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基于最近邻支撑向量特征线融合算法的核爆地震识别

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摘要 为增强核爆地震模式分类器的泛化能力以提高对核爆炸事件的准确识别能力, 论文提出了一种选择支撑向量样本集来表征训练样本集的最近邻支撑向量特征线分类算法, 用以训练时扩展核爆地震的训练样本库, 提高分类器的泛化能力. 该算法用于核爆炸和地震的识别结果发现, 和最近邻特征线分类器相比, 提出的算法降低了计算复杂度, 但识别能力却有些许降低. 对新算法的分析发现, 纯粹的支撑向量集不能完全代表原始样本空间集, 支撑向量比例在其中具有重要作用, 为发挥支撑向量比例的作用以提高核爆分类器的识别能力, 提出了最近邻支撑向量特征线融合算法. 最后以核爆地震数据库对上述算法进行了检验和分析, 理论分析和识别结果证实, 在相同的训练样本选择条件下, 最近邻支撑向量特征线融合算法对于核爆炸的识别来说具有较好的泛化能力, 正确识别率达到 90.3%, 且优于支持向量机算法和最近邻特征线算法.

关键词 [最近邻特征线](#) [支撑向量](#) [核爆炸](#) [天然地震](#)

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Discrimination of nuclear explosions and earthquakes using the nearest support vector feature line fusion classification algorithm

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Abstract Statistical pattern recognition is an important method to distinguish nuclear explosions from natural earthquakes, but because the number of nuclear explosions is few and this limits the generalization performance of the nuclear explosions' classifier, and finally affects the classification performance for the nuclear explosions. To improve the classification performance of the classifier, a nearest support vector feature line algorithm is introduced to expand the virtual nuclear explosions samples and improve the generalization performance correspondingly. However, this new algorithm can not distinguish nuclear explosions from natural earthquakes more accurately, and even is not as good as the nearest feature line algorithm. Theoretical analysis finds that the support vector set is not a good representation of the train set and the ratio of support vector plays an important role to the classifier. To improve the recognition result with the role of support vector ratio, support vector machine is integrated with nearest support vector feature line method by support vector ratio, and then a nearest support vector feature line fusion classification algorithm is presented, and experimental results and corresponding analysis show that this novel algorithm is more appropriate to the classification of underground nuclear explosions and natural earthquakes, and the accurate classification ratio is 90.3% on the data set of nuclear explosions and natural earthquakes, and moreover this classification ratio is higher than support vector machine and nearest feature line.

Key words [Nearest feature line](#); [Support vector](#); [Nuclear explosion](#); [Natural earthquake](#)

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