Weed Recognition System for Low-Land Rice Precision Farming Using Deep Learning Approach

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Abstract Precision farming helps to achieve maintainable agriculture, with an objective of boosting agricultural products with minimal negative impact on the environment. This paper outlines a deep learning approach based on Single Shot multibox Detector (SSD) to classify and locate weeds in low-land rice precision farming. This approach is designed for post-emergence application of herbicide for weed control in lowland rice fields. The SSD uses VGG-16 deep learning-based network architecture to extract a feature map. The adoption of multiscale features and convolution filter enables the algorithm to have a considerable high accuracy even at varying resolutions. Using SSD to train the weed recognition model, an entire system accuracy of 86% was recorded. The algorithm also has a system sensitivity of 93% and a precision value of 84%. The trained SSD model had an accuracy of 99% for close-up high definition images. The results of the system performance evaluation showed that the trained model could be adopted on a real rice farm to help reduce herbicide wastage and improve rice production with low chemical usage.

Keywords Precision agriculture · Deep learning algorithm · SSD · Google TensorFlow · Low-land rice

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