

论文摘要2023/8/19

[ELECTRONICS] Multi-Attention-Based Semantic Segmentation Network for Land Cover Remote Sensing Images

基于多关注的土地复盖遥感图像语义分割网络

【多注意力机制语义分割】 【土地覆盖】 【Unet】 【遥感图像和传统图像分割的差异】

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JCR 学科类别	类别排序	类别分区
COMPUTER SCIENCE, INFORMATION SYSTEMS 其中SCIE 版本	99/158	Q3
ENGINEERING, ELECTRICAL & ELECTRONIC 其中SCIE 版本	131/275	Q2
PHYSICS, APPLIED 其中SCIE 版本	71/159	Q2

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摘要

Semantic segmentation is a key technology for remote sensing image analysis widely used in land cover classification, natural disaster monitoring, and other fields. **Unlike traditional image segmentation, there are various targets in remote sensing images, with a large feature difference between the targets. As a result, segmentation is more difficult, and the existing models retain low accuracy and inaccurate edge segmentation when used in remote sensing images.** This paper proposes a multi-attention-based semantic segmentation network for remote sensing images in order to address these problems. Specifically, we choose UNet as the baseline model, using a coordinate attention-based residual network in the encoder to improve the extraction capability of the backbone network for fine-grained features. We use a content-aware reorganization module in the decoder to replace the traditional upsampling operator to improve the network information extraction capability, and, in addition, we propose a fused attention module for feature map fusion after upsampling, aiming to solve the multi-scale problem. We evaluate our proposed model on the WHDLD dataset and our self-labeled Lu County dataset. The model achieved an mIOU of 63.27% and 72.83%, and an mPA of 74.86% and 84.72%, respectively. Through comparison and confusion matrix analysis, our model outperformed commonly used benchmark models on both datasets.

语义分割是遥感图像分析的关键技术，广泛应用于土地复盖分类、自然灾害监测等领域。**与传统的图像分割不同，遥感图像中存在多种目标，目标之间的特征差异较大。**因此，分割难度较大，**现有模型在遥感图像中使用时，边缘分割精度较低，不准确。**为了解决这些问题，提出了一种**基于多注意力的遥感图像语义分割网络**。具体来说，我们选择**UNet**作为基线模型，在**编码器**中使用**基于坐标关注的残差网络**来提高骨干网络对细粒度特征的提取能力。我们在**解码器**中使用**内容感知重组模块**来取代传统的上采样算子来提高网络信息提取能力，并提出了**上采样后特征图融合的融合注意模块**，旨在**解决多尺度问题**。我们在**WHDLD数据集**和我们的**自标记芦县数据集**上评估了我们提出的模型。该模型的**mIOU**分别为63.27%和72.83%，**mPA**分别为74.86%和84.72%。通过**比较和混淆矩阵分析**，我们的模型在两个数据集上都优于常用的基准模型。

Keywords

Keywords: remote sensing image; **attention mechanism**; image segmentation; deep learning; semantic segmentation

关键词：遥感图像；注意力机制；图像分割；深度学习；语义分割

引用

Jia, J.; Song, J.; Kong, Q.; Yang, H.; Teng, Y.; Song, X. Multi-Attention-Based Semantic Segmentation Network for Land Cover Remote Sensing Images. *Electronics* **2023**, *12*, 1347. <https://doi.org/10.3390/electronics12061347>

[计算机工程与科学] An improved semantic segmentation algorithm for remote sensing images

改进的遥感图像语义分割算法

【遥感分割：边缘、小尺度问题】

摘要

Aiming at the problems of **edge confusion** caused by multiple objects gathering in remote sensing image, unclear segmentation of small scale objects, and insufficient global information acquisition in semantic segmentation process, this paper proposes a semantic segmentation algorithm of remote sensing images based on mixed attention and full-scale skip connection network, called DU-net. In this algorithm, U-net3+ is used as the basic network, and full-scale skip connection network is used as the feature extraction network. The depth supervision in the original model is abandoned, the association between feature and attention mechanism is established, and the process of semantic segmentation is finally realized. The experimental results show that the DU-net algorithm has significant improvement over the classical algorithm under different indexes, and improves the quality of image edge segmentation and the accuracy of the algorithm for small scale target segmentation.

针对遥感图像中多个目标聚集导致边缘混淆,小尺度物体分割不明显,以及语义分割过程中全局信息获取不足的问题,提出了一种基于混合注意力与全尺度跳层连接网络的遥感图像语义分割算法DU-net。该算法以U-net3+为基础网络,采用全尺度跳层连接网络作为特征提取网络,摒弃了原算法中的深度监督,建立特征与注意力机制之间的关联,最终实现语义分割的过程。实验结果表明, DU-net算法在不同指标下较经典算法都有明显提升,同时提高了图像边缘分割质量,改善了算法对**小尺度目标**的分割准确度。

关键词

注意力机制;全尺度跳层连接;遥感图像;语义分割;

引用

[1]库向阳,马亦骏.改进的遥感图像语义分割算法[J].计算机工程与科学,2023,45(03):504-511.

[IEEE J-STARS] A Multi view Stereo Algorithm Based on Image Segmentation Guided Generation of Planar Prior for Textureless Regions of Artificial Scenes

一种基于图像分割引导生成人工场景无纹理区域平面图像的多视点立体算法

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ENGINEERING, ELECTRICAL & ELECTRONIC 其中SCIE 版本	58/275	Q1
GEOGRAPHY, PHYSICAL 其中SCIE 版本	6/49	Q1
IMAGING SCIENCE & PHOTOGRAPHIC TECHNOLOGY 其中SCIE 版本	6/28	Q1
REMOTE SENSING 其中SCIE 版本	9/33	Q2

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摘要

Textureless building surfaces composed of homogenized pixels could lead to failure of photometric consistency. However, textureless regions widely present in artificial scenes usually exhibit strong planarity enabling depth estimation of textureless regions with planar priors. However, existing methods for generating planar priors suffer from oversegmentation of large

planes with textureless regions, which indicates that planarity is not fully exploited. In this study, we propose a novel generation method of planar prior by combining mean-shift clustering and superpixel segmentation. The planarity is fully utilized given preferential generation of planar priors for large planes with textureless regions in artificial scenes. Finally, a probabilistic graphical model is used to adopt the planar priors and smoothing constraints into depth estimation process. The image gradient is used as a criterion of the degree of texture to adaptively adjust the weights of different constraints. Experimental results on the benchmark dataset ETH3D, UDD5, and SenseFly demonstrate that the proposed method can effectively recover the depth information of textureless regions in high-resolution images to obtain highly complete three-dimensional (3-D) models of artificial scenes.

由均匀像素组成的无纹理建筑表面可能导致光度一致性的失败。然而，在人工场景中广泛存在的无纹理区域通常表现出很强的平面性，从而能够对具有平面前序的无纹理区域进行深度估计。然而，用于产生平面前序的现有方法遭受具有无纹理区域的大平面的过度着色，这表明平面性未被充分利用。在这项研究中，我们提出了一种结合mean-shift聚类 and 超像素分割的新型平面先验生成方法。由于在人工场景中具有无纹理区域的大平面优先生成平面前序，平面性得到了充分利用。最后，利用概率图形模型将平面前序和平滑约束引入深度估计过程。图像梯度作为纹理程度的判据，自适应调整不同约束的权值。在基准数据集ETH3D、UDD5和SenseFly上的实验结果表明，所提出的方法可以有效地恢复高分辨率图像中无纹理区域的深度信息，以获得高度完整的人工场景三维模型。

关键字

Planar priors, image segmentation, multi view stereo (MVS), point clouds, remote sensing, three-dimensional **(3-D) building reconstruction**.

平面先验，图像分割，多视图立体（MVS），点云，遥感，三维（3-D）建筑重建。

引用

N. Huang et al., "A Multiview Stereo Algorithm Based on Image Segmentation Guided Generation of Planar Prior for Textureless Regions of Artificial Scenes," in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, vol. 16, pp. 3676-3696, 2023, doi: 10.1109/JSTARS.2023.3237588.