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Deep learning and image processing for weed identification in vegetable plantations

***¹Shubhangi Bharti**

¹UG Student, Department of Electronics and Communication Engineering, Dayananda Sagar Academy of Technology and Management, Bengaluru, Karnataka, India

**Corresponding Author: Shubhangi Bharti
 Email: shubhangibharti966@gmail.com*

Abstract:

Vegetable plantations have variable plant spacing, which makes weed identification considerably more difficult than for crop weeds. There has been little work done so far on identifying weeds in vegetable plantation. Traditional methods for identifying crop weed are usually focused mainly on directly identifying weed; there is a large amount of variability in weed species. In this paper, a new method is suggested that takes a different approach, combining deep learning and image processing technology. Initially, a trained CenterNet model has been utilized for detecting vegetables and drawing bounding boxes around them. Then, the remaining green objects that do not fit within the bounding boxes are considered weeds. This way, the model concentrates on identifying only the vegetables, avoiding the need to deal with various weed species. Moreover, this approach can significantly reduce the size of training image dataset and the complexity of weed detection, thus improving weed identification performance and accuracy. For separating weeds from the background, a color index-based segmentation was conducted using image processing. The chosen color index was established and assessed using Genetic Algorithms (GAs) based on Bayesian classification error.

Keywords:

Deep learning, color indexing, image processing, genetic algorithms, and weed identification