IAF EARTH OBSERVATION SYMPOSIUM (B1)
Interactive Presentations - IAF EARTH OBSERVATION SYMPOSIUM (IP)

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CLOUDCFNET: CASCADING FUSION CLOUD REMOVAL NETWORK BASED ON ATTENTION MECHANISMS

Abstract

Space remote sensing technology is developing rapidly and the demand for remote sensing data is increasing. Remote sensing images captured by spacecraft have been widely used in areas such as identification of building areas and monitoring of environmental changes. However, remote sensing images received by optical sensors are often interfered by clouds. The reflection and absorption of light by clouds reduces the resolution and contrast of remote sensing images. This interference makes surface information difficult to distinguish and affects the subsequent scenarios such as object detection and semantic segmentation. The cloud removal preprocessing is crucial in image analysis. Without the cloud removal step, the aerospace sensors do not take pictures to generate remote sensing images of the cloud removal until the clouds dissipate. The algorithm of cloud removal not only recovers information, but also reduces the cost of cloud removal data collection and ensures the applicability of data.

The algorithms of existing remote sensing image cloud removal have flaws. Due to the simplified a priori assumptions and insufficient fitting ability of models, the reconstructed image will have distortion of color and texture features. Especially the image regions with thick cloud layers, existing methods have difficulties to ensure the continuity and color consistency of the recovered images. Meanwhile, deep neural networks have good generalization ability and strong fitting ability with the rapid development of artificial intelligence technology. The representative convolutional neural network and Transformer can learn the high-level semantic information of remote sensing images better. Compared with traditional machine learning methods, deep neural networks have stronger robustness and universality in complex cloud removal scenarios.

This paper reviews several traditional algorithms of cloud removal and related research works. The innovation of this paper is to design a cascading fusion cloud removal network for dense prediction with a Transformer architecture for the backbone network. Firstly, we redesigned the attention module of the backbone network, combining channel convolution attention and window self-attention to strengthen

the interactivity between the adjacent windows. Secondly, we introduced feature fusion modules to the backbone network. Semantic features are fused to reorganize the connections between different scales and reconstruct new pixels in the cloud region at each layer of the cascade. Through comparison experiments on thin and thick cloud datasets, the performance of our proposed cascade fusion cloud removal network is better than other cloud removal algorithms. And we verified the effectiveness of the proposed method through visualization and analysis.