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REMOTE SENSING IMAGE TARGET DETECTION BASED ON IMPROVED SPARSE R-CNN

Abstract

Object detection technology has proven to be incredibly valuable in the realm of remote sensing, with a vast array of potential applications. The continual evolution and widespread adoption of remote sensing technology has transformed it into a crucial tool for observing surface information on Earth. By using target detection technology, targets in remote sensing images can be easily and automatically identified and located.In the realm of urban planning, object detection technology can be utilized to monitor and identify urban buildings and roads. In the field of environmental protection, object detection technology can assist in the automated detection and tracking of glacier edges, enabling researchers to gain a deeper understanding of changes to glaciers. Despite the widespread use of object detection algorithms in remote sensing, many existing algorithms struggle with issues of high computational complexity.To address this concern, it is imperative to design target detection algorithms with smaller computational requirements that can meet the size and weight constraints of satellite equipment. This paper presents a novel remote sensing image object detection algorithm based on improved Sparse R-CNN. By introducing a sparse attention mechanism in Region Proposal Network, the number of candidate regions is significantly reduced, thereby reducing computational complexity.Furthermore, fixed boundary boxes can lead to decreased detection accuracy since the size and position of targets may vary. To address this issue, this paper employs learnable boundary boxes to further enhance detection accuracy and computational efficiency. Additionally, Sparse R-CNN's feature fusion only utilizes features of one scale, which can limit the algorithm's ability to detect targets of different sizes. Therefore, a pyramid structure is introduced into Sparse R-CNN to extract multi-scale features, enabling the Sparse R-CNN detection algorithm to better adapt to targets of varying sizes.Experimental results demonstrate that the improved Sparse R-CNN algorithm proposed in this paper reduces the computational complexity of the detection algorithm while ensuring the accuracy of target detection. This lays a foundation for the development of lightweight satellite target detection devices in the future.