Professional Program in AI, June 2019

Indian Institute of Technology Hyderabad
Lab: Computer Vision

1 Convolution

1. Write a program to convolve two images. Test your program by using an image and an averaging filter of size 5×5. Experiment with different filter kernel sizes and present your observation.

2 Binary Morphology

For this part, work with the images *aeroplane*, *truck*, *airport*, *APC*.

1. Write a function to compute the histogram of an image and plot the same. What is the modality of the histogram for the images mentioned above? It may help to vectorize the image for this question.
2. Binarize I using the above histogram following the modal thresholding approach discussed in class.
3. Implement the connected components algorithm and use it to label the binarized version of I.
4. Implement minor blob removal to get rid of minor blobs.
5. Now implement the following filters that take a binary image I and window B as inputs: DILATE, ERODE, MEDIAN. Filter the above binary image using the following windows B = CROSS(5), B = SQUARE(3).
6. Following the development in class, implement the compound operators OPEN and CLOSE using the basic filters implemented above. Filter the binary image from the problem before last using the same windows as above.
7. Finally, implement OPEN-CLOS and CLOS-OPEN. Filter the binary image using the same windows as above.
8. For the *APC* image, count the number of pixels in the object of interest - i.e., the military vehicle.