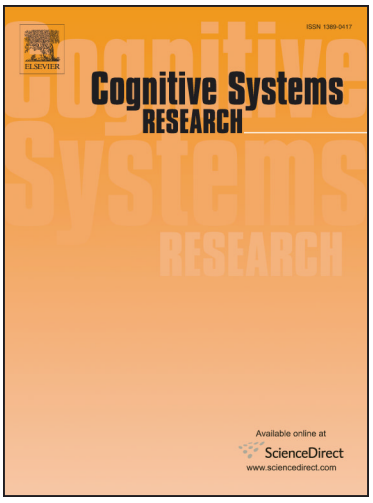

Method of plant leaf recognition based on improved deep convolutional neural network

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PII: S1389-0417(17)30348-0
DOI: https://doi.org/10.1016/j.cogsys.2018.06.008
Reference: COGSYS 638

To appear in: *Cognitive Systems Research*

Received Date: 18 December 2017
Revised Date: 28 March 2018
Accepted Date: 19 June 2018

Please cite this article as: Zhu, X., Zhu, M., Ren, H., Method of plant leaf recognition based on improved deep convolutional neural network, *Cognitive Systems Research* (2018), doi: https://doi.org/10.1016/j.cogsys.2018.06.008

Method of plant leaf recognition based on improved deep convolutional neural network

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Abstract: The identification of plant species mainly depends on the recognition of plant leaf characteristics. However, most recognition systems show the weak performance on detecting small objects like plant leaves in the complicated background. In order to improve the recognition ability of plant leaves in the complex environment, this paper proposes an improved deep convolutional neural network, which takes advantage of the Inception V2 with batch normalization (BN) instead of convolutional neural layers in the faster region convolutional neural network (Faster RCNN) offering multiscale image features to the region proposal network (RPN). In addition, the original images first are cut into the specified size according to the numerical order , and the segmented images are loaded into the proposed network sequentially. After the precise classification through softmax and bounding box regressor, the segmented images with identification labels are spliced together as final output images. The experimental results show that the proposed approach has higher recognition accuracy than Faster RCNN in recognizing leaf species in the complex background.

Keywords: Deep learning; Convolutional neural network; Leaf recognition; Complex background

1. Introduction

As an important resource, plants can not only provide human beings with food and medicine, but also have positive effect on maintaining ecological balance (Wang et al., 2016). Thus, it is important to recognize and protect plants. It is common knowledge that a great mount of species information is contained in plant leaves, including obviously different textures, colors and morphological structures, which play a critical role in distinguishing plant species. Unlike flowers or fruits, plant leaves can exist in almost every season and have noticeable changes in different seasons. Since these advantages of leaves can be obtained conveniently, the classification and recognition of plants by leaves has become a hot topic in recent years. Even though identification by human experts has become the most commonly used method, it is a subjective and inefficient method in leaf recognition (Zheng et al., 2017). With the rapid development of digital image processing and machine vision, the recognition