TNM087 – Image Processing and Analysis
Lab 2 –Spatial Filtering

TASK 3 - MATLAB code for eliminating objects smaller than a given size

Write a code that eliminates objects smaller than (or equal to) those enclosed by a square of size $q \times q$ pixels by filtering the image by appropriate **box kernel** in one pass of the kernel over the image. Suppose that the background pixels have an intensity of $B = 0.1$ and all objects have an average intensity value of $Q = 0.8$. Suppose that we want to reduce the average intensity of those objects to one fourth of the average intensity of the objects (or less). That is, we want to reduce the average intensity to $Q/4$ or less. In this way, their intensity will be closer to the intensity of the background and they can be eliminated by thresholding. In your code, calculate first the (odd) size (e.g. $n \times n$) of the smallest box kernel that will give the desired reduction in average intensity in one pass of the kernel over the image**. (Hint: see assignment 19 and its solution in "lektion 2")**

Use the MATLAB template $eliminateobjects.m$ and write your code in this file. Read the comments in this template and write your MATLAB codes after each instruction. Notice that your code should be general and work for any input image and q.

Test your code on (at least) four different given test images, according to the following:

test1.tif contains five square objects of size 2×2, 3×3, 4×4, 5×5 and 6×6. Your code should work properly on this test image. Setting for example $q = 1$ will not remove any object. Setting $q = 2$, will only remove one object, etc. $q \geq 6$ will remove all objects.

test2.tif contains five objects of size 2×2, 3×3, 4×4, 5×5 and 6×7. Your code should work properly on this test image. Setting for example $q = 1$ will not remove any object. Setting $q = 2$ will only remove one object, etc. $q = 6$ will remove four objects, and finally $q > 6$ will remove all objects.

test3.tif contains four **circular** objects with radius of 5, 9, 15, and 21. Your code should work properly on this test image. Setting for example $q = 11$ will remove the smallest circular object, which has a radius of 5 and setting for example $q = 19$ will remove the two smallest circular objects, etc. Just notice that it is possible that, for example even $q = 10$ eliminates the smallest circular object, which doesn't mean that your code doesn't work properly.

Notice: In this simple solution we have assumed that small objects are far enough from larger objects. Test your code on image *test4.tif* according to the following:

test4.tif contains six square objects, two of them of size 2×2, and the rest of size 3×3, 4×4, 5×5 and 6×6. One of the two 2×2 objects is close to the 6×6 object. Setting $q = 2$ in your code will not remove the 2×2 object that is close to another object, but will remove the other 2×2 object. Test it. **Explain why this is the case, at the end of the MATLAB template.**