

Peer Review

Review of: "Plantation Monitoring Using Drone Images: A Dataset and Performance Review"

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This paper proposes a novel dataset and framework for monitoring tree health using drone-captured RGB images. It experiments with various convolutional neural network (CNN) models to classify tree health into three categories: "Good health," "Stunted," and "Dead." Below is a detailed review of its strengths, weaknesses, and an overall rating.

Strengths

Relevance and Practicality

The study addresses a critical issue in precision agriculture by providing a cost-effective solution for small-scale farmers, especially in developing countries. Using drones equipped with RGB cameras offers a practical alternative to expensive satellite imagery.

Introduction of a New Dataset

The authors introduce a unique dataset consisting of 255 high-resolution drone images annotated with 9,534 individual tree samples. This dataset is categorized into three health classes, which can significantly contribute to research in agricultural monitoring.

Comprehensive Experiments

The paper evaluates several well-known CNN architectures (e.g., AlexNet, ResNet, VGGNet, EfficientNet) and object detection models like YOLO v8 to benchmark performance on the dataset. This provides valuable insights into the challenges of tree health classification using drone images.

Open-Source Contribution

By committing to open-source the dataset and code, the authors encourage further research and collaboration in this domain.

Focus on Accessibility

The use of affordable RGB cameras and small drones makes the proposed system accessible to farmers with limited resources, aligning well with its stated goals.

Weaknesses

Limited Dataset Size

The dataset comprises only 255 images, which may not be sufficient for training deep learning models effectively. Although it includes over 9,000 annotations, the limited diversity in image sources could hinder model generalization.

Narrow Scope

The study focuses exclusively on mango trees, which limits the applicability of its findings to other crops or tree species. A broader dataset encompassing multiple types of plantations would enhance its utility.

Model Performance

Despite using state-of-the-art models like YOLO v8, the reported accuracy (69%) is relatively low for practical deployment. This indicates either the complexity of the dataset or the need for further optimization in model design.

Lack of Advanced Techniques

While CNNs are tested extensively, newer methods such as transformers or hybrid models combining spatial and temporal features (e.g., ConvLSTM) are not explored. These could potentially improve performance on complex datasets like this one.

Insufficient Real-World Evaluation

The paper lacks an assessment of how the proposed system performs in real-world conditions beyond experimental setups. Factors like environmental variability, drone stability, and computational efficiency are not addressed.

Annotation Challenges

Annotating images manually using tools like CVAT is labor-intensive and prone to errors, especially when scaling up for larger datasets.

Conclusion

The paper makes a strong contribution to precision agriculture by introducing a new dataset and exploring CNN-based methods for tree health monitoring using drone images. However, its limited scope, modest model performance, and lack of advanced techniques leave room for improvement. Expanding the dataset, incorporating more diverse crops, and experimenting with cutting-edge methods could significantly enhance its impact in future research.

Declarations

Potential competing interests: No potential competing interests to declare.