

Rapid and Non-Destructive Approach for Discrimination and Classification of Various Apple Age Categories Post-Harvest

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Abstract:

This research presents an economical prototype that utilizes an Arduino Uno alongside four gas sensors (MQ3, MQ7, MQ135, and TGS183) to identify volatile organic compounds (VOCs) and assess the freshness of fruit. We used KNN, decision tree, and random forest algorithms to sort the apples by age after they were picked. We then used Linear Discriminant Analysis (LDA) to get the features. The results showed that the first two discriminant components of LDA explained 98.3% of the total variance in the data, making it easy to separate the features. KNN was the most accurate classifier, with an accuracy rate of **98.72%**. The random forest achieved a score of 95.74 %, and the decision tree achieved a score of 98.29 %. These results demonstrate that the system can distinguish between samples of fresh and rotten fruit. This indicates that it has considerable potential for detecting fruit spoilage in real-time, on the go, and at a low cost in storage and distribution settings.

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