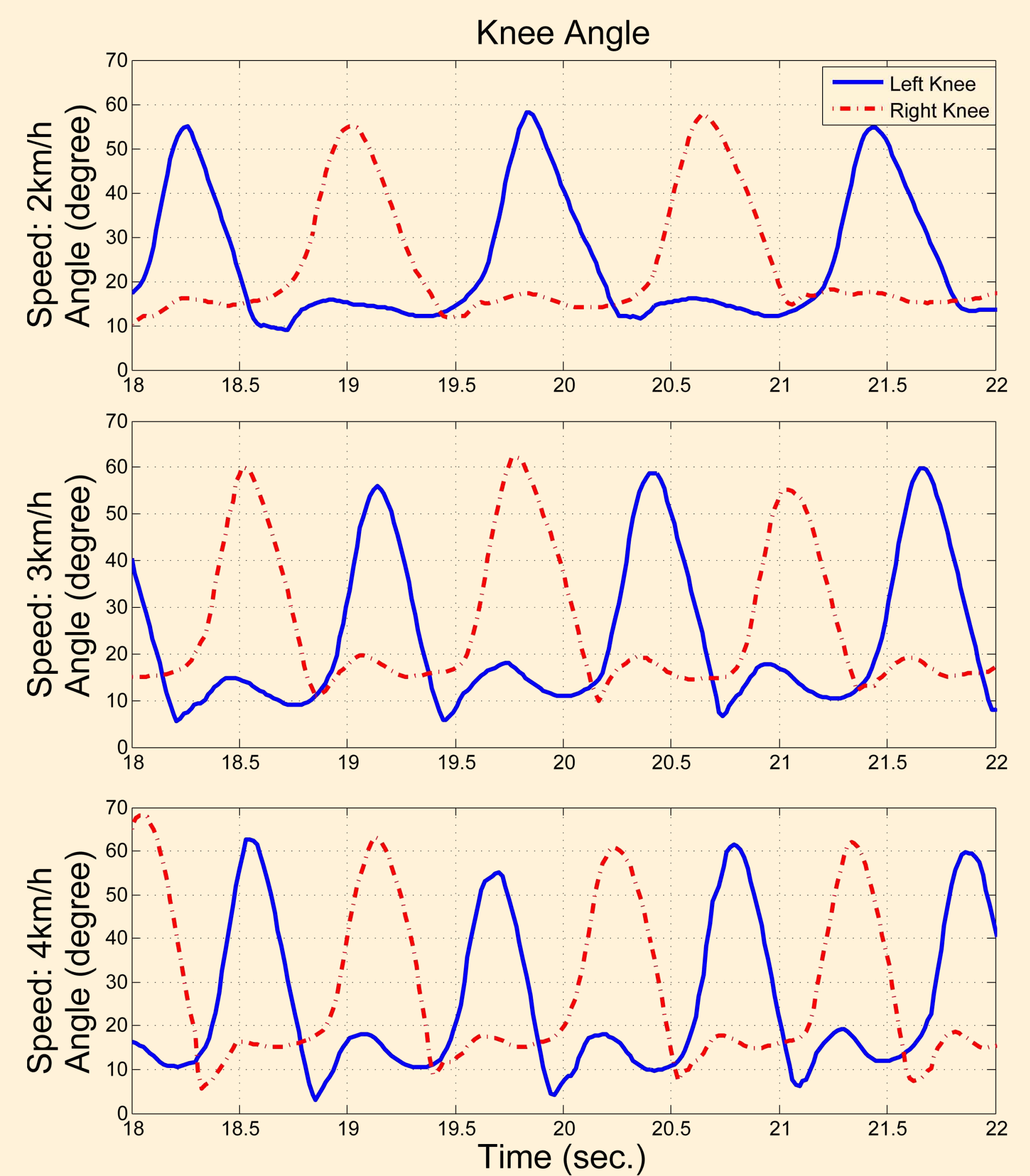


Figure 2: Knee angles at 2, 3 and 4 km/h

Our method qualitatively exhibits knee angle graphs consistent with other measurements.

Conclusion

The proposed method could be an alternative for a knee joint measurement.

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References

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