

COSC 5590 – Digital Image Processing and Computer Vision – Fall 2015

Assignment 4

Report

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Time spent – 10 hours

The **purpose** of this assignment is to understand and implement Morphological Operations, Erosion, Dilation and their combinations Open, Close, Boundary extraction, Top-Hat. And also to understand and implement Edge Detection Filters Prewitt, Sobel and Canny Filters.

1. Morphological Operations

- a. Erosion, Dilation – A binary Finger Print image was given to understand these techniques



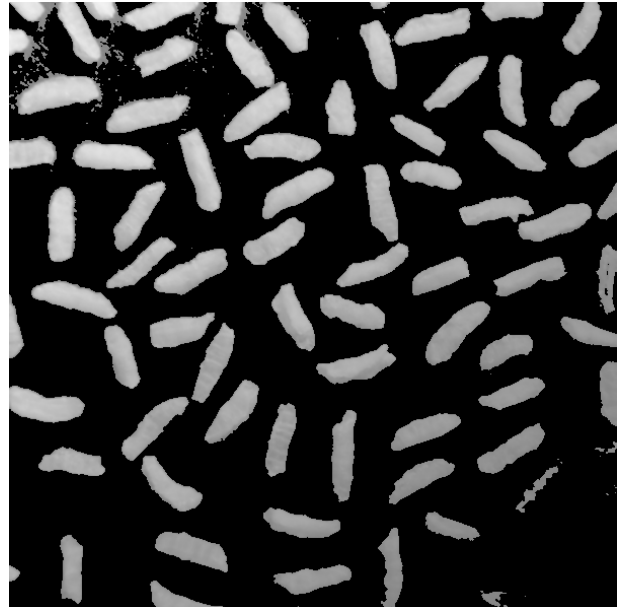
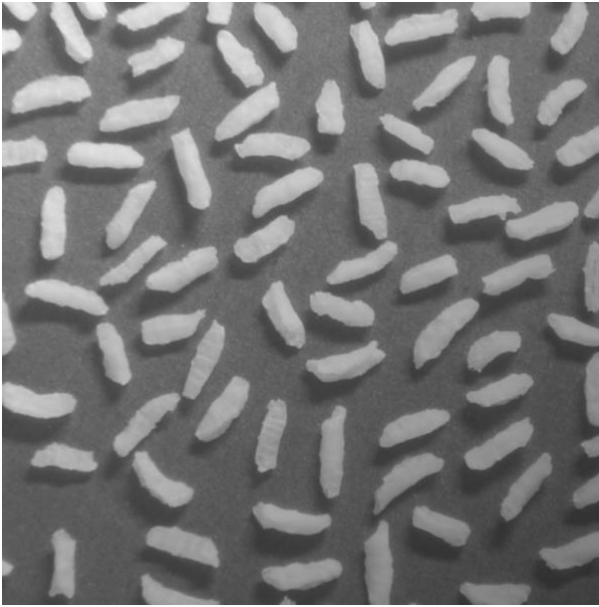
- i. Erosion – It shrunk the white lines eroding the borders of those lines.
- ii. Dilation – It expanded the white lines, the borders of the finger prints.
- iii. Open – It closed the holes and removed the noise. It is obtained by the erosion of an image followed by a dilation.



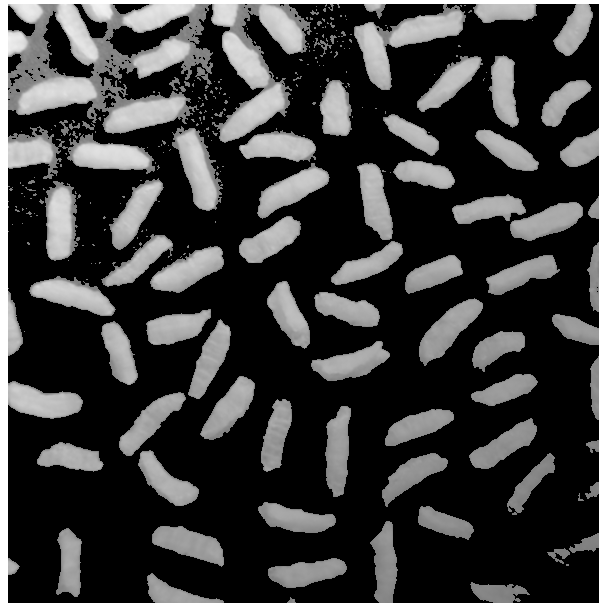
- iv. Close – It connected the lines which is at first disconnected. This is great to connect lines with small separation due to errors. It is obtained by the dilation of an image followed by an erosion.
- b. Boundary Extraction – Boundary can be achieved by subtracting the input image from its erosion image. As the erosion shrinks the boundaries of the target, subtracting it with original image will leave only the borders.



- c. Implementing Threshold, Open morphological operation using Disk and Top-Hat Operation.
 - i. Threshold – Here I have only allowed the pixels which have an intensity value greater than 133, so that the background is omitted and only the grains are obtained.



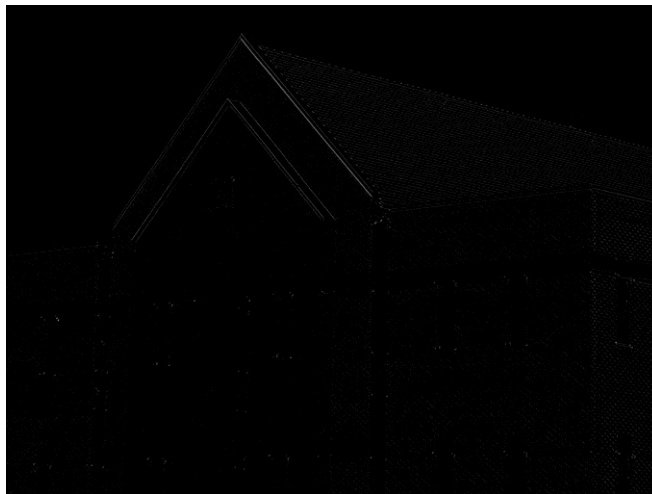
- ii. Top-Hat – It is the difference between an input image and its opening morphological operation. This was applied on the thresholded image using disk Structure of radius 40.



- 2. Edge Detection – A house image was given to detect the edges of the house.
 - a. Prewitt Filter – This filter was constructed using the filter2D function in both Horizontal and Vertical Direction and then the image is added to get both horizontal and vertical edges.



b. Sobel Filter – Sobel filter was good at detecting edges which are 45 degrees.



- c. Canny Filter – two thresholds (higher and lower) are given to this filter so that it detects the edges in that range. It's a derivative of Sobel filter. It's the most efficient of the previous filters.

