

基于数据 动地形校正和机器学习的山地竹林提取

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摘要: 竹林是我国南方山地丘陵地区的重要森林资源, 拥有巨大的生态和经济价值。但遥感提取山区竹林的精度易受地形影响和其它类型森林光谱的混淆。对此, 采用近年提出的数据驱动地形校正新方法——Integrated Topographic Correction (ITC)进行遥感影像地形校正, 消除阳坡、本影和落影的光谱反射率畸变; 并结合机器学习算法 XGBoost 提取竹林。选取福建省长汀县为研究区, 采用 2000 年和 2022 年的 Landsat 影像为主要数据源。研究表明 ITC 可以有效消除遥感影像上地形影响, 本影和落影相对阳坡的反射率误差由校正前的 54.59% ~ 67.17%降为校正后的 1.32% ~ 14.31%, 并有效突出了竹林光谱特征和斑块完整性。最终, 竹林提取精度(相对于未做地形校正)提高了约 7.5%。进一步分析表明 2000—2022 年长汀县竹林面积增幅高达 105%, 呈显著增长趋势; 同时, 竹林分布具有明显的地形梯度效应, 主要分布于高程 400~700 m, 坡度 15~30° 范围。

Mountainous Bamboo Extraction using a data-driven topographic correction and machine learning

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Abstract: Bamboo is an important forest in Chinese southern mountainous area, with huge ecological and economic value. However, the extraction accuracy of mountainous bamboo using remote sensing is decreased, since topographic effect from rugged terrain and spectral interference from other forest types. Therefore, we use the newly proposed data-driven topographic correction method, i.e., Integrated Topographic Correction (ITC) to remove the topographic effects from sunny area, self-shadow and cast shadow in image. Meanwhile, a machine learning technique of the XGBoost was used to extract bamboo from the corrected images of Changting county, China in 2000 and 2022. The results show that topographic effect was eliminated drastically by the ITC, with the relative error between shadows and sunny area declining from 54.59% ~ 67.17% to 1.32% ~ 14.31%, and the spectral characteristics of bamboo was highlighted. So, the bamboo extraction overall accuracy from the ITC corrected image was higher about 7.5% than that from the uncorrected image. Spatio-temporal analysis shows that bamboo mainly locates in the elevation ranging from 400 m to 700 m and slope ranging from 15° to 30°. From 2000 to 2022, bamboo area was enlarged with growth rate of about 105%.