MEASURING MOTION AND THE KICK AND GLIDE PHASES OF NORDIC SKIING FOR PRECISION ANALYSIS

CROSS COUNTRY AND SKI MOUNTAINEERING: PERFORMANCE ESTIMATION AND ENERGY OPTIMIZATION

Wearable systems using inertial measurement units (IMU) have been proposed in a variety of sport disciplines, but their application to skiing and particularly Nordic skiing such as cross country or ski mountaineering is new. New methods based on IMUs fixed on skis, poles and body segments are proposed to estimate spatio-temporal parameters and lower limbs angles for the diagonal stride in classical cross-country skiing. Good accuracy and precision were obtained for detecting each cycle, thrust and pole push phases as well as for estimating cycle speed, cycle length, shank and thigh angles. The system was also sensitive to changes of speeds and inclines and offers a very easy setup to provide an unlimited capture volume for measurements on snow. The algorithm was adapted for ski mountaineering and used to determine an optimal slope and speed allowing minimization of energy expenditure.