MCTE 7106 MACHINE VISION: QUIZ 1 (20 marks)
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Assume that you are working in a company that produces bricks for edutainment. As a machine vision engineer, you are required to build an algorithm which is able to automatically calculate the number of objects in each batch prior delivering them to packaging house.

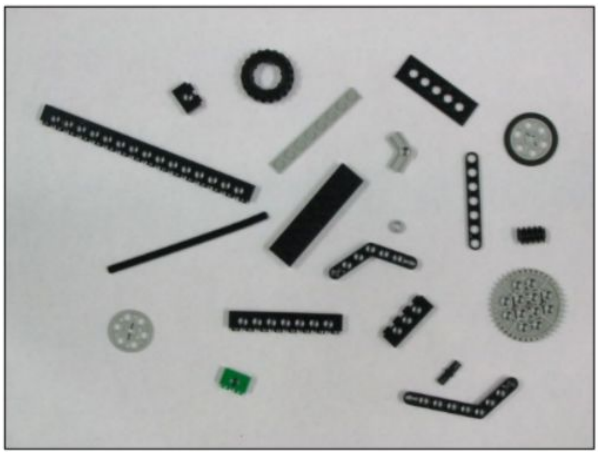


Figure 1: lego1.png file containing image of lego pieces

Specifically, your task is to perform morphological image processing operations so that you get the correct count of the number of objects present in the image lego1.png (refer Figure 1).
1) Write a Python script that reads the image 'lego1.png', binarizes it, and then performs the necessary morphological operations to print out the correct number of objects in this image. (10 marks)
2) Write a comment at each important code line to describe the operation. (5 marks)
3) Briefly describe how the algorithm works and make a flowchart to visualize such procedure. (5 marks)

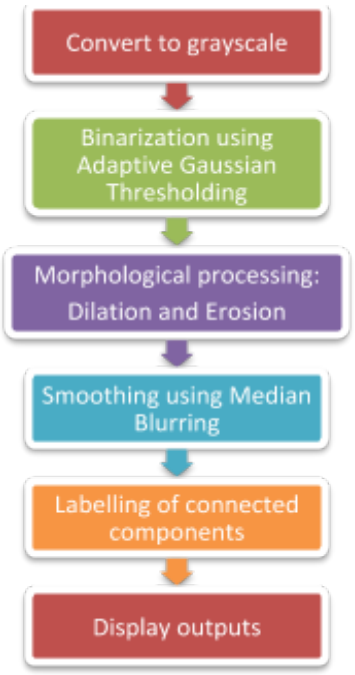
To submit this quiz, please upload your code (for Question 1 and 2) and pdf (for Question 3) on your personal GitHub. You can then submit the link of your GitHub account and the assessment will be fully based on the items deposited in that link.

ANSWER

Question 1 and 2: Refer to GitHub

Question 3:

- Firstly, the coloured image is converted to grayscale image, in order to have only one channel image. The image is then binarized through thresholding process using Adaptive Gaussian Thresholding method. This method using threshold value that is weighted sum of neighbourhood values where weights are a gaussian window.
- In the morphological processing, kernel size of 12 x 12 is chosen for Dilation and Erosion operation. Both using single iteration to adequately form relevant connected regions of the same object while providing sufficient gaps between each object to form separate regions.
- The image is then smoothen using Median Blurring to remove salt-and-pepper noise. It computes the median of all the pixels under the kernel window and the central pixel is replaced with this median value. Without this filter, the total object count resulted to be additional 1 object due to salt-and-pepper noise.
- Next, the connected components of the image are labelled and return total number of labels which is equivalent to the total number of objects.
- Finally, the original and after processed image are displayed with result of the total number of objects counted in the original image which is 20 objects.



Final Results:

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Total # of objects: 20
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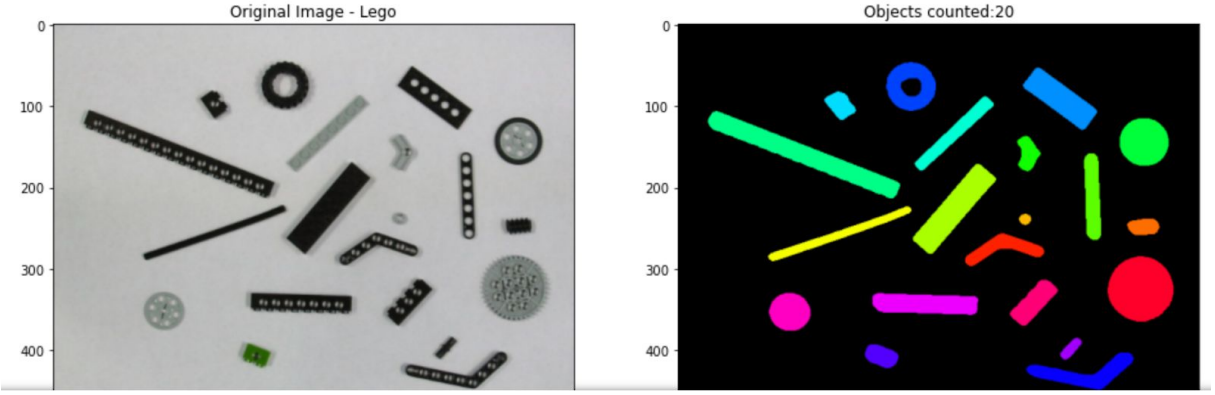

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