Meat Quality Control

Computer Vision, UPC

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Abstract

Our goal is to discuss about different binarization methods. We have used the *basic binarization*, *p-tile thresholding*, *optimal thresholding*, *kapur method*.

Contents

1 Introduction

The objective of this assignment is to detect the percentage of fat in chops using images. To do it, we have used several different threshold techniques. Those methods consists in setting a constant value called *threshold* (T) and separe the pixels depending its value ($f(i, j)$):

$$g(i, j) = 1 \ if \ f(i, j) \geq T$$

$$g(i, j) = 0 \ if \ f(i, j) \leq T$$

In the following sections we will introduce different methods to find the threshold value and compared its results.

2 Binarization

2.1 Basic Binarization

This is the first method we tried and also the fastest and easiest one.
Our approach was to print the histogram of the picture and check where we could set the best value for the *threshold* in order to separe the fat. The histograms that we got were bimodal so we coud set an acceptable value just by looking at it. We believe that this distribution of pixel values is formed because we are working with grayscale pictures of chops where we can appreciate clearly a lighter tone for the fat and darker tones for the rest.

2.2 P-tile Method

This method uses knowledge about the area size of the desired object. It assumes the desired part of the image are brighter that the background and occupy a fixed percentage of the picture area. The *threshold* is defined as the grey level that mostly corresponds to mapping at least that fixed percentage into the object.

2.3 Otsu Method

2.4 Optimal thresholding Method

2.5 Kapur, Sahoo and Wong Method

In this method two probability distributions are derived from the original gray level distribution of the image(i.e. object distribution and background distribution):

$$\frac{p_0}{P_t}, \frac{p_1}{P_t}, ..., \frac{p_t}{P_t}$$

and

$$\frac{p_{t+1}}{1-P_t}, \frac{p_{t+2}}{1-P_t}, ..., \frac{p_{l-1}}{1-P_t}$$

where t is the value of the threshold and $P_t = \sum_{i=0}^{t} p_i$. Define

$$H_b(t) = -\sum_{i=0}^{t} \frac{p_i}{P_t} log_e \left(\frac{p_i}{P_t}\right)$$

$$H_b(t) = -\sum_{i=t+1}^{l-1} \frac{p_i}{1-p_i} log_e \left(\frac{p_i}{1-P_t}\right)$$

Then the optimal threshold t^* is defined as the grey level which maximizes $H_b(t) + H_w(t)$, that is,

$$t^* = \ ArgMax\,(H_b(t) + H_w(t))$$

3 Results

	bla	bli	blu
Otsu			
Kapur			
Optimal Thresholding			
P-tile			

Table 1: Results obtained using different methods of binarization

References

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