A transfer-learning-based feature classification algorithm for UAV imagery in crop risk management

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ABSTRACT

The development of precision agriculture puts forward higher requirements for the construction of an ecological irrigation area, some of which are the control of crop risk and the good circulation of the environment. In this paper, a method for extracting crops and weeds using remote sensing images of unmanned aerial vehicle (UAV) is proposed. The main three crops (wheat, peanut, maize) and three weeds (*Chenopodium album*, *Humulus scandens*, *Xanthium sibiricum* Patrin ex Widder) in the ecological irrigation area are collected by UAV. By manual labeling, 2,287 training sets and 979 test sets are formed. AlexNet, a transfer neural network, is trained in a single central processing unit (CPU), single graphics processing unit (GPU), and double GPUs to test the complexity of the algorithm. The classification results show that the accuracy of the *Chenopodium album* is 100%, *Humulus scandens* is 99.07%, *Xanthium sibiricum* Patrin ex Widder is 100%, wheat is 99.49%, peanut is 100%, and maize is 99.05%. The overall accuracy rate is 99.69%. The method proposed in this paper can accurately extract crops and weeds and calculate the quantity. The density of each weed can also be calculated in conjunction with the proposed density calculation method. It can provide a reference for the precise application of pesticides, thereby improving crop risk management capabilities.

Keywords: Ecological irrigation area; UAV; Weed classification; Convolutional neural network (CNN); Crop risk management; Remote sensing

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