CS4053: Computer Vision – Lab 2

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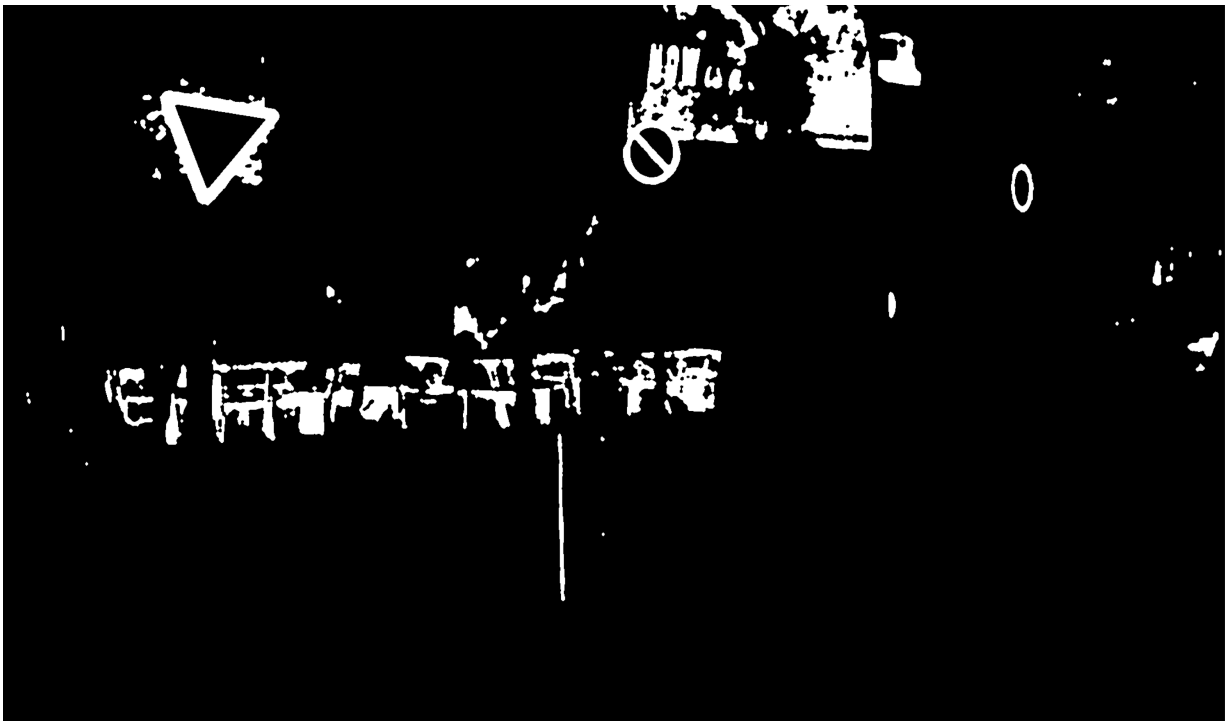
Abstract

For this lab we were asked to develop a program to recognise road signs in an image based off of some given sample road sign images.

Solution

To start my solution to this assignment I began by first extracting areas from the image potentially containing signs, by looking for red areas in it. To do this I first convert the image to Lab colour format, as road signs are meant to stand out and Lab most closely represents human colour perception, making it easier to filter out out non red sections. I then blur it the image slightly and filter out all non-red colors. Following this I perform a morphological open and close on the image to remove noise and join any disjointed components. Using this technique I was able to easily to detect all signs in road images at first but needed to increase the range of colours allowed to detect all signs in the composite images, which decreased accuracy by a huge amount.



Red areas extracted from image

After extracting the red areas from the image I find all the contours in these areas to detect possible sign locations. Any contours with a width or height less than 30 are removed so nothing smaller than a possible sign is included. I then merge any contours contained entirely within other

contours to exclude any contours contained within the borders of the sign, so only the entire sign is checked.

Sign contour areas found in sample image

Using the contours found in the red areas I was then able to extract potential signs from the images to check against each of the samples using Chamfer Matching. For each potential sign in the image I create a distance transform map to compare it with each of the samples using Chamfer Matching and determine the closest match by looking for which sample image has the most number of local minima points. If a potential sign is smaller than the sample images it will scaled up with it's aspect ratio preserved.

Successfully matched sign

Results

In my results I define a true positive as when my program detects and matches a road sign, a true negative when it successfully doesn't match another object as a sign, a false positive as when it incorrectly detects or matches something as a sign and a false negative when it fails to match or detect a sign.

Total Signs = 24
Total Potential Signs = 72

True Positives = 9
False Positives = 63
True Negatives = 0
False Negatives = 0

Precision = 9 / (9 + 0) = 1

Recall = 9 / (9 + 63) = 0.125

Accuracy = 9 / 72 = 0.125

Specificity = 0 / (63 + 0) = 0

$F(1) = (1 + 1^2) \times ((1 \times 0.125) / ((1^2 \times 1) + 0.125)$
$= 0.125 / 1.125$
$= 0.11111111111$