

Detection of harmful algal blooms in remote sensing images based on multi-feature difference and random forest

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Objectives

Detection of harmful algal blooms is a hot issue in current research. The existence of harmful algal blooms can lead to the death of a large number of aquatic organisms, destroy the normal water ecosystem structure, produce toxic substances and endanger human health, and seriously affect the surrounding landscape, living environment and economic development.

Methods

Firstly, multi-source remote sensing image data is input into a depth expandable module to obtain detailed features. The module is composed of a depth residual network and a cyclic network;

Secondly, the spectral, texture and feature difference of each object on the image are extracted as input data of random forest.

Then, by comparing the accuracy of three different loss functions, a new loss function is derived to solve the problem of unbalance between algae and seawater samples, and improve the model performance.

Finally, the features obtained from the deep extensible network are compared with those obtained from the random forest, and the results are added to the analysis to optimize the final classification results.

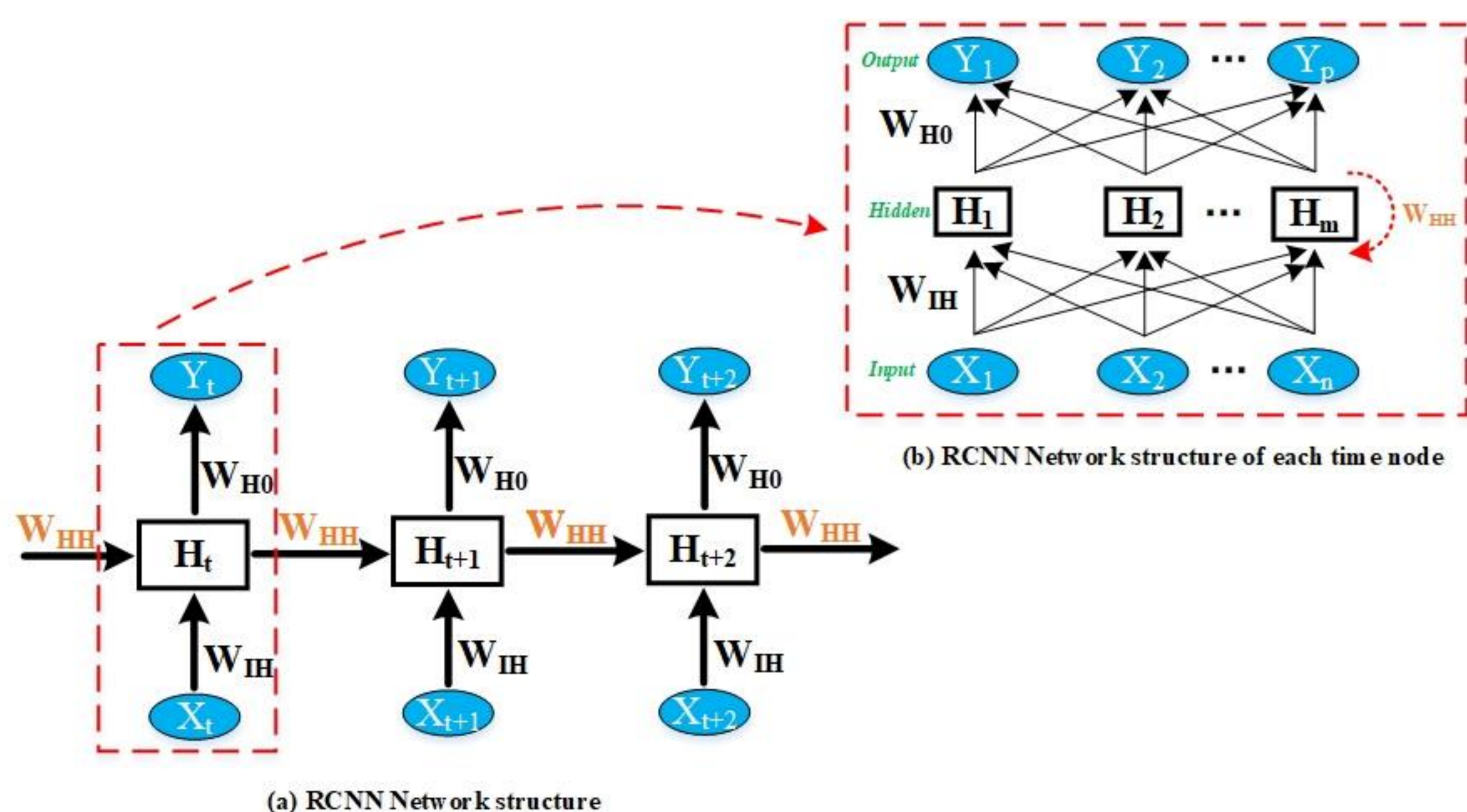


Figure 1 Cyclic network structure and detail structure

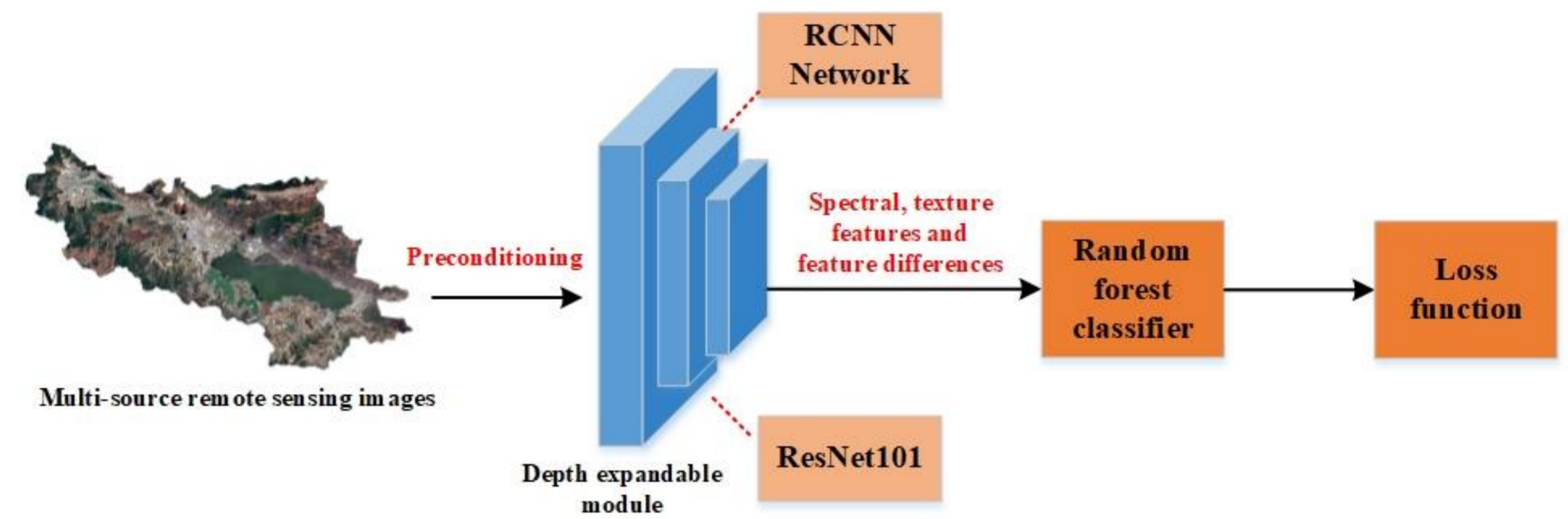


Figure 2 Overall framework of this method

Results

The results show that compared with the traditional spectral index threshold method and the existing deep learning method, the proposed method can provide highly accurate detection results and faster detection speed, and improve the work efficiency.

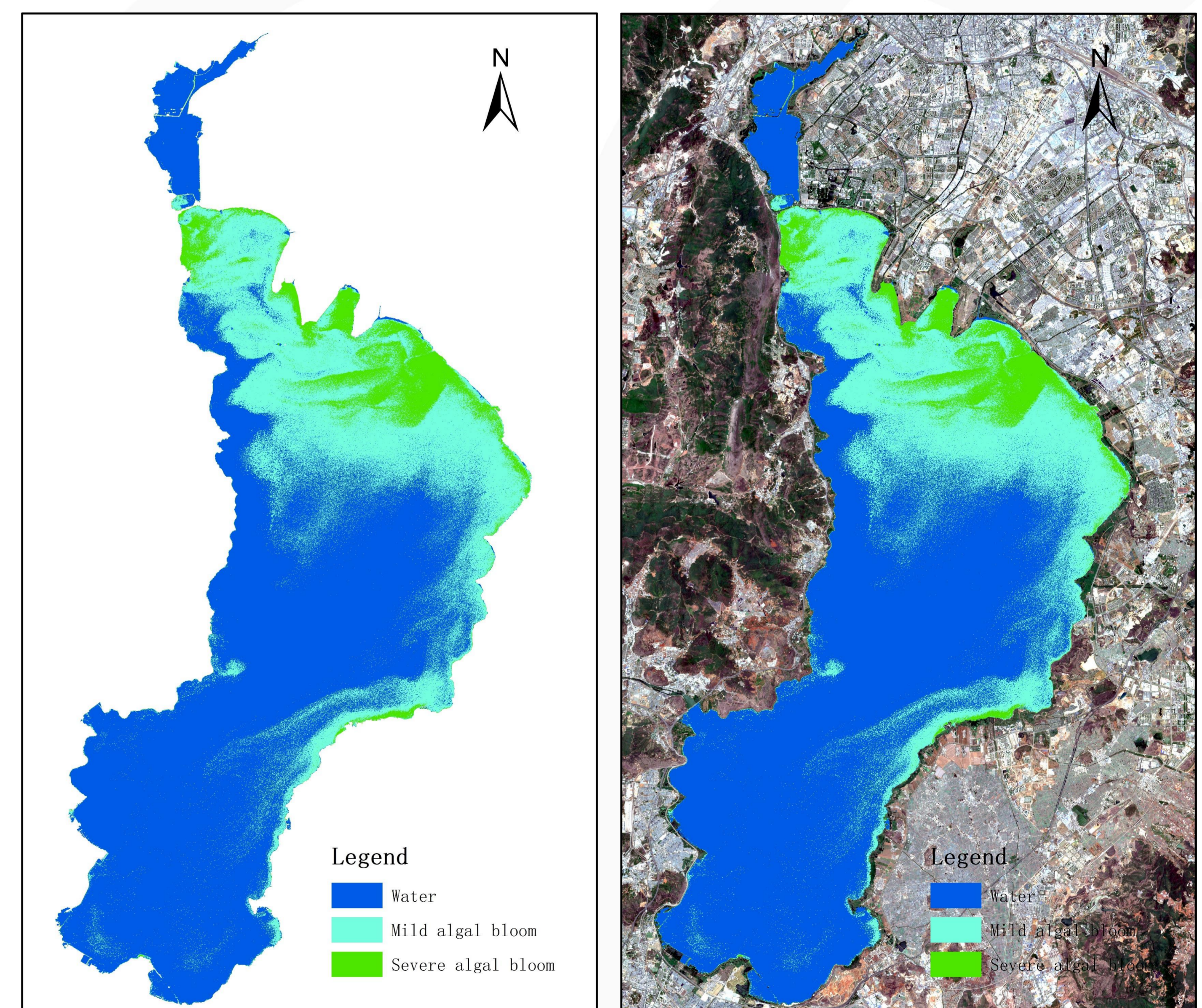


Figure 3 Harmful algal blooms extracted by this method

Conclusions

The addition of the cyclic convolutional network module can improve the detection accuracy, indicating the effectiveness of the module.

The proposed detection method of harmful algal blooms in remote sensing images based on multi-feature difference and random forest is feasible, and can detect harmful algal blooms quickly and efficiently, which can be applied to water environment management.