CS4053: Computer Vision – Lab 1

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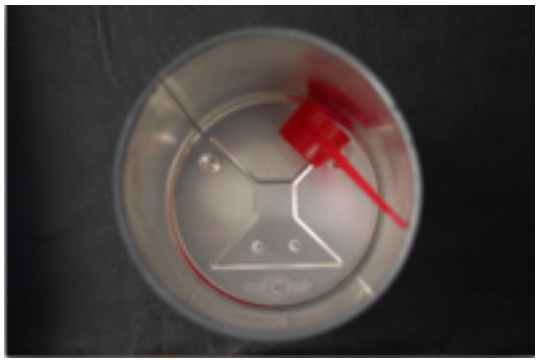
Abstract

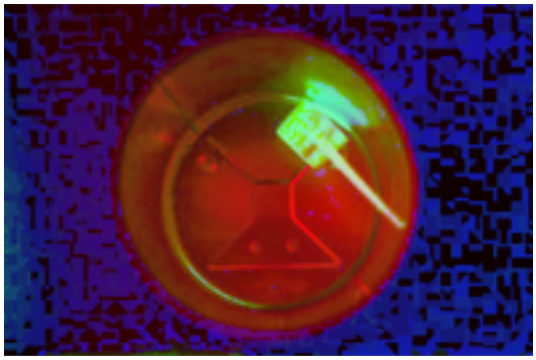
For this lab we were asked to develop a program to determine the number of spoons inside a baby food can. We were given 18 images to test and 3 sample images of a can containing zero, one and 2 spoons respectively.

Solution

My solution to this problem involves simply going through each test image and comparing the mean saturation value of it with the mean saturation values of the sample images to find the closest match. This is done by first converting the images to HSV format. In the HSV colorspace, colours with a high colour intensity are represented with a high saturation value in the second channel. In our case, the only area of high colour intensity is the spoon which is bright red. This means that images with more than one spoon will have a higher mean saturation value than those with one spoon, which in turn, will have a higher mean saturation than those with no spoons.

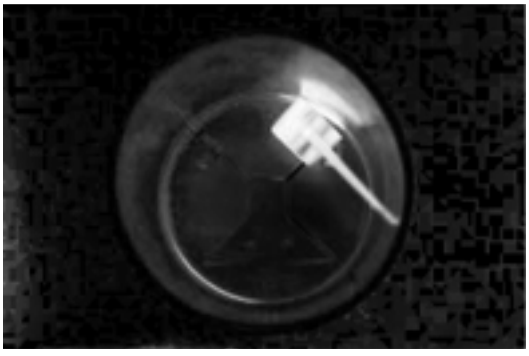


Original Image



HSV Format

Once the images are in HSV format, the saturation channel is isolated resulting in a greyscale image with bright areas representing the spoon and dark representing the rest of the image, which can be seen below. This can be used to calculate the mean saturation value by summing all of the pixel colour values and dividing by number of pixels in the image.



Isolated Saturation Channel

In my program I begin by first applying this method to each of the sample images and storing their mean saturation values in 3 variables so they do not need to be recalculated. I then iterate through each of the test images and perform the same calculation on each. The mean saturation value of each test image is then compared with each of the sample ones by taking the absolute value of the difference between each to find the closest match. By looking at the smallest difference I can determine how many spoons are in the can of baby food

Results

In my results I define a true positive as when my program correctly determines there is only one spoon in a can. I define a true negative as when it correctly determines their is no spoon or more than one spoon in the can.

Total Samples = 18

True Positives = 10
False Positives = 0
True Negatives = 8
False Negatives = 0

Precision = 10 / (10 + 0) = 1

Recall = 10 / (10 + 0) = 1

Accuracy = (10 + 8) / 18 = 1

Specificity = 8 / (0 + 8)

$F(1) = (1 + 1^2) \times ((1 \times 1) / ((1 \times 1) + 1)$
$= (2(1)) / 2$
$= 2 / 2$
$= 1$