

ABSTRACT

Strawberry (Fragaria x ananassa) is a popular fruit with high economic value in Indonesia. According to the Central Statistics Agency (BPS), the production of strawberries in Indonesia reached 28,895 tons in 2022, an increase of 193.05% compared to the previous year's production of 9,860 tons. West Java Province is one of the major producers, with a production of 25,413 tons, equivalent to 87.95% of the national total. The sorting process is crucial in determining the ripeness and quality of strawberries. However, the current method used for sorting is conventional, often consumes a lot of time and resources, and needs more consistency in fruit classification, necessitating a more efficient system for detecting strawberry ripeness.

This system utilizes deep learning technology with YOLOv7 object detection and EfficientNetV2S object classification models. The system is integrated with the cloud and implemented in an Android application for strawberry fruit classification. The Android application sends images to the deep learning system via the cloud. Subsequently, the deep learning system processes the images, classifies them, displays the confidence levels, and presents the classification results on the smartphone screen.

Based on the implementation and testing results, the deep learning system can identify five predefined class categories: Ripe Grade-A, Ripe Grade-B, Half-Ripe Grade-A, Half-Ripe Grade-B, and Unripe, displaying the confidence levels for each categorized class. Testing results show that the object detection model minimizes loss during object detection, with Box and Val Box losses at 0.02095 and 0.03029, respectively. Objectness and Val Objectness values are recorded at 0.004057 and 0.00333, while Classification and Val Classification values are 0.008343 and 0.007392. Evaluation of the classification model yielded precision, recall, and F1-Score values, each at 0.990, achieving an accuracy of 99%. Furthermore, cloud processing times demonstrate that the model can swiftly identify objects in 1-2 seconds and classify objects within 180 milliseconds. Primary application features were tested using Blackbox methods, confirming the application's functionality. Usability and compatibility testing with 33 respondents showed positive ratings predominantly with scores of 4 and 5, indicating good performance across various Android versions. Additionally, performance testing indicated that the application uses memory efficiently without significant resource consumption or crashes during use.

Keyword: deep learning, cloud, mobile application, ripeness, quality