INTISARI

IDENTIFIKASI KEMATANGAN ROASTING KOPI DENGAN E-NOSE BERBASIS *SUPPORT VECTOR MACHINE*

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Kualitas kopi dipengaruhi oleh aroma dan warna. Kedua parameter ini banyak ditentukan pada saat proses roasting. Sedangkan hasilnya masih sangat bergantung pada kepakaran roaster. Namun hasil ini umumnya masih subyektif, sehingga standardisasi belum bisa dilakukan. Penelitian ini bertujuan untuk mengembangkan metode klasifikasi tingkat kematangan biji kopi selama proses roasting menggunakan electronic nose (e-nose). E-nose merupakan piranti yang dirancang untuk mendeteksi dan menganalisis perbedaan aroma kopi terkait dengan tingkat kematangan kopi secara objektif. Dalam penelitian ini, e-nose dilengkapi dengan larik sensor gas untuk menangkap aroma kopi selama proses roasting, yang kemudian dianalisis menggunakan metode support vector machine. Metode ini bertujuan untuk mengidentifikasi profil aroma yang berkaitan dengan tingkat kematangan kopi, dengan tujuan akhir menghasilkan klasifikasi tingkat kematangan kopi secara objektif dan otomatis.

E-nose dengan 8 sensor gas (MQ135, MQ136, MQ137, MQ138, MQ2, MQ3, TGS822, dan TGS2620) ditempatkan pada mesin roasting kopi untuk menentukan aroma pada tiga jenis roasting: light, medium, dan dark secara real-time. Dari 1 kg sampel kopi Arabika, sebanyak 18.000 data dikumpulkan (4.500 data per jenis roasting) dan dianalisis menggunakan metode support vector machine. Implementasi algoritma Support Vector Machine, pada e-nose telah menghasilkan model klasifikasi yang akurat dengan nilai akurasi dan presisi mencapai 99%. Performa model saat pengujian secara realtime didapatkan rerata akurasi 98,5%, recall 98,2%, spesitifitas 98,7%, dan presisi 98%. Hasil pengujian yang dilakukan secara realtime menunjukkan bahwa model SVM mampu mengklasifikasikan aroma kematangan kopi dengan tingkat akurasi yang tinggi, menegaskan kemampuan teknologi e-nose dalam mendukung proses evaluasi kualitas kematangan kopi.

Kata Kunci: Tingkat Sangrai Kopi, *Electronic Nose*, *Support Vector Machine*

ABSTRACT

IDENTIFYING THE ROASTING LEVEL OF COFFEE BEANS USING AN E-NOSE BASED ON SUPPORT VECTOR MACHINE

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The quality of coffee is influenced by its aroma and color. These parameters are largely determined during the roasting process. However, the outcome is still heavily dependent on the expertise of the roaster. Yet, these outcomes are generally subjective, making standardization challenging. This study aims to develop a classification method for the maturity level of coffee beans during the roasting process using an electronic nose (e-nose). The e-nose is a device designed to detect and analyze differences in coffee aroma related to its maturity level objectively. In this study, the e-nose is equipped with an array of gas sensors to capture coffee aroma during the roasting process, which is then analyzed using support vector machine methods. The objective is to identify aroma profiles associated with the maturity level of coffee, ultimately aiming to achieve objective and automatic classification of coffee maturity levels.

The e-nose, equipped with 8 gas sensors (MQ135, MQ136, MQ137, MQ138, MQ2, MQ3, TGS822, and TGS2620), is placed on the coffee roasting machine to determine the aroma of three roasting types: light, medium, and dark, in real-time. From 1 kg of Arabica coffee samples, a total of 18,000 data points were collected (4,500 data points per roasting type) and analyzed using the Support Vector Machine method. The implementation of the Support Vector Machine algorithm on the e-nose has resulted in an accurate classification model with an accuracy and precision reaching 99%. The model's performance during real-time testing yielded an average accuracy of 98.5%, recall of 98.2%, specificity of 98.7%, and precision of 98%. Real-time testing results demonstrate that the SVM model is capable of classifying the aroma maturity of coffee with high accuracy, confirming the e-nose technology's ability to support the evaluation process of coffee maturity quality.

Keywords: *Coffee Roast Level, Electronic Nose, Support Vector Machine*