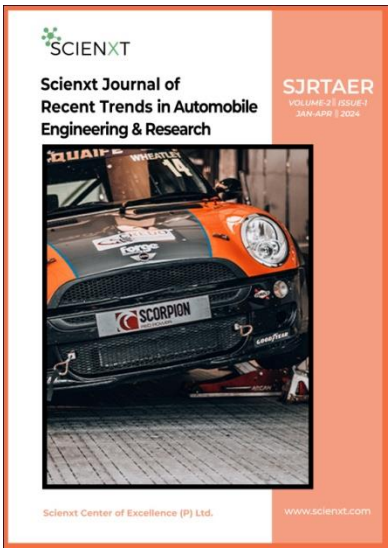

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Motion velocity, acceleration and energy expenditure estimation using micro flow sensor motion

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Abstract:

This paper presents a groundbreaking solution for quantitatively assessing physical recovery and designing exercise interventions for post-stroke patients with neurological impairments. By leveraging a micro flow sensor, our proposed wearable device enables accurate estimation of motion velocity, acceleration, and energy expenditure during human limb motion.Our approach utilizes a homemade micro thermal flow sensor to precisely detect motion velocity. To extract motion acceleration, we introduce a Jerk–Kalman based algorithm, enhancing the reliability of our estimations. By integrating motion velocity and acceleration data, we are able to estimate the energy expenditure associated with limb motion.We conducted calibration experiments and applied our methodology to real-world scenarios to validate its effectiveness. The results demonstrate that our micro flow sensor-based motion estimation method is not only free from accumulated errors but also robust for dynamic motion measurements. This promising approach offers a valuable auxiliary tool for evaluating energy expenditures during rehabilitation training, providing crucial insights for post-stroke patient care and recovery.

Keywords:

Flowsensor, Kalmanfilter, motionacceleration, motionvelocity, energyexpenditure.