Image Processing Assignment

Assignment due to: 16.06.2017

Upload link: https://www.dropbox.com/request/3B4yglaUidfBQWHiLXtj

In this project, you will have to create an image-filtering tool that follows the same concept as the Focal Statistics from ArcGIS[1]. The idea is to create a moving window that calculates different statistics for every pixel neighborhood, given a specific size window. For example, let us take an image with gray values and a filtering window of 3 by 3 pixels to calculate a maximum filter (Figure 1). The center of the filtering window will be the object of focus every calculation step. Then, the pixel with higher value within the filtering window is assigned to the central pixel. This procedure runs through the whole image, resulting in a maximum filtered image. The same concept would be used for minimum, mean, standard deviation and variance descriptors.

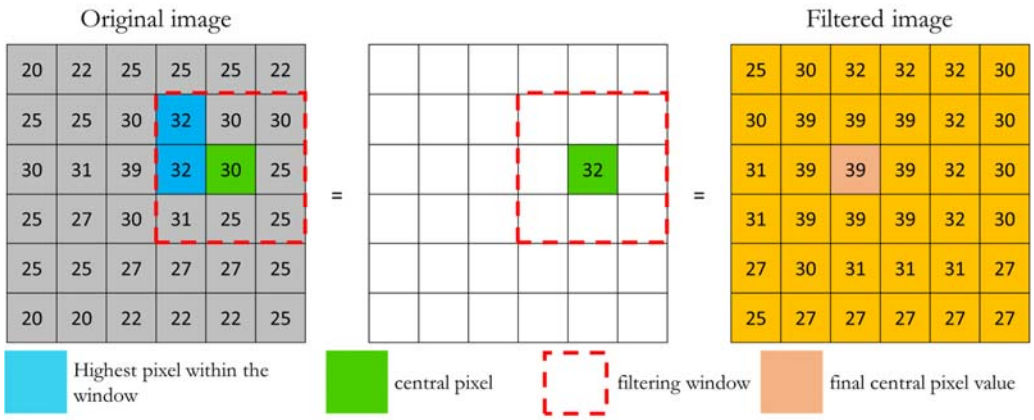

Figure 1. Schematics on how a maximum filter would work.

In the example from Figure 1, the filtering window is a square (pixel length = pixel width). However, you can have circular windows (Figure 2a), rectangular windows (Figure 2b) or wedge

[1] http://desktop.arcgis.com/en/arcmap/10.3/tools/spatial-analyst-toolbox/how-focal-statistics-works.htm

windows (Figure 2c). The important issue to be aware of when window shapes are concerned, is that the central pixel must be in the right position, as highlighted in red in Figure 2.

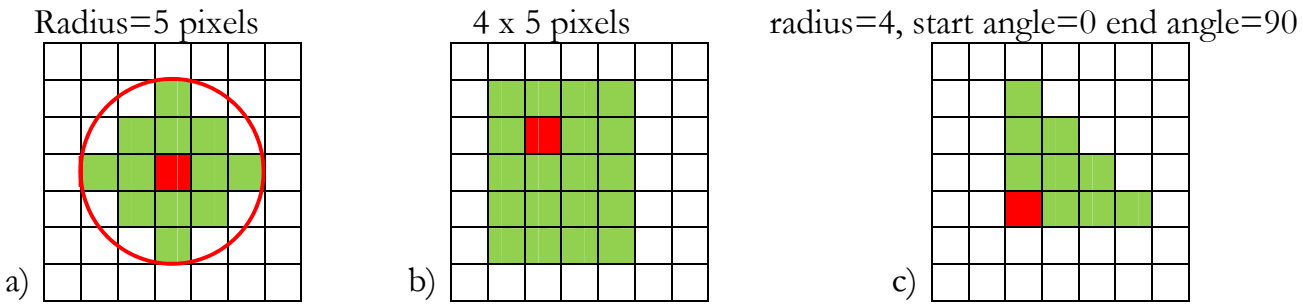

Figure 2. Example of possible filtering windows with the central pixel in red; a. circle window; b. rectangular window; c. wedge shape window.

Tasks:

1. (5P) Implement a function that creates a filtering window based on the user input. The user must provide the basic parameters (i.e. radius, size and/or angles) of the filtering window and the shape type.
2. (10P + 5P) Based on the input in task 1, implement the circle, square and rectangular shape options. The wedge shape will grant you extra points.
3. (15P + 5P) Based on tasks 1 and 2 implement the image filter like explained at the beginning of this project description and in the Focal Statistics documentation. Implement the functions minimum, maximum and mean. If you implement standard deviation and variance, you will get extra points.

You are allowed to create as many functions as you want. The design of the script is entirely up to you.

Good luck!!