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基于动态分类器集成的MEMS气体传感器阵列的气体定性识别方法

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摘　要：

气体识别研究中，传感器的性能漂移问题始终是最具挑战的问题之一。为了减少漂移对气体识别的影响，本文利用动态分类器集成技术，针对基于MEMS技术的气体传感器阵列，提出了气体识别方法。本方法主要关注对气体样本在任意浓度下的定性分析。该方法基于支持向量机（SVM）分类器，首先利用在不同时间段采集的数据分别训练SVM分类器，再利用各分类器对不同时期数据的最优权值，估计拟合函数的参数；然后利用拟合函数，根据数据的采集时刻，预测各分类器的权值；最终利用预测的权值，对所有分类器的识别结果进行集成，得到最终识别结果。本文利用三年的测量数据，对该方法与已有类似方法的性能进行了比较。结果显示，该方法可以在较长时间内具有更高的准确率。而且，该方法可以通过选择更合理的拟合函数，提高识别性能。

关键词：MEMS气体传感器；传感器阵列；漂移补偿；分类器集成；动态加权

A Method for Gas Qualitative Discrimination Using MEMS Gas Sensor Array Based on Dynamic Classifier Ensemble

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Abstract:

Sensor response drift remains to be the most challenging problem in gas sensing. We proposed a novel ensemble method with dynamic weights to solve a gas discrimination problem regardless of their concentration with high accuracy over extended periods of time. The method uses a dynamic weighted combination of classifiers trained at different points of time. Their weights in testing future datasets are predicted by fitting functions which are obtained by proper fitting of optimal weights in training. We compared the performances of the proposed method and competing methods in experiment based on the public dataset over a period of three years. As results illustrate, the proposed method performs better than others. Furthermore, the method can be further optimized by applying a fitting function that is better match variation of the optimal weight over time.

Keywords: MEMS Gas Sensor; Sensor Array; Drift Compensation; Classifier Ensemble; Dynamic Weights

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