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基于高光谱图像处理的大豆品种识别

Identification of soybean seed varieties based on hyperspectral image

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中文关键词: [高光谱图像](#) [图像处理](#) [主成分分析](#) [种子分类](#) [纹理特征](#) [BP神经网络](#)

英文关键词: [hyperspectral image](#) [imaging processing](#) [principal component analysis](#) [soybean seed classification](#) [textural feature](#) [BP neural network](#)

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中文摘要:

大豆组分(油,蛋白质,脂肪等)在不同的大豆品种间差异很大。对于提高大豆品质来说,大豆品种识别是一个关键因素。该文利用高光谱图像技术对不同的大豆品种进行识别。利用高光谱成像系统获取大豆样本1 000~2 500 nm范围的光谱反射数据;应用主成分分析法(PCA, principal component analysis)对获取到的光谱数据进行数据降维并去除冗余数据;在分类算法中将得分高的主成分值作为输入特征,通过PCA方法从每个特征图像中提取4个特征变量(能量、熵、惯性矩和相关性);对于具体特征提取,从16个特征变量中提取8个重要特征参数;根据选择的特征,应用神经网络方法构建分类器;训练精度精度达到97.50%,平均测试精度达到93.88%以上。结果表明,应用高光谱图像技术结合神经网络建模方法可以对大豆品种进行分类。

英文摘要:

Abstract: Different soybean seed varieties have different components (oil, protein, fat etc.) content. Identification of soybean seed varieties is a critical factor that improves the quality of produced soybean. In this study, hyperspectral image technique was applied in order to classify soybean seeds based on their varieties. The spectral reflectance data was collected using the optical sensor system with spectral region of 1000-2500nm. Principal component analysis (PCA) was performed to reduce the dimensionality of the data and remove the redundancy. Scores of four PCs were used as input features in the classification algorithm. Four texture feature parameters (angular second moment, energy, entropy and correlation) were extracted from each feature image selected by PCA. For the extraction of specific features, four significant feature parameters were computed from the 16 characteristic variables. Artificial neural network (ANN) classifier was employed for classification using top selected features. The obtained average training accuracy rate was 97.50% and the average testing accuracy rate was 93.88%. Thus, the results confirmed that hyperspectral image technique in-conjunction with BP neural network could be useful for soybean seed varieties classification.

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