

College of Engineering Chengannur
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M. Tech. Computer Science (Image Processing)
03CS6901 Seminar I

Abstract of Proposed Seminar Topic
**Prediction of Microbial Spoilage and Shelf-Life of
Bakery Products Through Hyperspectral Imaging**

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Keywords: Shelf life of bakery products, fungus detection and prediction, PCA, K-means, SVM, hyper sharpening.

Abstract

Bakery products are important ready-to-eat processed foods. Bakery products have been an integral part of the majority of the world population's daily routine. The shelf life of bakery products highly depends on the environment and it may get spoiled earlier than its expiry which results in food-borne diseases and may affect human health or may get wasted beforehand. The traditional spoilage detection methods are time-consuming and destructive in nature due to the time taken to get microbiological results. This paper presents a novel method to automatically predict the microbial spoilage and detect its spatial location in baked items using Hyperspectral Imaging (HSI) range from 395-1000 nm. Hyperspectral imaging (HSI) is a technique that analyzes a wide spectrum of light instead of just assigning primary colors (red, green, blue) to each pixel. A spectral preserve fusion technique has been proposed to spatially enhance the HSI images while preserving the spectral information. To automatically detect the spoilage, Principal Component Analysis (PCA) followed by K-means and SVM (Support vector machine) has been used. The proposed approach can detect the spoilage almost 24 hours before it started appearing or visible to a naked eye with 98.13 percentage accuracy on test data. This trained model has been validated through external dataset and detected the spoilage almost a day before it started appearing visually.

Every baked product has a pre-defined shelf-life depending upon the type of ingredients used in it or the environment it is placed. The variations in the estimated shelf-life of bakery products may result in two ways such as moderate environment and extreme environment. The traditional spoilage detection methods are Molecular-Level Analysis (MLA) such as confocal microscopy, immunology-based methods, polymerase chain reaction and quartz crystal microbalance. On the other hand, modern techniques include the use of ultrasound, electronic nose, digital images, and spectroscopy to detect the spoilage. HSI has been used to detect fungal, bacterial,

and microbial spoilage in several food items. This novel HSI-based technique that not only automatically detects and predicts the microbial spoilage in bakery products but also its spatial location. The analysis of microbial change in baked cake sponges has been made spatially, therefore the size of the cake images needed to be the same. While with time, the cake sponges change size due to the enhancement or reduction of moisture content. Therefore, a spectral preserve hyper sharpening technique has been used to spatially enhance the HSI images while preserving the spectral information. Furthermore, to automatically detect the spoilage PCA followed by K-means has been used.

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