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技术方法

基于高斯混合模型的建筑物QuickBird多光谱影像数据分类研究

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摘要：

针对任何一种遥感影像数据的信息提取都有其无法逾越的理论极限，正确认识这种极限有利于明确相关算法研究的方向，降低工程应用成本。制约影像信息提取精度的“同物异谱”现象以及与之相关的影像对象“光谱异质性”问题正是科学认识这种极限的关键和切入点。城市下垫面中的建筑物屋顶材料不同，光谱反射率也不同，“同物异谱”现象严重。基于高斯混合模型的期望最大（Expectation Maximization,EM）估计算法，能为分析建筑物类内以及同一建筑物对象内部光谱异质性程度提供科学依据， 进而提高分类精度。本文以QuickBird多光谱影像为实证研究数据， 利用高斯混合模型及其EM估计算法拟合出不同材料屋顶的密度分布， 实现建筑物影像对象分类， 得到优于传统监督、非监督分类的结果。

关键词： 高空间分辨率 光谱异质性 混合模型 屋顶

THE CLASSIFICATION OF MULTI-SPECTRAL QUICKBIRD IMAGE DATA OF BUILDINGS BASED ON GAUSSIAN MIXTURE MODEL

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Abstract:

The extraction of information from any remote sensing imagery has its own unavoidable theoretical limitation. Facing this problem properly can make clear the direction of research on related algorithms and reduce the cost of application. It is the Spectral Confusion within the Same Object or Similar Objects (SCSO) and the related problem of image objects with heterogeneous spectra that seriously restrict the precision of image information extraction. To understand this is the key to the awareness of such a limitation. There exist different spectral reflective rates in different roof materials, which results in the serious SCSO phenomenon for different architecture objects in remote sensing imagery of urban areas. The Gaussian-mixture-model-based EM (Expectation Maximization) estimate algorithm can provide a scientific basis for analyzing the degree of spectral heterogeneity within a building and in an object of architecture category and hence improve the classification precision. Taking the multi-spectral QuickBird image as the sample data, this paper introduces the basic principle of Gaussian-mixture-model-based EM estimate algorithm, by means of which the density distribution of the different material roofs can be imitated and sub-classes of architecture be recognized. It turns out that the EM algorithm is superior to the traditional supervised and unsupervised classification in terms of the classification result of architecture image objects.

Keywords: High spatial resolution Spectral heterogeneity Mixture model Roofs

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