

Image analysis as analytical method for determination of cheese meltability

Gustavo Vechin de Matos*, Douglas Fernandes Barbin.

Abstract

The evaluation methods of food quality in industry are getting faster and more accurate with the development of new technologies and the improvement of the existing ones. In this scenario, computer vision system is increasingly promising, as it provides a fast, non-destructive, and often more accurate method than traditional analytical methods.

Key words:

Computer vision, cheese, rheology

Introduction

This project proposes a computer vision system to determine the meltability of different cheese samples compared to a standard method and the validation of this approach.

Results and Discussion

A total of 102 samples from six types of cheese (each one with 5 mm of height and 36 mm of diameter) from 17 different brands were used. The modified Schreiber method was used as standard, which consists in comparing the original diameter of the sample with the mean of the 4 different diameter measurements after cheese melting, with 45° between each measurement.

Images of the samples were acquired in a dark chamber, with a digital camera and two LED lamps. One image was acquired before and after melting for each sample. Then, each RGB image was separated in its 3 color channels (Image 1). The contrast was enhanced for image segmentation. After application of median filter, the Otsu's thresholding method was applied, and with a few more steps only the cheese remained in the image (Image 2).

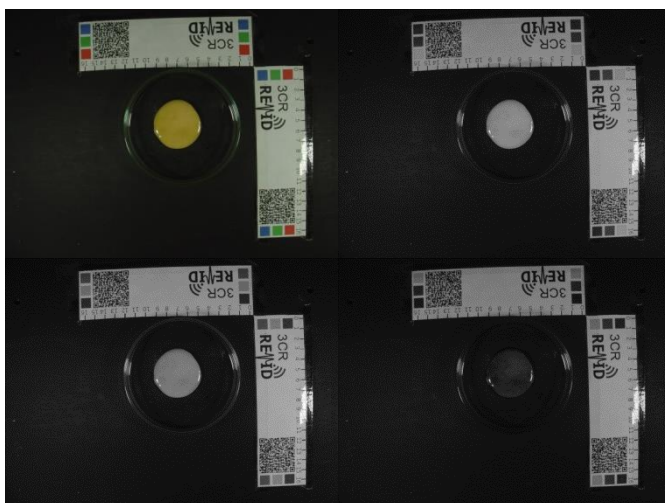


Image 1. The original RGB image and the channels red (R), green (G) and blue (B).

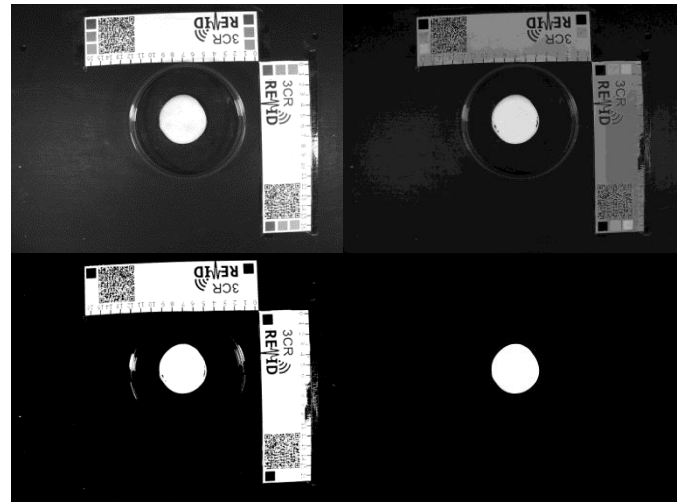


Image 2. The different steps of the image processing.

Images before and after melting were compared, and the increase in sample area was determined similarly to the Schreiber method.

The comparison between the measures of the diameters in the traditional method and the areas in the automated method showed a **correlation (r) of 0.98**, and the comparison between the increase in diameter between the traditional method and the area increase in the automated method showed a **correlation (r) of 0.96**.

Conclusions

The computer vision method is an accurate approach to determine cheese meltability. This automated method offers several advantages, as it is faster, unaffected by the fatigue of human technicians and more precise, since it only depends on the image resolution and not on a ruler.

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