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A SMART AGRICULTURE APPROACH FOR MANGO RIPENESS DETECTION AND SHELF-LIFE PREDICTION USING IOT

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ABSTRACT

Mango is among the most consumed tropical fruits and it is very sensitive to environmental factors in their storage and transportation and may be easily affected resulting in their quick ripening and spoilage. Fruit ripeness and spoilage must be detected early to avoid post-harvest losses and preserve the quality of fruits. Conventional ways of determining the ripeness of mangoes are largely determined by human eyes of farmers and sellers, which are more than subjective, imprecise and ineffective when dealing with a huge amount of fruits. To eliminate these constraints, the proposed system suggest an Internet of Things based solution to real-time monitoring of mango fruit ripeness and the risk of spoilage and predictive shelf-life estimates. The developed system employs a set of inexpensive sensors consisting of an ethylene gas sensor, temperature-humidity sensors, in order to inexpensively measure the environmental variables that are related to the maturity of fruits. The sensor data is collected and preprocessed by a microcontroller platform, like ESP32, and an initial classification of the data as ripeness is performed. The analyzed data is sent through the Wi-Fi to a cloud-based IoT service where sophisticated analytics are used to categorize mangoes into various ripeness levels such as unripe, ripening, ripe, and spoiled and to compute the remaining shelf life. Farmers and other stakeholders can also receive real-time monitoring, data visualization, and alerts on the mobile or web-based dashboard and when fruits are at the optimal level of ripeness or indicate signs of spoilage. Preliminary testing on stored sets of mangoes proves that the Random Forest model classifies the ripeness of the mangoes with 96% accuracy give predictable shelf-life results. The suggested IoT based system will allow to efficiently manage a post-harvest, minimize losses on fruit, and improve the quality of products delivered to consumers, which indicates the possibilities of IoT technologies in intelligent agriculture and management of fruit supply chains.

Keywords: Internet of Things, Random Forest, Mango Ripeness Detection, Post-Harvest Monitoring, Shelf Life Prediction