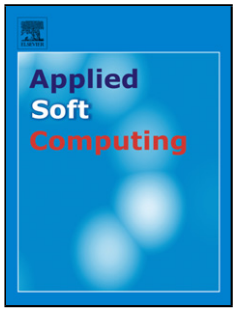

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PII: S1568-4946(17)30461-1
DOI: http://dx.doi.org/doi:10.1016/j.asoc.2017.07.041
Reference: ASOC 4369

To appear in: *Applied Soft Computing*

Received date: 20-6-2016
Revised date: 13-7-2017
Accepted date: 17-7-2017

Please cite this article as: TzeWei Yeoh, Fabio Daolio, Hernán E. Aguirre, Kiyoshi Tanaka, On the Effectiveness of Feature Selection Methods for Gait Classification under Different Covariate Factors, *<![CDATA[Applied Soft Computing Journal]]>* (2017), http://dx.doi.org/10.1016/j.asoc.2017.07.041

On the Effectiveness of Feature Selection Methods for Gait Classification under Different Covariate Factors

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Abstract

Gait classification is the problem of recognising individuals by the way in which they walk. The presence of covariate factors such as different clothing types, carrying conditions, walking surfaces, etc., can seriously complicate the task. Clothing, for instance, can occlude a significant amount of gait features and make human recognition difficult. Since the location of occlusion may differ for different covariate factors, relevant gait features may become irrelevant when the covariate factor changes, and exploiting occluded gait features can hinder the recognition performance. Therefore, feature selection has become an important step to make the analysis more manageable and to extract useful information for the gait classification task. Nevertheless, although feature selection is often used in order to identify the relevant body parts, to the best of our knowledge, a comparative analysis of feature selection techniques in gait recognition is seldom addressed. In this paper, we present an empirical approach to evaluate the degree of consistency among the performance of different selection algorithms in the context of gait identification under the effect of various covariate factors. First, a model-based framework for extracting informative gait features is introduced, then, an extensive comparative analysis of feature selection approaches in gait recognition is carried out. We perform a statistical study via ANOVA and mixed-effects models to examine the effect of six popular selection feature methods across classifiers and covariates. In addition, we systematically compare the selected feature subsets and the computational cost of the different selection approaches. The implemented method addresses the problem of feature selection for gait recognition on two well-known benchmark databases: the SOTON covariate database and the CASIA-B dataset, respectively. The investigated approach is able to select the discriminative input gait features and achieve an improved classification accuracy on par with other state-of-the-art methods.

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