



Drone Images for Mango Production Estimation

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Abstract: Fruit yield estimation is one of the important objectives of precision farming, which makes it easier for farmers to plan ahead and use resources effectively, but in the past, manual counting of fruit on trees was usually done, which was very labor-intensive. Therefore, this study intends to develop yield estimation techniques using drones and to investigate the following questions.

- (1) To explore the feasibility of drone imagery for mango yield estimation.
- (2) The inspection uses low-cost consumer-grade drone images to estimate the accuracy of the yield.

In the pre-harvest stage of mango harvesting, drone images are used for yield estimation, and the drones are equipped with general RGB cameras to perform. Based on the bagging features evident in the images, remote sensing variables are established to estimate the mango yield, allowing it to achieve the goal of precision agriculture in a cost effective manner.

The detection of mango bagging features in the image is mainly combined with RGB-based vegetation index (green ratio vegetation index, NGRD), local maximum method, and leaf surface bright spot filtering technology to effectively extract bagging features and convert them into remote sensing variables for mango yield estimation with field survey data.

The coefficient of determination of the estimation model was 0.8 or higher for the mango yield estimation results. The coefficient of determination of the validation model was 0.9 or higher. The yield error of each mango tree is less than 4 kg on average, which meets the high precision estimation standard.

Keywords: Irwin mango, drone, yield estimation, precision agriculture