APPLYING DEEP LEARNING TO TRAINING AND INTERPRETING MULTI-PLATFORM IMAGERY FOR CROP SURVEY

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In Taiwan, crop survey provides agricultural authorities with an understanding of annual land use, crop varieties, and distribution patterns. This information helps them grasp the current status of crop cultivation and estimate yields. As a result, it is possible to adjust agricultural policies in advance, which serves as critical data for policymaking by agricultural units, and such surveys have been conducted since 1947. In the past, this relied heavily on manual labor, and the subjective judgment of surveyors led to discrepancies between the collected data and actual conditions.

Nowadays, because of the advancements in technology, this study utilizes four different platforms: ground-based smartphones and panoramic images; aerial-based unmanned and manned aircraft to collect crop imagery to develop the deep learning crop interpretation module for the establishment of a fast, scientific, and structured approach for crop survey. For enhancing the efficiency of interpretation, the different platforms deep learning models are developed using a binary interpretation model with Convolutional Neural Network (CNN). CNN is not only the most popular but also the most powerful imagery interpretation model for deep learning. In this investigation, the backbone of Xception is employed for ground-based, and the ResNet-32 is for aerial-based. The crop interpretation expert is involved in the model development for the training data collection. And thus, the model should be fine-tune by checking the result of losing and missing data with iteration processing until convergence.

The study focuses on the crop of red bean and acquires imagery from different platforms in Xin Yuan Township, Pingtung County. After iterative training and processing of the ground-based and aerial-based data, the accuracy is over 80%. Finally, the research was able to increase the efficiency of survey data interpretation by at least 50% and reduce the reliance on manual labor.

Keywords: Deep learning, crop imagery interpretation, multi-platform.