

Using Hyperspectral Camera and Deep Learning to Identify the Ripeness of Sugar Apples

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Abstract : This study uses AI technology to establish an expert system and establish a fruit appearance database for pineapples and custard apples. It collects images based on appearance defects and fruit maturity. It uses deep learning to detect the location of the fruit and can detect the appearance of the fruit in real-time. Flaws and maturity. In addition, a hyperspectral camera was used to scan pineapples and custard apples, and the light reflection at different frequency bands was used to find the key frequency band for pectin softening in post-ripe fruits. Conducted a large number of multispectral image collection and data analysis to establish a database of Pineapple Custard Apple and Big Eyed Custard Apple, which includes a high-definition color image database, a hyperspectral database in the 377~1020 nm frequency band, and five frequency band images (450, 500, 670, 720, 800nm) multispectral database, which collects 4896 images and manually labeled ground truth; 26 hyperspectral pineapple custard apple fruits (520 images each); multispectral custard apple 168 fruits (5 images each). Using the color image database to train deep learning Yolo v4's pre-training network architecture and adding the training weights established by the fruit database, real-time detection performance is achieved, and the recognition rate reaches over 97.96%. We also used multispectral to take a large number of continuous shots and calculated the difference and average ratio of the fruit in the 670 and 720nm frequency bands. They all have the same trend. The value increases until maturity, and the value will decrease after maturity. Subsequently, the sub-bands will be added to analyze further the numerical analysis of sugar content and moisture, and the absolute value of maturity and the data curve of maturity will be found.

Keywords : hyperspectral image, fruit firmness, deep learning, automatic detection, automatic measurement, intelligent labor saving

Conference Title : ICAACS 2025 : International Conference on Agriculture, Agronomy and Crop Sciences

Conference Location : Tokyo, Japan

Conference Dates : June 05-06, 2025