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Oil Reheating Analysis Using a Multispectral Image by Machine Learning

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ABSTRACT:

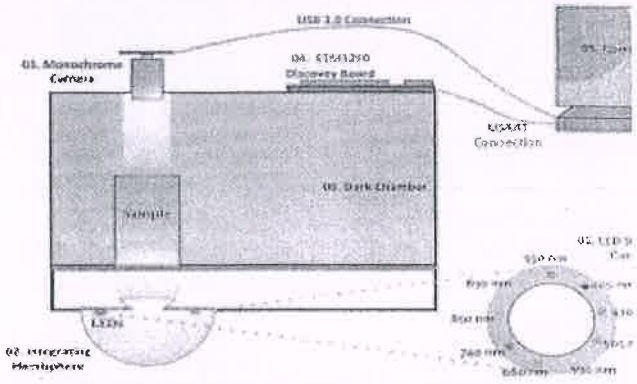
This project describes Oil reheating analysis using a multispectral image. The quality of food consumed plays a pivotal role in assuring the health of a society the reheating of oil condition is predicted using a machine learning algorithm with a multispectral image.Thereafter, another algorithm is proposed to develop a spectral-clustering-based classifier to determine the effect of reheating and reuse of coconut oil. Distinct clusters were obtained for different levels of reheated oil classes and the classification was performed with an accuracy of 0.983 on training samples. Further, the input images for the proposed algorithms were generated using in-house development.

KEYWORDS: Oil Reheat, Multispectral Image, Convolutional Neural Network, Feature Extraction

INTRODUCTION:

Coconut (Cocos nucifera), belonging to the palm family is a multipurpose tree with many uses. The fibrous one-seeded drupe is used for the production of coconut water, coconut milk, desiccated coconut, and coconut oil. Coconut oil has been used as a cooking or frying oil, as an ingredient in some foods, production of skincare products, pharmaceuticals, among others. Palm oil which shows quite similar physical properties is often used to adulterate coconut oil (Young, 1983; Pandiselvam et al., 2019) as their cost of production is significantly less than that of coconut oil. However, unfortunately, the chemical and thermo physical properties are altered during reuse and these physico-chemical changes compromise the safety of edible oils and, thus making fried foods unsafe for consumption.

A multispectral imaging system was developed utilizing nine spectral bands with peak wavelengths from 405 nm to 950 nm. An algorithm was developed based on Principal Component Analysis (PCA) and Bhattacharyya Distance. A low-cost multispectral imaging system (Goel et al., 2015; Prabhath et al., 2019) to measure the transmittance spectrum of liquids was developed. This imaging system has the capability of capturing monochrome multispectral images from ultraviolet (UV) to near-infrared (NIR), having an overall resolution of 9 spectral bands. The details of the LEDs which were used for this build. The imaging system used in this study consists of several major components. A 10-bit CMOS monochrome camera (FLIR Blackfly S Mono,1.3 MP, USB3 Vision camera, Resolution – 1280×1024) was mounted on top of the portable dark chamber to capture the transmittance spectrum of a sample.



Schematic diagram of the in house developed transmittance based multispectral imaging system