COFFEE BEAN QUALITY CLASSIFICATION SYSTEM USING THE SUPPORT VECTOR MACHINE METHOD BASED ON COLOR, SIZE, AND TEXTURE FEATURES

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ABSTRACT

Coffee is an agricultural commodity with high economic value and significant growth potential in the global market. This study aims to address the challenges of coffee bean sorting in Empat Lawang Regency, which is currently performed manually, leading to lengthy processing times, high labour requirements, and inconsistent quality assessments. To overcome these issues, an automatic classification system based on Support Vector Machine (SVM) and image processing techniques was developed. The dataset, obtained from local collectors, consists of 740 images: 286 of good beans, 240 of moldy beans, and 214 of damaged beans. Feature extraction focused on three primary characteristics: color, size, and texture. Colour features were derived from the average values of the RGB and HSV colour spaces; size features included area, perimeter, and roundness; and texture features were extracted using the Grey Level Co-occurrence Matrix (GLCM) method. The SVM model uses a Radial Basis Function (RBF) kernel with the best parameters C = 2 and γ = 0.1. The evaluation results show an accuracy of 94.37%, a precision of 94.41%, a recall of 94.37%, and an F1-score of 94.35%. The novelty of this research lies in integrating color, size, and texture features for three-class classification using a lightweight model that is easily applicable at the MSME scale. However, the system is still limited to single-object images, so further research is recommended using multi-bean datasets and deep learning approaches, such as CNNs with YOLO or R-CNN, to be more adaptive to variations in the number and position of coffee beans.

Keywords: Classification, Coffee Beans, SVM, Feature Extraction, Machine Learning