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内蒙古灌丛化草原分布特征的遥感辨识

Remote sensing identification of shrub encroachment in grassland in Inner Mongolia

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英文关键词: [remote sensing](#) [identification](#) [classification](#) [typical steppe](#) [shrub encroachment identification](#) [object-oriented](#) [supervised classification](#)

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中文摘要:

灌丛化草原在中国内蒙古干旱、半干旱草原区广为分布。为了探究灌丛化草原的分布状况, 该文利用高空间分辨率(5.8 m)卫星资源三号遥感影像, 结合地面调查, 研究了内蒙古镶黄旗境内灌丛化草原的分布特征。以归一化植被指数(normalized differential vegetation index, NDVI)阈值法提取植被覆盖区域后, 分别采用基于像元的监督分类方法(支持向量机、最大似然和马氏距离)和面向对象方法进行灌草镶嵌斑块和草地斑块的辨识, 并对分类结果进行对比分析。结果表明: 在3种基于像元光谱信息的监督分类算法中, 支持向量机算法对灌丛化草地的识别精度相对较高, 表现在这一类型的生产者精度和用户精度均大于另外2种算法, 并且, 该算法的总体分类精度也最高(81.15%), 明显优于最大似然(73.33%)和马氏距离(61.77%)。然而, 融入了空间信息进行分类的面向对象方法(合并尺度97)的总体识别精度高达89.24%, 并且随着对象合并尺度的增大, 灌丛化草地的错分和漏分比例明显降低。这一结果表明利用草本与灌丛像元的空间纹理属性差异, 能够有效削弱噪声, 提高识别精度。

英文摘要:

Abstract: Shrub encroachment has been a wide phenomenon across the arid and semi-arid grasslands in Inner Mongolia, China. Although numerous studies have investigated the effect of this phenomenon on community composition, ecosystem structure, and nutrient cycling, reports on the distribution patterns of shrub encroachment are limited. A recent development in satellite remote sensing enables accurate assessment of shrub distribution and its dynamics at large scales. In this paper, the combined ground survey in Xianghuangqi, four satellite images (with spatial resolution of 5.8 m) of ZY-3, covering nearly the whole area and taken between July and August in 2013, were used to identify the shrub distribution in this region. It should be noted that the shrub here indicated the shrub-grass mosaic due to the mixed pixel effect, and the identification was weak when the coverage of shrub was on low levels. The NDVI threshold method was first used to extract the vegetation coverage area, and then three traditional pixel-oriented methods (Support vector machine, Maximum likelihood and Mahalanobis distance), compared with the object-oriented method, were used for the classification of images. Object-oriented method is different from the traditional one, in that the classification is not based on the spectral characteristics of individual pixel, but relies on the image object with spatial texture and shape and size characteristics. Ground survey data were used to compare the accuracy level of these methods. It indicated that the shrub recognition accuracy by using support vector machine algorithm is the highest among the three pixel-oriented methods, with higher producer accuracy and user accuracy than the other two algorithms. Furthermore, the overall classification accuracy of this algorithm is 81.15% higher than that of the maximum likelihood (73.33%) and the Mahalanobis distance (61.77%). However, the overall recognition accuracy by using the object-oriented approach (combined scale 97) was up to 89.24%. It also revealed that the proportion of shrub omission and commission decreased while the combined scale of object increased. These results suggest that the object-oriented method, with high accuracy level, is much more favorable in shrub extraction from grassland background.

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