Recognition of Individual Kinematic Patterns during Walking and Running – A Comparison of Artificial Neural Networks and Support Vector Machines

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Abstract

Modeling of complex relations concerning the analysis of patterns of human walking and running in the past years was realized using different methods of soft-computing. Looking at the classification of individual movement patterns optimized model approaches seem to lead to an advancement regarding classification rates. In the present analyses kinematic data of eight male competitive athletes (middle- and long-term running) were collected while walking respectively running on a treadmill at three different velocities. The segmented and modeled data were used to train an Artificial Neural Network (ANN) and a Support Vector Machine (SVM) in order to compare the classification rates of the models regarding the identification of subjects due to their kinematic patterns. As expected the optimized SVM separated the data over all velocities more precisely and classification rates of 100% could be achieved concerning the identification of subjects (ANN 94%-95.5%). Regarding the identification of individuals with models that were trained with data from different velocities the SVM could still achieve a classification rate of 98.6% (ANN 94%). Due to the implemented optimization in data separation classification of unknown data with the SVM leads to a higher rate of classification.

KEYWORDS: PATTERN RECOGNITION, TREADMILL SURVEY, ARTIFICIAL NEURAL NETWORK, SUPPORT VECTOR MACHINES, KINEMATIC ANALYSIS