

算法研究

基于改进的蛙跳算法与支持向量机的实用语音情感识别

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摘要:

支持向量机是一种基于统计学习理论的新型机器学习算法, 在高维特征空间中寻找最优分类超平面, 具有很好的分类精度和泛化性能。支持向量机的训练需要求解一个带约束的二次规划问题, 针对数据规模很大情况下经典训练方法变得很困难的缺点, 提出一种基于改进混合蛙跳算法的支持向量机分类器参数优化方法, 既提高了混合蛙跳算法的收敛速度和精度, 又能借助混合蛙跳算法的全局随机搜索能力, 为支持向量机参数的优化选择提供一条有效途径。本文提取情感语句的韵律特征、音质特征和混沌特征参数, 提出一种基于改进蛙跳算法的数据融合方法, 并利用基于改进蛙跳算法的支持向量机进行实用语音情感的识别研究。在实验中比较了PCA方法、BP神经网络和数据融合方法用于语音情感识别的识别率, 研究结果表明本文所提的各项改进机制能有效提升情感识别率, 为实用语音情感的识别提供一种新方法和新思路。

关键词: 支持向量机; 混合蛙跳算法; 混沌; 实用语音情感; 情感识别

Recognition of Practical Speech Emotion based on Improved Shuffled Frog Leaping Algorithm and Support Vector Machine

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Abstract:

Support Vector Machine (SVM) is a state-of-the-art machine learning algorithm based on the statistical learning theory. It tries to find the optimal classification hyperplane in high dimensional feature space and has a good classification accuracy and generalization performance. Since the training of SVM requires solving a restrained quadratic programming problem, in order to overcome the defect of the classical training method becoming difficult for large datasets, an improved Shuffled Frog Leaping Algorithm(Im-SFLA) is proposed as an alternative to the current classical algorithm, which not only improves the convergence speed and accuracy of SFLA but also provides an effectual approach to the optimal selection of parameters about SVM by means of the global random searching ability of SFLA. In this paper, the prosodic feature, the voice quality feature and the chaos characteristic parameter of the emotional statement are extracted firstly, a data fusion method based on Im-SFLA is proposed and the emotion recognition of practical speech is researched by use of modified SVM. In the recognition experiments, PCA method, BP neural network and data fusion method are compared under the same testing environment. The test result indicates that the improvement mechanisms provided in this paper bring an outstanding improvement in the classification ability and provide a new method and idea for speech emotion recognition.

Keywords: Support Vector Machine (SVM) Shuffled Frog Leaping Algorithm (SFLA) Chaos Practical Speech Emotion Emotion Recognition

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